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

Received w/Ltr Dated 12/14/89

Reply to:

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M E M O R A N D U M

DATE: December 14, 1989

FOR: John J. Linehan, Director, Repository Licensing and Quality Assurance Project Directorate (HLPD), Division of High-Level Waste Management

FROM: Paul T. Prestholt, Sr. OR - YMP

SUBJECT: YMP Site Report for the month of November, 1989

I. GEOLOGY-GEOPHYSICS

A. The prototype drilling program is scheduled to resume at the Apache Leap, Arizona site in January, 1990. It is anticipated that all permits and permissions will have been received by the first of the new calendar year. Mobilization of the Lang rig and crew is expected to take place during the first week of January, 1990.

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It is expected that the crew will hammer drill to about 1700' during the first three to seven days of the program. A perched water zone is reported at ± 350 feet. The crew plans to cement off the water zone to assure a dry hole at the test depth. This first hole is designed to test the entire section and locate problem zones.

The second hole will be cored using the 12 inch core system to 1100 feet and then the 8 inch core system to 1700 feet. The 12 inch system produces a PQ (3.3 inch) core while the 8 inch system produces an HQ (2.4 inch) core. It is hoped to start the core hole by the end of the 2nd week in January.

It is suggested that, should the staff wish to conduct a QA audit of the Sample Management Facility (SMF) that the audit begin at Apache Leap during the drilling of the test core hole. SMF personnel plan to use level one procedures in the handling of all core taken during this exercise. The Project hopes that any flaws or problems with the procedures will show up now so that everything will be ready to go when the drilling program at Yucca Mountain starts.

A copy of the Phase 1e Prototype Drilling Prospectus is enclosed. Please note that boreholes UZP-4 and 5 are combined and that only one 6 1/2 inch hammer drilled hole (UZPSI-2) is planned.

B. The NRC staff, the ACNW, the State of Nevada and the EEI have all commented on the need for site characterization activities to concentrate on potentially adverse conditions (PACs). In an early November guidance document (dated October 31), DOE-Hq. requested YMPO to perform a task to ensure that early testing (surface based) is prioritized to provide data needed to evaluate potentially adverse conditions as found in 10 CFR 6.122 and SCP Issue 1.8.

From the guidance document (enclosed):

"The requested effort (Attachment 1) would expand on existing information in the SCP. As appropriate, a methodology should be developed to prioritize testing in the initial phase of site characterization and, possibly, to make decisions regarding testing priorities or changes during site characterization. This effort could be used to help define priorities for performance assessment sensitivity studies to be completed over the next one to two years as well as to make use of the initial results from such performance assessment studies. The results of the effort described in Attachment 1 will be an important source of information in terms of defining the process to be used to evaluate potentially adverse conditions during site characterization, and should form the primary basis for a draft methodology to evaluate site suitability. Specifically, the feasibility of developing evaluation criteria for the potentially adverse conditions will be considered. Such criteria may be associated with either the results of field work or the results of performance assessment sensitivity work and should be related to the process to be developed and employed on a continuing basis during site characterization for evaluating site suitability. Such a process would focus initially on geotechnical information obtained from surface-based testing related to characterization of potentially adverse conditions and their potential impacts on waste isolation.

"It is envisioned that this task would be completed under appropriate YMP QA controls, and that an implementation management plan would be written to describe the work to be accomplished and documentation to be produced in implementing this guidance. Included in the management plan should be a schedule for completion, with appropriate linkage to the ongoing performance assessment work being undertaken jointly by the Project Office and Headquarters, as well as an assessment of the

geosciences, engineering, and performance assessment resources that would need to be committed to the completion of the proposed task."

A discussion of the documentation and deliverables are (from the guidance document):

DOCUMENTATION AND DELIVERABLES

The documentation and deliverables produced as a result of the implementation of this guidance should include the following:

I. The first deliverable should be a detailed management plan to describe how the guidance provided here will be implemented. The management plan should describe the sequence of activities to be completed to satisfy the scope of work described in Section 3.0 and present a schedule for the activities that will result in meeting the milestones identified in Section 8.0. The individuals responsible for conducting the work should be identified and the organizational framework described. The plan should identify the deliverables to be developed and the YMPO quality assurance (QA) requirements and procedural controls that will be applied in controlling and documenting the activities.

II. Briefing materials should be provided as interim deliverables to support interactions associated with milestones 8.4, 8.5 and 8.6.

III. The final report and supporting documentation should include the following information:

- A description of the process followed and criteria used in: 1) evaluating the significance of each PAC known or suspected to be present at the site with respect to its potential impacts on waste isolation; 2) identifying and assessing the relative importance of the information needed to characterize each PAC; 3) comparing information needed against the surface-based tests planned to acquire that information; and 4) prioritizing the testing program based on the relative significance of the PACs and the tests associated with their characterization.

- The results of the evaluation, including: 1) a description of the PACs and their relative ranking in terms of significance to waste isolation, including identification of the site-specific conditions or features that are associated with the possible presence of each PAC; 2) a description and assessment of the relative importance of the information needed to characterize each PAC; 3) priorities for surface-based testing, including justification based on items 1 and 2; and 4) an assessment of the adequacy of the current plans for testing, or recommendations regarding the need for resequencing of planned tests, or modifications to the testing strategy in response to programmatic decisions regarding the scope and timing for site characterization activities.

- A description of the options considered for conducting site-suitability evaluations on a continuing basis during site characterization, an evaluation of the options, and recommendations for the preferred approach to conducting both the preliminary and more detailed evaluations described in Section 3.4.

- A description and discussion of the information used in support of the evaluations.

- A description of the QA controls applied to the activities.

- A listing of the minimum qualifications for participants in each aspect of the evaluations, identifying the actual participants and their qualifications.

- A list of references.

Oversight, implementation and QA are described as follows:

I. The YMPO will have lead responsibility for the actions taken in response to this guidance and for documenting the results. It is expected that this guidance will be implemented through a joint effort involving YMPO, their contractors, and YMP participants, with DOE-HQ management over view of the progress. The prioritization activities should be conducted by a small team (perhaps 6-8 FTEs), with staff representing geoscience, engineering, and performance assessment. Periodic briefings will be scheduled to inform DOE-HQ of the status and preliminary results of these activities. The results will be subject to review and approval by DOE-HQ as noted in Section 7.3.

II. The evaluations to be conducted warrant the selective application of QA procedural controls sufficient to ensure that the nature of and basis for the evaluations and conclusions are appropriately documented. The activities to be conducted should be assessed in accordance with the YMP QA program requirements to confirm the preliminary determination of QA program applicability and to determine the necessary QA requirements and procedural controls to be

applied. The QA controls to be applied by YMPO should be described in the management plan as discussed in Section 6.1.

III. The final report, presenting the results of the evaluations conducted in response to this guidance (see Section 6.3), will be submitted to OFSD (RW-20) for review by DOE-HQ under OCRWM QAAP 3.1.

IV. A mangement plan (as described in Section 6.1), covering the activities to be conducted, the responsibilities and personnel involved, the QA controls to be applied, and the schedule for the evaluations and preparation of the associated documentation, should be prepared and submitted to OFSD (RW-20) for approval prior to initiating work.

The suggested schedule of milestones are:

Milestone	Date
1. Issue DOE-HQ guidance for activity	10/30/89
2. YMP management (implementation plan submitted to OFSD (RW-20) for DOE-HQ approval	12/15/89
3. DOE-HQ approval of management (implementation) plan	01/05/90
4. Brief DOE-HQ on status (progress, problems, etc.)	04/13/90
5. Brief DOE-HQ on status and preliminary results of prioritization activities (relative ranking of PACs and prioritization of surface-based testing)	06/08/90

6. Briefing DOE-HQ on status and preliminary results identification of bases for evaluating site suitability. 08/03/90

7. Submit final documentation and recommendations to OFSD (RW-20) 09/28/90

8. Briefing to Executive Committee on results 10/19/90

9. Recommendations to RW-1 for approval 11/09/90

Insert "A" is the "Preliminary Scoping for Surface-Based Testing Prioritization Initiative"

C. The Right-of-Way Reservation was granted by the Bureau of Land Management (BLM) on October 10, 1989. All mining claims have been relinquished so there are no longer any issues regarding mining claims. DOE has now completed all land access requirements for the site characterization activities in the Yucca Mountain area. Public hearings on land withdrawal will be held in Reno, Nevada on December 18 and in Henderson, Nevada on December 19.

Enclosed is a copy of the Nevada Nuclear Waste News, published by the Nevada Nuclear Waste Project Office, which presents some views in opposition to this land withdrawal.

II. HYDROLOGY

During the December 8 Technical Project Officer (TPO)-Project Manager meeting, Dr. John Stuckless, USGS gave an update on the hydrogenic deposits (calcite and opaline silica) found in Trench 14, other trenches and on Busted Butte.

11-17-89

Enclosure 2

PRELIMINARY SCOPING FOR SURFACE-BASED TESTING PRIORITIZATION INITIATIVE

TASK PLAN FOR SBT PRIORITIZATION

- Assume 5-7 FTE support for 11 mos.
- Task is to have high priority
- Limited or no new evaluations/analyses will be performed
- Small expert team will utilize available information (previous SCP-Integration Group assessments of site activity importance, records of interactions with U.S. Nuclear Regulatory Commission, etc.) to reevaluate priorities
- Options and recommendations will be developed through formal use of expert opinion/decision analysis
- Integration Team will be called upon to provide input to core team and to serve as members on expert panels

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CORE TEAM

DOE Task Force Leads: Hughes/Boak (.4 FTE)
T&MSS Team Lead: S. Mattson (.5 FTE)
Site Team Lead: T. Barbour, USGS/SAIC-Golden (.5 FTE)
Perf. Assessment Team Lead: S. Sinnock, SNL (.5 FTE)
Decision Analyst Consultant: TBD (.3 FTE)
Regulatory-Technical Consultants: TBD (.5 FTE)

YMP Integration Team (IT)
USGS Contact & staff (1 FTE)
(R. Raup - Geology; W. Wilson - Hydrology)
SNL Contact & staff (1 FTE)
(F. Bingham; T. Bonano)
LLNL Contact & staff (.3)
(Ballou)
LANL Contact & staff (.3)
(Canepa)
T&MSS technical/administrative support (.5)

HQ Direct Oversight*
HQ-OFSD rep.: Van Camp (.3 FTE)
Weston rep. (.3 FTE)
HQ-OSIR rep. (.3 FTE)

YMP Management Review **
YMP RSED & EDD Division Managers
T&MSS Technical Director
T&MSS Senior Technical Staff

* Oversight of IT activities (telecons, workshops)
** Review and approve recommendations at completion

INSERT "A"

These studies are important in site characterization in order to determine (from the handout):

- Whether or not any hydrogenic deposits or hydrothermal data have significant implications for repository performance?
  - Stability of waste package?
  - Travel time to biosphere?

- Do any hydrogenic deposits have potential economic implications?

Hydrogenic deposits are defined as (from the handout) "Minerals and Mineraloids precipitated from water". Three types of hydrogenic deposits have been identified in the Yucca Mountain region. They are (from the handout):

- Calcite and opaline silica
- Bedrock breccias
- Drusy quartz and other vug fillings

There are four modes of origin for hnydrogenic deposits. They are (from the handout):

1. Pedogenic: deposited by meteoric waters as part of the soil forming process.
2. Cold springs: groundwater of deep or shallow origin that has moved along fractures.
3. Hydrothermal springs: water heated by any of several mechanisms and moved up fractures.
4. Seismic springs: hot or cold waters moved along faults as a direct result of faulting.

This problem came to the forefront in 1984 during a field trip and inspection of trench 14. Since then, trench 14 has been deepened and mapped in detail. Other hydrogenic deposits have

been identified and studied. These paleohydrologic studies are not complete, however, Dr. Stuckless and his colleagues are over 90% convinced that these deposits are not hydrothermal (hot water) in origin and are probably the result of meteoric (rain) water deposits in fault zones. The enclosed handout describes some of the research that led to this conclusion.

III. GEOCHEMISTRY

During the November 3 TPO-PM meeting, Dr. Edward Norris, LANL gave a presentation on his work using ^{36}Cl (Chlorine-36) as a tracer to characterize water movement at a potential repository. Such water movement includes:

- Infiltration
- Percolation
- Fault and fracture flow
- Hydrologic flow

The characteristics of chlorine that make it useful as a tracer are (from the handout):

- Geochemical form is chloride
- Soluble in water
- Nonsorbing
- Nonvolatile
- ^{36}Cl half-life is $3X10^5$ year
- Quantitative assay by accelerator mass spectrometry
- Epigene (process originating near earth surface) sources of ^{36}Cl -
  - Cosmogenic fallout
  - Bombpulse fallout (important at test site)

Dr. Norris explained that he is interacting with other disciplines and organizations while pursuing his research. Examples are:

- J. Czarnecki, USGS — Regional Hydrology
- F. Kaplan, SNL — Performance Assessment
- B. Travis, LANL — TRACR3D
- M. Ray, LANL — Air Coring Test

Other interested parties:

- B. Scanlon, U-Texas — Texas Low-Level Nuclear Waste Site
- T. Beasley, DOE/EML — ^{36}Cl at INEL

The following is a summary of Dr. Norris' work to date (from the handout):

Infiltration

Measured rate of approximately 1.8 mm/yr from bomb pulse

Percolation

$^{36}Cl/Cl$ varies with particle size

Fault and fracture flow

Bomb pulse detected at 500 ft beneath Yucca Mountain and 1300 ft beneath Rainier Mesa

Studies of solute transport may be possible in G-Tunnel

Hydrologic flow

$^{36}Cl/Cl$ profiles along flow path may show that water in saturated zone beneath Yucca Mountain is old

IV. REPOSITORY ENGINEERING

A. Exploratory Shaft Facility Alternatives Study

From the Implementation Plan - Rev. 0, "The Yucca Mountain Project will perform an evaluation, conducted under a quality assurance program that meets the requirements of YMP/88-9 to identify various Exploratory Shaft Facility configuration and

construction method options, to evaluate those options, and to select a preferred option to be used as the basis for subsequent design efforts.

"The Project Office has assigned the lead technical and coordination responsibility for the evaluation to Sandia National Laboratories (SNL). Other Project participants will be assigned by the Project Office, at the request of SNL, to perform individual tasks within this evaluation."

The tasks outlined by SNL to complete this study are (from the handout):

ESF Alternatives Study

Tasks

1. Plan management & implementation
   - Develop and approve task plans
   - Schedule and approve task plans
   - Records management
   - Training
2. Develop methodology/rules for evaluations of options
   - Repository options
   - ESF options
3. Identify requirements basis for evaluations
   - Requirements for repository
   - Requirements for ESF
   - Testing requirements
4. Identify options to be evaluated
   - Repository UG configurations and accesses
   - ESF options
5. Selection of preferred option
   - Application of methodology/rules

6. Prepare study report
   - Prepare text for each task
   - Graphics/editorial support
   - Independent technical review
   - Management approval/acceptance
7. Revise SDRD for resumption of design
   - Establish quantitative PA requirements, as required
   - Update repository and testing interface requirements, as necessary
   - Verify requirements
   - Prepare/submit CR to CCB
8. Identify revisions to RDR

The proposed schedule is insert "B".

The alternatives study will be accomplished using the SNL QAPP and procedures:

<u>ESF Alternatives Study</u>

<u>QA</u>

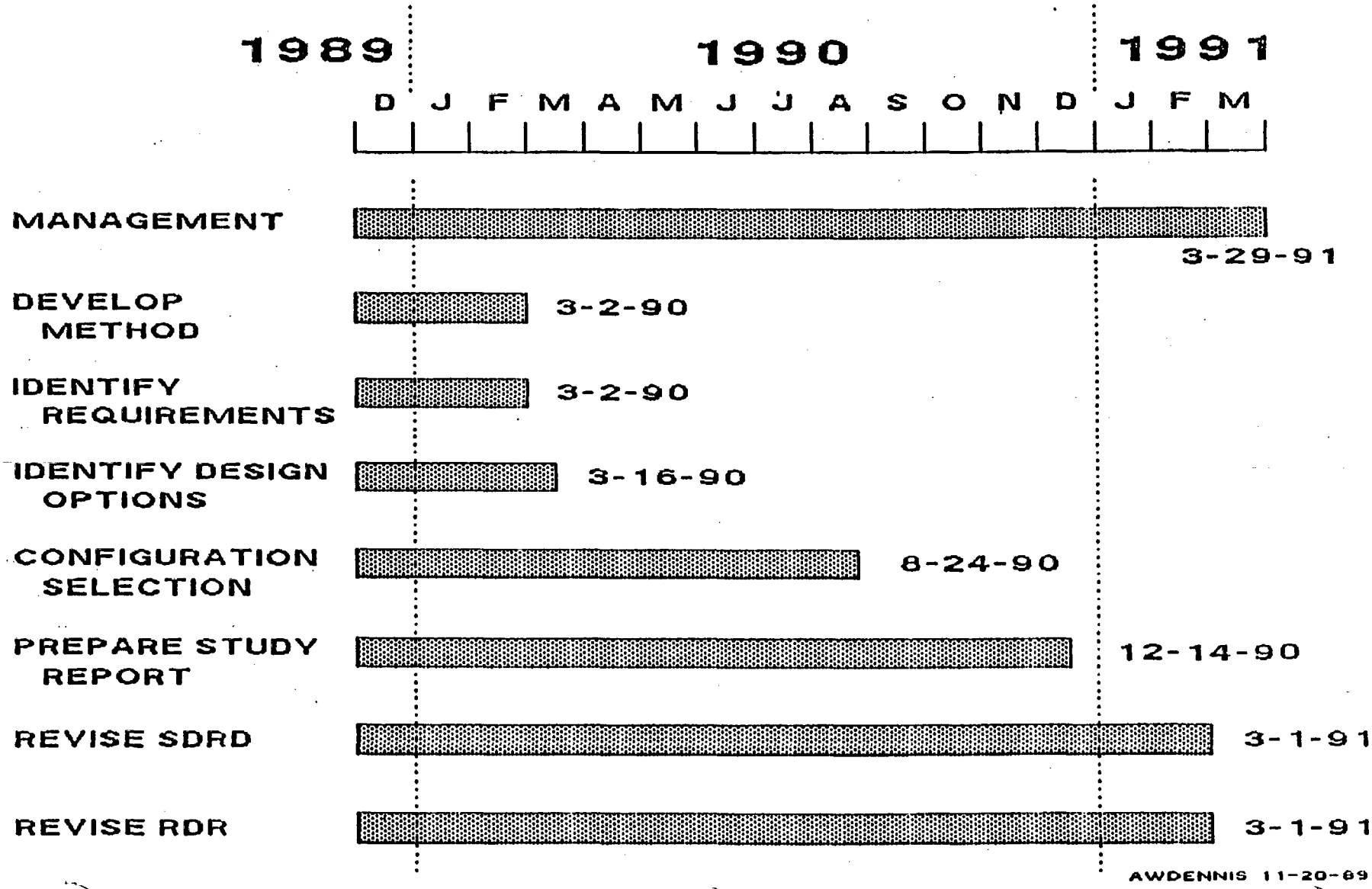
Basis for QA program is SNL QAPP and Procedures

- Those "participants" with an "approved" QA Program will operate under their own program and interface with SNL through AP-5.19Q, Interface Control.
- Those "participants" without an "approved" QA Program will operate under SNL QA procedures.

First time application of subpart G under YMP 88-9

- Work/task plans with QALAS and grading
- Software QA
- Use of data
- Formal plans
  - Personnel certification and training
    - Implementing instructions
      - Records
        - Peer review
          - Document preparation and review
            - Audits & surveillances

ESF ALTERNATIVE STUDIES SCHEDULE



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The various construction and layout options that will be addressed in this study include:

ESF Alternatives Study

Options

Repository/ESF layout

- Access (Shaft-Ramp)
- Location of Access

Construction Method

- Drill & Blast
- Mechanical
  - TBM
  - V-Mole
  - Raise-Borer
  - Etc

The SNL technical lead and the participant lead scientists for the tasks outlined above are:

Task	Lead	Participant Lead
1. Plan Mgmt	Al Dennis (SNL)	
1.1 QA		- Richards (SNL)
		- Heaney (SAIC)
1.2 Dev/Approve		- Dennis (SNL)
		- Dokuzoguz (SAIC)
1.3 Records		- Sharpton (SNL)
1.4 Training		- Tang (SNL)
2. Methodology	Costin (SNL)	- Voegele (SAIC)
		- Kalia (LANL)
		- Stanly (FSN)
		- Harig (PB)
		- Deklever (H&N)
		- Grams (REECo)

3.	Requirements	Davenport (SAIC)	- Parsons (SAIC)
			- Morales (SNL)
			- Hill (SNL)
			- Foster (SAIC)
			- Oliver (LANL)
			- Mirza (FSN)
			- Schreiner (H&N)
			- Schepens (REECo)
4.	Options	Wavrik (SNL)	- Chytrowski (FSN)
			- Graves (PB)
			- Musick (H&N)
			- Elkins (LANL)
			- Luke (SNL)
			- Koss (REECo)
			- Gardiner (SAIC)
5.	Selection	Bauer (SNL)	- Hinkebein (SNL)
			- Peterson (SNL)
			- Hardin (SAIC)
			- Grenia (FSN)
			- Mrugala (FSN)
			- Kalia/Elkins (LANL)
			- McNeely (H&N)
			- Gardella (REECo)
6.	Report	Dennis (SNL)	All Task Leaders
			Reviewers (All Part.)
7.	SDRD	Morales (SNL)	- Smith (SAIC)
			- Milligan (LANL)
			- Kennedy (FSN)
			- Brake (H&N)
			- PA Staff (SNL)
8.	RDR	Hill (SNL)	- Standish (SAIC)
			- (TBD) (PB)

The possible impacts of the ESF Alternatives Study on the program are:

ESF Alternatives Study

IMPACTS

Possible major revisions to test program

Title II Design restart moved to March '91

Construction dates estimated to be

Site prep 6-92

Collar 11-92

Repository configuration may change

Surface based testing program may change

Enclosed is the "Yucca Mountain Project Exploratory Shaft Facility Alternatives Study Implementation Plan - Rev. 0 and the handout of Dr. Tom Hunter's presentation at the December 8 TPO-PM meeting.

V. LICENSING AND DOE-NRC INTERACTIONS

A. A list of study plans that are presently in review cycle was given to each Participant with the request that YMPO be told whether or not these listed study plans can be completed in FY 90.

The Project expects to send about 60 study plans to the NRC for review by the end of FY 90. It was hoped that 3 to 4 study plans would be submitted to the staff by Christmas. There are 25 study plans that deal with ongoing activities. These plans have a high priority.

B. Since the DOE budget was reduced by 10%-15%, there will be some personnel actions among Participants. Supposedly, most personnel reassignments will take place at REECo, H&N and FSN. However, SAIC and the laboratories are expected to lose some people.

LLNL is expected to lose some people because major waste package studies, along with repository design activities, are being deferred.

Testing in "G" tunnel has been suspended and the Climax facility has been closed. Exploratory Shaft Facility (ESF) design work has been stopped and the alternative ESF concept studies have started.

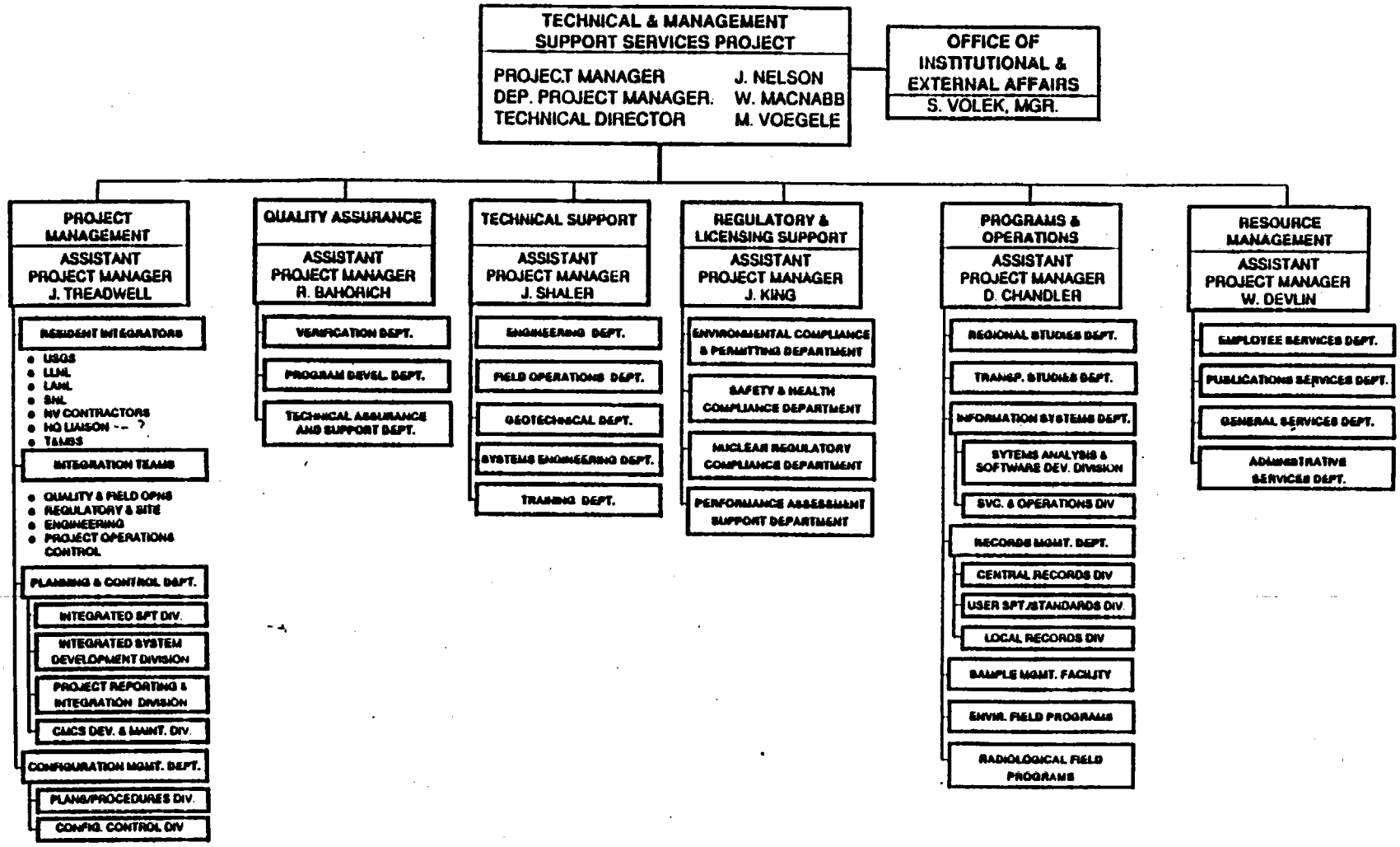
C. The SAIC T&MSS organization is undergoing a reorganization. SAIC has not issued a detailed staffing chart yet but an organization chart with the major managers is included as insert "C".

VI. STATE OF NEVADA

A. Brian McKay, the State of Nevada Attorney General, has issued an opinion concerning the legality of the States' veto of the HLW repository. The full text of this opinion is enclosed. Mr. McKay finds the Governor's veto to be legal. In the last paragraph of his opinion, Mr. McKay states:

"With respect to the pending applications for permits, it appears, based upon the foregoing conclusions, that they are moot. We advise you therefore to direct the agencies considering such permits to consider action upon the applications as unnecessary."

B. The State of Nevada attended the tectonics meeting that was held with the USGS in Denver. Mr. Carl Johnson, leader of the States' group, expressed disappointment with the technical content of the meeting. Mr. Johnson pointed out that he had made sure that the State was properly represented by technical staff to interact with the USGS principle investigators working on the tectonics problem. Mr. Johnson felt that the subject matter of the meeting was programmatic rather than technical.


TECHNICAL & MANAGEMENT SUPPORT SERVICES PROJECT
PROJECT MANAGER J. NELSON
DEP. PROJECT MANAGER. W. MACNABB
TECHNICAL DIRECTOR M. VOEGELE
OFFICE OF INSTITUTIONAL & EXTERNAL AFFAIRS
S. VOLEK, MGR.
PROJECT MANAGEMENT
ASSISTANT PROJECT MANAGER J. TREADWELL
RESIDENT INTEGRATORS
USGS
LLNL
LANL
SNL
NV CONTRACTORS
HQ LIAISON -- ?
T&MSS
INTEGRATION TEAMS
QUALITY & FIELD OPNS
REGULATORY & SITE
ENGINEERING
PROJECT OPERATIONS CONTROL
PLANNING & CONTROL DEPT.
INTEGRATED SPT DIV.
INTEGRATED SYSTEM DEVELOPMENT DIVISION
PROJECT REPORTING & INTEGRATION DIVISION
CMCS DEV. & MAINT. DIV.
CONFIGURATION MGMT. DEPT.
PLANS/PROCEDURES DIV.
CONFIG. CONTROL DIV
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ASSISTANT PROJECT MANAGER R. BAHORICH
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TECHNICAL ASSURANCE AND SUPPORT DEPT.
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FIELD OPERATIONS DEPT.
GEOTECHNICAL DEPT.
SYSTEMS ENGINEERING DEPT.
TRAINING DEPT.
REGULATORY & LICENSING SUPPORT
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SAFETY & HEALTH COMPLIANCE DEPARTMENT
NUCLEAR REGULATORY COMPLIANCE DEPARTMENT
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PROGRAMS & OPERATIONS
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TRANSP. STUDIES DEPT.
INFORMATION SYSTEMS DEPT.
SYTEMS ANALYSIS & SOFTWARE DEV. DIVISION
SVC. & OPERATIONS DIV
RECORDS MGMT. DEPT.
CENTRAL RECORDS DIV
USER SPT./STANDARDS DIV.
LOCAL RECORDS DIV
SAMPLE MGMT. FACILITY
ENVIR. FIELD PROGRAMS
RADIOLOGICAL FIELD PROGRAMS
RESOURCE MANAGEMENT
ASSISTANT PROJECT MANAGER W. DEVLIN
EMPLOYEE SERVICES DEPT.
PUBLICATIONS SERVICES DEPT.
GENERAL SERVICES DEPT.
ADMINISTRATIVE SERVICES DEPT.

INSERT "C"

VII. GENERAL

Meetings attended:

11-6 Meeting with Carl Gertz concerning new DOE budget exercise and how the Project would be effected

11-13 Meeting with Dr. Uel Clanton, DOE concerning the prototype drilling program at Apache Leap, Arizona

11-20 Field trip for the Center's Overview Committee, Mr. John Latz, et al

11-22 Meeting with Dr. Larry Hayes, USGS, TPO, concerning the upcoming tectonics meeting and QA in the USGS

11-28 Tectonics meeting in Denver, Colorado

There are no new issues that this office has identified that have not been brought to management's attention.

cc: With enclosures: K. Stablein, M/S 4 H3, R. Adler, J. E. Latz
Without enclosures: C. P. Gertz, R. E. Loux, M. Glora, G. Cook, D. M. Kunihiro, K. Turner, R. E. Browning, M/S 4 H3; R. Bernero, M/S 6 A4; H. Thompson, M/S 17 G21; H. Denton, M/S 17 F2; S. Gagner, M/S 2 G5; L. Kovach, M/S NLS260

Enclosures: Request for Staff Support for Surface-Based Test Prioritization Task Force (from Gertz, 12/1/89); Phase 1e Prototype Drilling Prosepctus (from Gertz, 12/13/89); NV Nuclear Waste News, 12/89; Activity to Evaluate Prioritization of Surface-Based Testing, 12/8/89; ESF Alternatives Study, T. O. Hunter, 12/7/89; 8.3.1.5.2.1 Characterization of Quaternary Regional Hydrology (Paleohydrology), 12/8/89; YMP Exploratory Shaft Facility Alternatives Study Implementation Plan - Rev. 0, 11/30/89; TPO Presentation, Carl Gertz, 12/8/89; ^{36}Cl Studies of Water Movements for the Yucca Mountain Project, E. Norris, LANL, 11/3/89; Ongoing Study Plans; TPO Presentation, Carl Gertz, 11/3/89; NWTRB Presentation, 12/11-12/89; LLNL Monthly Status Report, 10/89; McKay re: Yucca Mountain Site (News Release, 11/1/89)

Department of Energy
Nevada Operations Office
P. O. Box 98518
Las Vegas, NV 89193-8518

DEC 01 1989

WBS 1.2.5.1
QA: N/A

Thomas O. Hunter, SNL, 6310, Albuquerque, NM
Leslie J. Jardine, LLNL, Livermore, CA
John H. Nelson, SAIC, Las Vegas, NV, 517/T-04
Richard J. Herbst, LANL, Los Alamos, NM
Larry R. Hayes, USGS, Denver, CO

REQUEST FOR STAFF SUPPORT FOR SURFACE-BASED TEST PRIORITIZATION TASK FORCE (NN1-1990-0588)

The enclosed letter (enclosure 1) transmits guidance to the Yucca Mountain Project Office (Project Office) from the Office of Civilian Radioactive Waste Management (OCRWM) to initiate an activity to ensure that site characterization testing is prioritized to study potentially adverse conditions early during site characterization. In the guidance, the Yucca Mountain Project (YMP) is requested to develop an implementation plan describing details of the task and the associated milestones by December 15, 1989.

Enclosure 2 provides a preliminary scoping of the general approach that is planned by the Project Office for implementing this guidance. By this letter, you are requested to identify staff to support the task described in Enclosures 1 and 2. The names of your staff who will serve as contacts and support this effort should be provided to the Project Office and the task force manager by December 8, 1989. You will note that, in some cases, suggested task force members and participant contacts are named in Enclosure 2. A kick-off meeting of the task force and key support staff will be scheduled to review the implementation plan prior to sending it to the U.S. Department of Energy (DOE) Headquarters.

According to the OCRWM guidance (Section 7.2, enclosure 1), this activity should be conducted under appropriate YMP quality assurance (QA) procedural controls. Attachment 1 explains that procedural controls should be selectively applied to ensure that the evaluations and conclusions are appropriately documented. The Project Office regards this task to be primarily a review of existing information, accompanied by identification of options and recommendations for consideration by DOE management on the basis of that information. For this reason, we believe this activity is not subject to the requirements of the YMP QA Plan. However, due to the importance of future management actions that could result from this activity, the management/implementation plan should ensure that adequate controls are placed on documentation and records maintenance. In addition, if calculations or analyses are performed as a part of this task, it is assumed they will be done under the participant's approved QA program.

If you have any questions, please direct them to Maxwell B. Blanchard of my staff at (702) 794-7939 or FTS 544-7939.

Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:MBB-1000

Enclosures:
1. Ltr 10/31/89 Barrett to Gertz
2. Preliminary Scoping

cc w/encls:
D. H. Alexander, HQ (RW-332) FORS
L. H. Barrett, HQ (RW-20) FORS
S. J. Brocoum, HQ (RW-22) FORS
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DOE F 1325.8
(10-89)

Enclosure 1

From Steve

United States Government

Department of Energy

memorandum

DATE: OCT 31 1989

REPLY TO ATTN OF: RW-221

SUBJECT: Guidance on Confirming Test Prioritization Associated with Potentially Adverse Conditions

TO: Carl Gertz, Director
Yucca Mountain Project Office

During the past few months, several organizations, including the Nuclear Regulatory Commission (NRC), the Advisory Committee on Nuclear Waste, the State of Nevada, and the Edison Electric Institute, have commented that the Department should ensure that site characterization testing is prioritized to study potentially adverse conditions early on during site characterization. While the Site Characterization Plan (SCP) includes schedules for each study and activity, and includes testing associated with the NRC's potentially adverse conditions (10 CFR Part 60.122, SCP Issue 1.8), additional effort may be needed to address these outside concerns and ensure that planned tests are appropriately sequenced. By this memorandum the Project Office is requested to initiate an effort related to test prioritization for site characterization. Detailed guidance for this effort is included as Attachment 1 and is briefly discussed below.

The requested effort (Attachment 1) would expand on existing information in the SCP. As appropriate, a methodology should be developed to prioritize testing in the initial phase of site characterization and, possibly, to make decisions regarding testing priorities or changes during site characterization. This effort could be used to help define priorities for performance assessment sensitivity studies to be completed over the next one to two years as well as to make use of the initial results from such performance assessment studies. The results of the effort described in Attachment 1 will be an important source of information in terms of defining the process to be used to evaluate potentially adverse conditions during site characterization, and should form the primary basis for a draft methodology to evaluate site suitability. Specifically, the feasibility of developing evaluation criteria for the potentially adverse conditions will be considered. Such criteria may be associated with either the results of field work or the results of performance assessment sensitivity work and should be related to the process to be developed and employed on a continuing basis during site characterization for evaluating site suitability. Such a process would focus initially on geotechnical information obtained from surface-based testing related to characterization of potentially adverse conditions and their potential impacts on waste isolation.

Ultimately, the process would place reliance on the results of performance assessments employing analytical methods to determine whether site conditions, such as those represented by the potentially adverse conditions, would be likely to permit demonstration of compliance with regulatory requirements.

It is envisioned that this task would be completed under appropriate YMP QA controls, and that an implementation management plan would be written to describe the work to be accomplished and documentation to be produced in implementing this guidance.. Included in the management plan should be a schedule for completion, with appropriate linkage to the ongoing performance assessment work being undertaken jointly by the Project Office and Headquarters, as well as an assessment of the geosciences, engineering, and performance assessment resources that would need to be committed to the completion of the proposed task. Specific deliverables requested as part of this effort have also been identified in the guidance provided. We request that the implementation plan be provided by 12/15/89 with the final report and recommendation being completed by 9/28/90.

A second effort, separate from but closely related to the one directed by this memo, will be conducted in parallel. This second effort, to evaluate alternative strategies for the activities leading to assessment of site suitability and development of the license application, will be convered by guidance transmitted under separate cover, with Donald Alexander, Office of Systems Integration and Regulation, as the Office of Civilian Radioactive Waste Mangement manager with primary oversight responsibility. The work conducted under these two efforts should be coordinated, as necessary, to support the comparative evaluations of alternative strategies.

If you have any questions regarding the above request, or the more detailed information provided in the attachments, please contact Stephan Brocoum on FTS 896-4262.

Lake H. Barrett
Acting Associate Director for Facilities
Siting and Development
Office of Civilian Radioactive
Waste Management

Attachment

cc: R. Stein, RW-30
D. Alexander, RW-331
G. Appel, RW-332
S. Brocoum, RW-22
J. Kimball, RW-221
M. Blanchard, YMPO
D. Dobson, YMPO
W. Wowack, Weston
R. Jackson, Weston

GUIDANCE ON PRIORITIZATION OF SURFACE-BASED TESTING AND DEVELOPMENT OF A PROPOSED METHOD FOR SITE-SUITABILITY EVALUATIONS TO IMPLEMENT THE PROPOSED BASE-CASE SCHEDULE FOR THE REPOSITORY PROGRAM

1.0 OBJECTIVES

A process should be developed and used to review the prioritization of testing for the surface-based site characterization tests described in the SCP. The objective of the review will be to ensure an early focus on potentially adverse conditions (PACs) that may be significant in terms of system performance and the ability to meet the NRC's performance objectives, and hence significant to site suitability. In addition, a proposal should be developed regarding the method to be used to evaluate site suitability on a continuing basis during site characterization. The results from the activities conducted under this guidance should be reviewed to evaluate the need for additional performance assessment sensitivity or uncertainty studies or a refocusing of priorities for planned performance assessment studies. The results of the prioritization effort should be compared with the planned testing sequence to identify those tests, if any, to be recommended for rescheduling.

2.0 BACKGROUND

2.1 Comments received from the ACNW and EEI/UWASTE on the SCP, and the letter from the Director of NMSS transmitting the NRC's site characterization analysis, have suggested that the SCP does not provide an adequate focus on the early identification of conditions that could make the site unsuitable for a geologic repository. In particular, the comments suggest that DOE should conduct site characterization in a manner that will give early priority to addressing those concerns that may have the greatest impact on suitability. The comments also suggest that performance assessment activities should be integrated with site characterization planning in order to help establish priorities for the testing program and to provide for early evaluations of the significance of PACs with respect to meeting the NRC's performance objectives.

2.2 The DOE's preliminary strategies for evaluation of the NRC's PACs are covered in the SCP under Issue 1.8, Section 8.3.5.17. The initiating events for various scenario classes and the performance parameters that relate to each of the PACs, as defined under the strategy for evaluating total system performance (Issue 1.1, SCP Section 8.3.5.13), are identified, as are the site-characterization studies or activities planned to acquire the information needed to determine the presence and significance of each condition. The descriptions of the activities that relate to the PACs (including any planned surface-based tests) and the sequencing of these activities are presented in the various subsections of Section 8.3.1.

2.3 A decision to initiate underground exploration and testing will be made at some time in the future. That decision will reference and have as part of its basis the results of the surface-based testing and evaluations that have been conducted up to that point. Consequently, the surface-based testing program will serve to support a decision to proceed with underground work, but will not constitute any establishment of prerequisites for such underground work.

3.0 SCOPE

3.1 For the purposes of the prioritization activities covered by this guidance, the focus should be on the potentially adverse conditions (PACs), identified by the NRC in 10 CFR 60.122, that should be taken into account in evaluating performance against the NRC's performance objectives relating to waste isolation. In particular, early evaluations of site suitability are expected to be closely related to the identification and characterization of any PACs that may be present and to preliminary assessments of how these PACs might affect performance.

3.2 The strategy for addressing the NRC's siting criteria (10 CFR 60.122), described under Issue 1.8 in Section 8.3.5.17 of the SCP, should be reviewed to identify the information and testing needed to characterize the site with respect to each of the PACs. The PACs should be evaluated and judgements made regarding the relative significance of each with respect to the NRC's performance objectives for waste isolation and, hence, to site suitability. The linkage between the PACs and the NRC's performance objectives should be clearly described. If possible, limited performance assessments (e.g., sensitivity studies) should be undertaken for the purposes of supporting such evaluations. These initial evaluations of the PACs should be coordinated with the performance assessment studies that are planned to be conducted over the next year.

3.3 The surface-based tests described in the SCP should be evaluated with respect to the PACs and judgements made regarding the relative importance of each test in providing the information needed to characterize the PAC. These evaluations should consider, where possible, performance assessments made specifically for this prioritization effort or those being conducted in parallel as part of the broader performance assessment calculational exercises. Priorities will be established for the testing program through identification of those tests that provide data that are deemed important to the characterization of the most significant PACs. The results of this prioritization effort will be compared with the currently planned sequence for surface-based testing in order to assess the adequacy of the current plans and to develop recommendations for resequencing the testing program, where appropriate, to ensure an early focus on PACs that may represent site-suitability concerns. Comments received from the NRC, the ACNW, the State, and the EEI will be reviewed to determine whether specific site conditions or features have been identified that are not covered by the NRC's PACs that should be factored into the prioritization process.

3.4 A process or method that could be used to evaluate site suitability on a continuing basis during site characterization should be defined as part of this effort to ensure that the priorities identified for the testing program are consistent with a reasonable range of options for assessing site suitability. At least two distinctly different types of evaluations should be considered: 1) preliminary evaluations, based on the results from surface-based testing, and 2) detailed evaluations, including a final evaluation conducted near the end of site characterization as part of the process leading to a decision on site recommendation. The strategies presented in the SCP for making findings related to site suitability (Sections 8.3.5.6, 8.3.5.7, and 8.3.5.18) should be reviewed to identify whether programmatic or technical changes would be necessary to implement the evaluation considered under item 2.

3.5 The process or method for evaluating site suitability should consider the use of specific evaluation criteria. The evaluation criteria may be related to specific field tests or to performance assessment sensitivity results during the early phase of site characterization.

3.6 The results from the activities described in Section 3.2, 3.3, 3.4, and 3.5 should be reviewed to identify whether recommendations should be made on revising priorities for planned performance assessment studies or on adding new sensitivity or uncertainty studies to support prioritization of testing and definition of the bases for site suitability evaluations.

3.7 The assumptions made in planning the activities to be conducted under this guidance are as follows:

- The surface-based testing program currently planned provides an adequate basis for initiating site characterization and can proceed in parallel with the evaluations to be conducted under this guidance, once the appropriate prerequisites for initiation of such testing have been satisfied.

- The implementation of this guidance will require resource commitments from both site characterization and performance assessment program efforts. Planned performance assessment sensitivity studies should be explicitly linked to the evaluation and documentation of testing priorities.

- Any changes in the testing program recommended as a result of this evaluation will be subject to review and must be approved under the appropriate change-control procedures before any change is implemented. Changes in the testing program and any necessary study plan revisions can be accommodated without causing significant schedule delays.

- The initial results of this evaluation will be available in time to support implementation of the base-case schedule for site characterization. This will ensure that surface-based tests are

appropriately sequenced to provide an early focus on PACs that are likely to be significant site-suitability concerns. The information is also needed as input to support a separate evaluation of alternative strategies leading to submittal of the license application.

- The decision to proceed with underground exploration and testing once prerequisites have been satisfied is not dependent on the completion of this evaluation or on the completion of the proposed surface-based testing program.

4.0 DEFINITIONS

4.1 Site suitability: For the purposes of the activities described in this guidance, site suitability is defined on the basis of evaluations of site and system performance against the performance objectives specified by the NRC in 10 CFR Part 60, taking into account the influence of PACs such as those identified in 10 CFR 60.122. A site is suitable if site conditions permit the natural and engineered barriers to meet the NRC's performance objectives, or other performance objectives approved by the NRC under 10 CFR 60.113(b).

4.2 Other definitions: As needed.

5.0 REFERENCES

5.1 Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada. DOE/RW-0199, December 1988.

5.2 NRC Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain Site, Nevada. July 1989.

5.3 ACNW Review of NRC Comments on DOE Site Characterization Plan. Letter from D. W. Moeller, Chairman, ACNW, to K. M. Carr, Chairman, NRC, July 3, 1989.

5.4 Comments on Department of Energy Site Characterization Plan for Yucca Mountain Site. Letter from J. J. Kearney, EEI, to C. P. Gertz, YMPO, transmitting EEI/WASTE comments on SCP, June 1, 1989.

5.5 State of Nevada Preliminary Comments on the Site Characterization Plan for the Yucca Mountain Candidate High-Level Nuclear Waste Repository Site. Letter from R. R. Loux, Executive Director, Agency for Nuclear Projects, Nuclear Waste Project Office, to C. Gertz, Project Manager, YMPO, May 30, 1989.

5.6 State of Nevada comments on the Site Characterization Plan. Letter from R. R. Loux to S. Rousso, Acting Director, OCRWM, September 1, 1989.

6.0 DOCUMENTATION AND DELIVERABLES

The documentation and deliverables produced as a result of the implementation of this guidance should include the following:

6.1 The first deliverable should be a detailed management plan to describe how the guidance provided here will be implemented. The management plan should describe the sequence of activities to be completed to satisfy the scope of work described in Section 3.0 and present a schedule for the activities that will result in meeting the milestones identified in Section 8.0. The individuals responsible for conducting the work should be identified and the organizational framework described. The plan should identify the deliverables to be developed and the YMPO quality assurance (QA) requirements and procedural controls that will be applied in controlling and documenting the activities.

6.2 Briefing materials should be provided as interim deliverables to support interactions associated with milestones 8.4, 8.5 and 8.6.

6.3 The final report and supporting documentation should include the following information:

- A description of the process followed and criteria used in: 1) evaluating the significance of each PAC known or suspected to be present at the site with respect to its potential impacts on waste isolation; 2) identifying and assessing the relative importance of the information needed to characterize each PAC: 3) comparing information needed against the surface-based tests planned to acquire that information; and 4) prioritizing the testing program based on the relative significance of the PACs and the tests associated with their characterization.

- The results of the evaluation, including: 1) a description of the PACs and their relative ranking in terms of significance to waste isolation, including identification of the site-specific conditions or features that are associated with the possible presence of each PAC; 2) a description and assessment of the relative importance of the information needed to characterize each PAC; 3) priorities for surface-based testing, including justification based on items 1 and 2; and 4) an assessment of the adequacy of the current plans for testing, or recommendations regarding the need for resequencing of planned tests, or modifications to the testing strategy in response to programmatic decisions regarding the scope and timing for site characterization activities.

- A description of the options considered for conducting site-suitability evaluations on a continuing basis during site characterization, an evaluation of the options, and recommendations for the preferred approach to conducting both the preliminary and more detailed evaluations described in Section 3.4

- A description and discussion of the information used in support of the evaluations.

- A description of the QA controls applied to the activities.

- A listing of the minimum qualifications for participants in each aspect of the evaluations, identifying the actual participants and their qualifications.

- A list of references.

7.1 OVERSIGHT, IMPLEMENTATION AND QUALITY ASSURANCE

7.1 The YMPO will have lead responsibility for the actions taken in response to this guidance and for documenting the results. It is expected that this guidance will be implemented through a joint effort involving YMPO, their contractors, and YMP participants, with DOE-HQ management overview of the progress. The prioritization activities should be conducted by a small team (perhaps 6-8 FTEs), with staff representing geoscience, engineering, and performance assessment. Periodic briefings will be scheduled to inform DOE-HQ of the status and preliminary results of these activities. The results will be subject to review and approval by DOE-HQ as noted in Section 7.3.

7.2 The evaluations to be conducted warrant the selective application of QA procedural controls sufficient to ensure that the nature of and basis for the evaluations and conclusions are appropriately documented. The activities to be conducted should be assessed in accordance with the YMP QA program requirements to confirm the preliminary determination of QA program applicability and to determine the necessary QA requirements and procedural controls to be applied. The QA controls to be applied by YMPO should be described in the management plan as discussed in Section 6.1.

7.3 The final report, presenting the results of the evaluations conducted in response to this guidance (see Section 6.3), will be submitted to OFSD (RW-20) for review by DOE-HQ under OCRWM QAAP 3.1.

7.4 A management plan (as described in Section 6.1), covering the activities to be conducted, the responsibilities and personnel involved, the QA controls to applied, and the schedule for the evaluations and preparation of the associated documentation, should be prepared and submitted to OFSD (RW-20) for approval prior to initiating work.

8.0 SCHEDULE AND MILESTONES

	Milestone	Date
8.1	Issue DOE-HQ guidance for activity	10/30/89
8.2	YMPO management (implementation) plan submitted to OFSD (RW-20) for DOE-HQ approval	12/15/89
8.3	DOE-HQ approval of management (implementation) plan	01/05/90
8.4	Brief DOE-HQ on status (progress, problems, etc.)	04/13/90
8.5	Brief DOE-HQ on status and preliminary results of prioritization activities (relative ranking of PACs and prioritization of surface-based testing)	06/08/90
8.6	Brief DOE-HQ on status and preliminary results from identification of bases for evaluating site suitability	08/03/90
8.7	Submit final documentation and recommendations to OFSD (RW-20)	09/28/90
8.8	Briefing to Executive Committee on results	10/19/90
8.9	Recommendations to RW-1 for approval	11/09/90

11-17-89

Enclosure 2

PRELIMINARY SCOPING FOR SURFACE-BASED TESTING PRIORITIZATION INITIATIVE

TASK PLAN FOR SBT PRIORITIZATION

- Assume 5-7 FTE support for 11 mos.
- Task is to have high priority
- Limited or no new evaluations/analyses will be performed
- Small expert team will utilize available information (previous SCP-Integration Group assessments of site activity importance, records of interactions with U.S. Nuclear Regulatory Commission, etc.) to reevaluate priorities
- Options and recommendations will be developed through formal use of expert opinion/decision analysis
- Integration Team will be called upon to provide input to core team and to serve as members on expert panels

---

CORE TEAM

DOE Task Force Leads: Hughes/Boak (.4 FTE)
T&MSS Team Lead: S. Mattson (.5 FTE)
Site Team Lead: T. Barbour, USGS/SAIC-Golden (.5 FTE)
Perf. Assessment Team Lead: S. Sinnock, SNL (.5 FTE)
Decision Analyst Consultant: TBD (.3 FTE)
Regulatory-Technical Consultants: TBD (.5 FTE)

YMP Integration Team (IT)
USGS Contact & staff (1 FTE)
(R. Raup - Geology; W. Wilson - Hydrology)
SNL Contact & staff (1 FTE)
(F. Bingham; T. Bonano)
LLNL Contact & staff (.3)
(Ballou)
LANL Contact & staff (.3)
(Canepa)
T&MSS technical/administrative support (.5)

HQ Direct Oversight*
HQ-OFSD rep.: Van Camp (.3 FTE)
Weston rep. (.3 FTE)
HQ-OSIR rep. (.3 FTE)

YMP Management Review **
YMP RSED & EDD Division Managers
T&MSS Technical Director
T&MSS Senior Technical Staff

* Oversight of IT activities (telecons, workshops)
** Review and approve recommendations at completion

Department of Energy
Nevada Operations Office
P. O. Box 98518
Las Vegas, NV 89193-8518

DEC 13 1989

WBS 1.2.3
QA: N/A

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Larry R. Hayes, USGS, Las Vegas, NV
Richard J. Herbst, LANL, Los Alamos, NM
Thomas O. Hunter, SNL, 6310, Albuquerque, NM
John H. Nelson, SAIC, Las Vegas, NV
Joseph C. Calovini, H&N, Las Vegas, NV
Robert F. Pritchett, REECo, Las Vegas, NV
Richard L. Bullock, FSN, Las Vegas, NV
Richard E. Lowder, MACTEC, Las Vegas, NV

PHASE 1e PROTOTYPE DRILLING PROSPECTUS

Enclosed please find a copy of the Borehole Prospectus which details the Phase 1e Prototype Drilling activities at Apache Leap. Please distribute a copy of the Prospectus to the Principal Investigators in your organization to establish any need for interface with the Phase 1e Program or utilization of the boreholes after drilling is completed.

The last paragraph of the Prospectus summary mentions that access to the prototype boreholes for testing following drilling will be handled through the Sample Overview Committee (SOC) by means of review and approval of a short, 2 to 3 page, proposal. It is important for the proposals to be in to this office no later than January 3, 1990, to be considered at the next SOC meeting, prior to initiation of drilling. Your earliest response to this request will be appreciated. After approved testing is completed, the boreholes will be plugged or "ownership" transferred through the Forest Service to either the University of Arizona or other interested parties.

Should you have any questions, please contact either Uel S. Clanton or Roy C. Long of my staff at (702) 794-7943 or FTS 544-7943 or (702) 794-7503 or FTS 544-7305 respectively.

Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:RCL-1104

Enclosure w/4 encls:
Borehole Prospectus

DEC 13 1989

cc w/encl:
S. J. Brocoum, HQ (RW-221 FORS
A. D. Youngberg, HQ (RS-221) FORS
Ray Wallace, HQ (RW-22) FORS
B. B. Garms, FSN, Las Vegas, NV
C. J. Mason, REECo, Las Vegas, NV

BOREHOLE PROSPECTUS
PHASE 1e PROTOTYPE DRILLING: APACHE LEAP, ARIZONA

The overall objective of the Phase I Prototype Drilling Program is to determine if the prototype air drilling and coring equipment that has been specially designed and fabricated for the Yucca Mountain Project can obtain core from the depths required (almost 3000 feet) and leave the borehole in such a clean, dry condition that the logging and testing programs described in the Site Characterization Plan (SCP) can be successfully carried out. (Please note that no one has previously had the requirement for drilling and coring equipment to perform under the scientific constraints to be applied in site characterization.) There is no off-the-shelf equipment available for this task; almost all of the equipment is one-of-a-kind, a prototype.

The Lang Exploratory Drilling LM-120 drilling rig that we presently have under contract for the prototype drilling has a "001" serial number. Its present configuration did not exist prior to our discussions with Lang Exploratory Drilling. This unit is the largest known dual-wall drilling rig presently used in an operational capacity by a drilling contractor in the mining industry. It has a pull-back capacity that permits us to test the tools to approximately one half the full depth required during site characterization. The LM-250 rig (a new design under construction by Lang Exploratory Drilling) is being built to our specific requirements and will be the only rig in existence that will have the capability to meet the sampling/testing requirements called out in the SCP.

The bits being tested (both diamond and roller cone) are new designs made to order; they are not off-the-shelf items. The drill strings (both 7 and 9-5/8 inch) that we are using with the LM-120 and LM-250 are nonstandard items. The new bits and modified drill strings must be tested at the earliest possible date and to the maximum depth to determine if the total system can drill the boreholes to depth with minimum borehole contamination and acquire the core required for site characterization.

The Apache Leap drilling program is the third test of the prototype equipment. Changes have been made to the tools based on each of the previous tests. If the present designs do not work to the depth required, some additional time/money/design/testing will be required to obtain a viable system. Ideally, we should have a proven drilling and coring system before we start site characterization.

The Project plans to drill three different diameter boreholes (6-1/4", 8", and 12-1/4") at Apache Leap, Arizona. The two smaller holes will be drilled to a planned depth of 1700'. The larger hole will be drilled to a depth of 1100'.

The 6-1/4" hole will be hammer drilled. Cuttings will be available but no core will be taken. The 8" hole will be drilled in close proximity (within 50') to the 6-1/4" hole. Both cuttings and HQ size core (2.4" diameter) will be taken and logged by Sample Management Facility (SMF) personnel. The 12-1/4" hole will be drilled in close proximity to the 8" hole. Cuttings and PQ size core (3.3" diameter) will be taken and logged by SMF personnel.

The continuing objective of the Phase I Prototype Program is to drill and core the prototype boreholes as deep as possible. In conjunction with this continuing objective, the focused, primary objective of the Phase 1e Drilling

ENCLOSURE

Program at Apache Leap is determination of drilling, coring, and trip times along with bit life (both roller cone and diamond bits) so that a drilling schedule can be developed to determine the time required to complete the drilling requirements outlined in the Site Characterization Plan (SCP). An important adjunct to this primary objective is the determination of the number of drill rigs required to complete the SCP drilling program once drilling/coring durations are known and a completion date is set.

The second objective is to compare the geophysical log quality from three different sizes of boreholes and establish, as soon as possible, a basis for determining the need for both the 8 and 12-1/4" boreholes. Enclosure A is a matrix of the activities to be completed versus diameter. The lower portion of the matrix describes the geophysical logs planned to be run as the basic U.S. Geological Survey (USGS) logging program. As noted on the matrix, additional logs may be run to fulfill geochemical requirements as soon as need and capabilities are verified. Enclosure B and C are the Apache Leap site evaluation report and the anticipated Geologic Section respectively. Enclosure B contains a map showing the primary and contingency drill sites.

A third, and continuing, objective is the establishment of efficient methods and procedures for acquisition of samples while minimizing contamination and maximizing quality of the borehole. Enclosure D is the Fenix and Scisson of Nevada (FSN) drilling program. In accordance with this program, perched water, known to exist at Apache Leap, will be grouted off. Development of successful grouting procedures for water shutoff in an empty borehole (and minimizing borehole contamination) will also be an objective of the prototype drilling. These procedures will be distributed to the Principal Investigators (PIs) following the Apache Leap drilling. The PIs will review the procedures for potential conflicts with each PIs testing/sampling program. Although perched water is not presently anticipated at Yucca Mountain, establishment of acceptable procedures will avoid significant delays in the event perched water (however limited) is found after Quality Level I Activities are initiated.

PI interactions while the borehole is being drilled will be limited. If the interaction <u>does not</u> impact the prototype objectives, the SOC will recommend a course of action as per AP-6.4Q. Both the Director, Regulatory and Site Evaluation Division, and the Project Manager, Yucca Mountain Project Office, will concur on PI involvement at Apache Leap.

The present plan calls for installing locking caps on all three boreholes to leave them available for additional packer and geophysical testing by the USGS and others as required. Access to the boreholes for testing, logging, gas sampling, etc. will be through the Sample Overview Committee (SOC) by way of a short proposal. The proposal should outline the activity to be performed, the time/duration of the activity, schedule/sequence of the test, support required and from which organization(s), Study Plan/Activity under which the activity will be performed and any other information that the PI wishes the SOC to consider in the evaluation of the proposal. Timing and schedules are required in order to allow coordination with the Forest Service (the landowner at Apache Leap) for potential conflicts.

The holes will be plugged and the locations reclaimed as soon as possible after completion of testing in order to maintain a good working relationship with the Forest Service. The possibility exists of leaving the boreholes open for an extended period, as required for additional testing, by means of a transfer of ownership agreement. However, the Yucca Mountain Project Office should be notified of needs as soon as possible and the transfer will have to be coordinated with and approved by the Forest Service.

PHASE 1 PROTOTYPE DRILLING, APACHE LEAP: DETAILED OBJECTIVES

	BOREHOLE SIZES		
	6-1/4"	8"	12-1/4"
CORING TIME		X	X
DRILLING TIME	X		
REAMING TIME		X	X
TRIP TIME:			
FOR CORING		X	X
FOR REAMING		X	X
FOR HAMMER	X		
BIT LIFE:			
CORE BIT		X	X
DRAG BIT		X	
ROTARY BIT		X	X
HAMMER BIT	X		
REAMING BIT - TESTING FOR DURABILITY		X	
GEOPHYSICAL LOGS:			
DENSITY TOOL #2213	X	X	X
DENSITY TOOL #2227		X	X
NEUTRON- ENP	X	X	X
NEUTRON- AWS TOOL #2415	X	X	X
6-ARM CALIPER	X	X	X
GYRO SURVEY	O	X	X
TV LOG	O	X	X
* DUAL INDUCTION	O	X	X
* DIELECTRIC		X	X

* These logs will require that laboratory measurement of water saturation be made in order to confirm calibration.

The above logs, marked with an "X", have the concurrence of USGS as a basic logging program to attempt at Apache Leap if "empty hole" calibrations can be made by Atlas Wireline Services in time for the Prototype operations estimated to begin in January. Lab work will also likely be required on recovered samples to confirm grain density and porosity. The three logs marked with an "O" are additional logs recommended to be run by the Project Office. Additional Geochemical and Water Saturation Logging tools available from Schlumberger are in the process of being investigated. Should these tools prove applicable to site investigation requirements, the following additional Schlumberger tools might be run: 1) GNT-G Dual Detector Neutron Log (improved compensated neutron log for air-filled boreholes); 2) Schlumberger's Geochemical Tool; and 3) TDT (Thermal Decay Time - new dual-pulse/dual-gate system for improved statistics)

EVALUATION OF THE

APACHE LEAP SITE, ARIZONA

FOR POTENTIAL PROTOTYPE DRILLING,

YUCCA MOUNTAIN PROJECT

November 1989

Prepared by
Field Operations of Sample Management
Technical and Management Support Services Contractor
Yucca Mountain Project

ENCLOSURE B

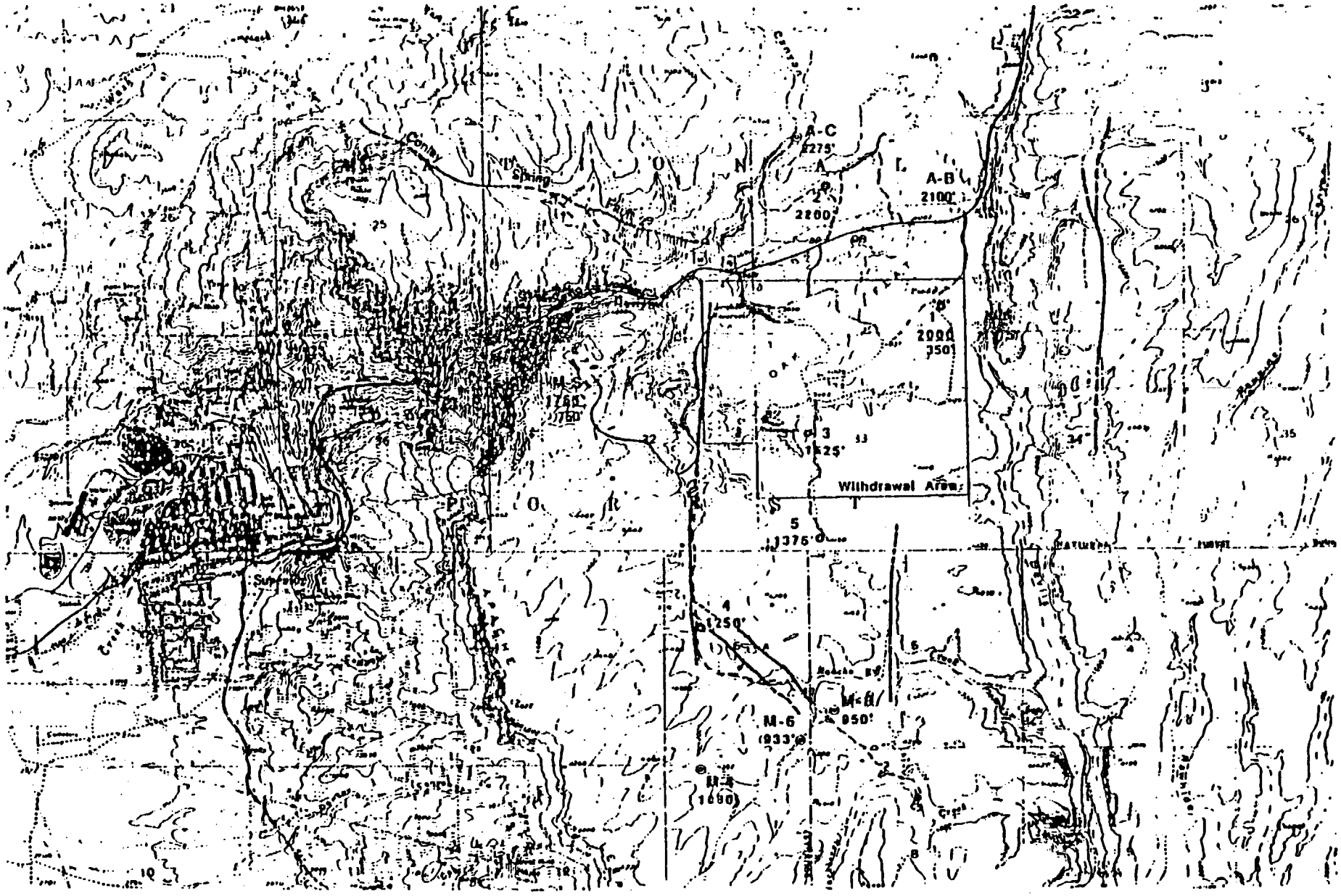
INTRODUCTION

In early October 1989, Field Operations of Sample Management was asked to identify potential drilling sites where the feasibility of continuous wireline coring could be tested using air rather than foam or mud to depths exceeding 1000'. Using guidelines developed from conversations with the Yucca Mountain Project Office (Project Office), sites were evaluated for (1) volcanic rocks similar to those at Yucca Mountain (e.g., moderately to densely welded rhyolitic ash flow tuffs); (2) a minimum of 1600' of volcanic rock, mostly welded tuff; (3) an unsaturated zone deep enough to continuously core 1600' of welded tuff; (4) less than 300' of non-volcanic rock above the welded tuff; (5) accessibility to the LM 120 drill rig and sufficient space for a drill pad; and 6) permittability. In early November 1989 a report was submitted to the Project Office which summarized preliminary evaluations of 23 sites for suitability for prototype drilling. In light of the geology, hydrology and access, the Apache Leap site east of Superior, Arizona, appeared to be the most promising of the sites investigated.

This report contains detailed site information and identifies five potential drilling locations in the Oak Flat area (Fig. 1). Based on existing drill hole information, the site appears to be underlain by a northward thickening wedge of moderately to densely welded dacitic tuffs, the Apache Leap Tuff, similar in composition and welding to the Paintbrush Tuff at Yucca Mountain. A mine shaft and several drill holes in the area are reported to have been either dry or to have encountered at shallow depths perched water that was controllable. Access to the area is good.

GEOLOGY

Apache Leap is a high escarpment which trends north-south along the western side of an extensive upland of volcanic tuff. Elevations are around 4700-4800' along the crest of the escarpment and are 4000-4400' over much of the upland. Bedrock is exposed over most of the area, and soil cover everywhere is less than 10-20' thick. The Tertiary-aged Apache Leap Tuff is a massive sequence of dacitic welded tuffs which thickens northward across the area from about 1000 feet to about 2300 feet. It unconformably overlies a very complex sequence of Precambrian through early Tertiary age sedimentary and metamorphic rocks. The following brief rock descriptions are based on observations made on a traverse along the type section of the Apache Leap Tuff in Queen Creek Canyon. Along the canyon the tuff dips eastward at low angles between 8 and 15 degrees. These descriptions were fitted into D. Peterson's informal stratigraphic subdivisions of the Apache Leap Tuff that were measured in the nearby Magma #9 shaft (1500' south of the canyon). The basal portion of the tuff begins about 200 feet west of the west portal of the tunnel for route 60 east of Superior. Fragmental material in these tuffs includes juvenile ejecta (generally pumice derived from the erupting magma), cognate ejecta (derived from volcanic rocks from previous eruptions of the same volcano) and accidental fragments from the subvolcanic basement. Lithic as used here covers cognate and accidental



3 – Map #
2000' – Thickness of fill
350' – depth to perched water, if known

0 Scale: 1 Mile

N

Figure 1. Location map of existing boreholes and potential prototype drilling sites.

material. The basal 30 feet of nonwelded tuff and all but the upper 20 feet of the overlying "black vitrophyre unit" (80 feet thick) are covered by talus here. This vitrophyre is a densely welded crystal-lithic vitrophyre with lapilli-size and larger fragments making up about 10 to 15 % of the rock. The overlying "brown inclusion unit" is about 275 feet thick and is a gray-brown, densely welded crystal lithic tuff . Most of this unit is masked by the tunnel. The overlying "gray unit" (1000 feet thick) is a partially welded pinkish gray crystal rich lithic tuff. The dominant type of fragmental material is a cream colored crystal "tuff" that was formed by the compaction of the original crystal bearing pumice fragment (juvenile ejecta). Accidental and possibly some cognate ejecta make up a small amount of the fragmental material. Flattening ratios are generally less than 6:1. Lapilli size fragments and larger make up less than 10 % of the rock in the lower portions of this unit, but appear to increase in size and amount (on the order of 25%) higher in the "gray unit". The "white unit" (600 feet thick) consists of partially welded to nonwelded, light pinkish gray to white crystal-lithic to pumice-block lithic tuff. Lapilli size and larger pumice fragments with minor amounts of cognate and accidental fragments make up as much as 60% of some intervals. The upper 100 feet of the "white unit" is composed of nonwelded, white crystal tuff, gray pumice-block lithic tuff, and white to tan reworked tuff (characterized by thin beds, cross bedding and thin channel structures). The pumice-block tuff contains a few cognate and accidental fragments. Pumice fragments weather out to give these rocks a vuggy appearance. This uppermost (100 foot) unit may be unconformable on the older Apache Leap units. North of the highway in the area of the second drill site the bedded tuffs abut directly against the older partially welded tuff without a change in attitude. Although this relationship could be interpreted as being due to faulting the lack of deformation near the contact (actual contacts are covered) suggests that the upper tuffs were deposited in a topographic low and are in depositional contact with the sides of a paleovalley. A few thin beds of silicified tuff along with associated veinlets of blue-white chalcedony occur in this upper unit.

Field time was not adequate for a detailed study of the fracturing in the Apache Leap Tuff. High angle joints (dips generally >75 degrees) with northeast, northwest, and east-west strikes are common throughout the unit. Low angle joints (dips generally < 45 degrees) are also present. Through at least the lower half of the tuff strong partings or joints parallel to the compaction foliation are well developed. Combinations of closely spaced high angle joints and joints or partings along the foliation lead to highly fractured masses of tuff within the Apache Leap unit. No evidence of springs or seeps along these fractures was observed in the canyon. Zones of tight, bleached granulated to brecciated tuff occur along shear zones examined in the vicinity of the canyon. Although some zones are silicified most of those observed were not.

Drill site 1 south of the highway is a large area of nearly flat topography with excellent road access. A borehole here would spud in the upper nonwelded white tuff (upper 100 foot unit). One small silicified breccia zone (N-S,80E) lies about 100 feet west of this site. The second site, north of the highway would require more site preparation, but has good road access. A borehole here would also spud in the upper white tuff. There is a minor amount of silicification in this area.

Several exploratory coreholes have been drilled in the area by Magma Copper Co. and ASARCO Inc. (Table 1). The tuff thickness increases northward from 933' in hole # M-6 to almost 2300' in hole # A-C. Unfortunately, little more than the thickness of the tuff was recorded during drilling of these coreholes. The most reliable information is from the sinking of the Magma #9 Shaft (map # M -S), which penetrated 1765' of dacite tuff closely matching the description of the type section. The Apache Leap Tuff is expected to equal or exceed that thickness over most of the area to the east and northeast of the shaft.

A number of faults have been mapped in the area (Fig. 1). One north-trending fault parallels the western edge of the withdrawal area. Two other north-trending faults are mapped about one and two miles to the east. A northwest-southeast trending horst passes between boreholes M-6 and M-8. Several other apparently discontinuous faults are mapped beyond the locations of the existing boreholes. Field observations suggest that there are probably numerous small faults and crushed zones present in addition to the major ones shown.

Table 1. Drill holes in the vicinity of potential prototype drilling sites.

Map #	Hole #	Location		Thick.	Depth
		Section	T., R.	of tuff	to water
A-A	ASARCO A	SW1/4 SW1/4 sec. 27	T. 1 S., R. 13 E.	1975'	400'
A-B	ASARCO B	SE1/4 NE1/4 sec. 28	T. 1 S., R. 13 E.	2100'	360'
A-C	ASARCO C	NW1/4 NW1/4 sec. 28	T. 1 S., R. 13 E.	2275'	*
M-S	Magma #9 Shaft	NW1/4 NW1/4 sec. 32	T. 1 S., R. 13 E.	1765'	750'
M-4	Magma 4	NE1/4 NW1/4 sec. 7	T. 2 S., R. 13 E.	1080'	*
M - 6	Magma 6	SE1/4 SE1/4 sec. 6	T. 2 S., R. 13 E.	933'	*
M - 8	Magma 8	SW1/4 SW1/4 sec. 5	T. 2 S., R. 13 E.	950'	*

HYDROLOGY

Very little published information is available on the surface and subsurface conditions at the Apache Leap site. Only one spring is mapped about two miles to the north of the area, and no indications of surface water were seen in Queen Creek or Devils Canyons. Rainwater has been impounded in small ponds on the upland surface. There does not appear to be any published information relating to the subsurface hydrologic conditions in the tuff section.

Magma mine records and personnel indicate that the Magma #9 Shaft was dry to 750' where a fracture aquifer was penetrated. The zone was grouted, shutting off the flow, and sinking continued, reportedly dry, to total depth. Mining ceased in 1982 and the shaft was allowed to flood. Maximum static level is reported to have been at about the 3550' level or only about 600 feet above sea level and well below the base of the tuff section. Water-supply wells were later drilled into the perched zone and have provided mine water at about 60 gallons per minute for nearly 20 years. If this perched water is found to be largely confined to a relatively isolated fracture zone, this could be advantageous for the purpose of closely simulating hydrologic conditions at Yucca Mountain (perched water and flow through fractures are included as part of the conceptual model of ground-water flow at Yucca Mountain). In addition, many of the rocks at Yucca Mountain are believed to have relatively high saturation levels (>50%). Drilling through a wet fracture zone at Apache Leap could simulate the conditions of perched or fracture water and water contents approaching saturation, similar to those that might be encountered at Yucca Mountain.

ASARCO has drilled a few coreholes in the area with air circulation and reported having encountered water zones similar to that in the Magma #9 Shaft at depths of 350-400'. Apparently no increases in volume were noted with depth, suggesting zones of limited vertical extent. Later, holes drilled with mud lost circulation at similar depths, indicative of possible low-pressure aquifers. These intervals were successfully plugged off, and drilling continued without problems.

LAND OWNERSHIP

Magma, ASARCO and probably others hold unpatented mining claims on a considerable portion of the area. However, most of the area of interest is controlled by the Forest Service of the U.S. Department of Agriculture as National Forest land. An area about one mile square around the Oak Flat campground has been withdrawn from mineral entry (Fig. 1). But permits for exploratory or scientific drilling can be obtained, even in the withdrawal area.

ROAD ACCESS

U.S. Highway 60 climbs Queen Creek Canyon just to the north of the area of interest, and there is limited access over fair to good roads within the area. Magma has a paved road to the Magam #9 Shaft near the crest of the Apache Leap escarpment, and there are a few forest service roads and trails across other parts of the area. The terrain along the crest is developed on bedrock and is very rough, and grading roads and a drill pad would be very difficult. A mile or so eastward the surface flattens, and several areas would provide good drill sites. A field examination was made of access routes into the southern part of the area. Generally these are impassable for the larger drill rigs without substantial upgrading. A newly-graded dirt road leads northward from the highway.

RECOMMENDED DRILL SITES

Based on geologic and hydrologic data and field examination of the area, three sites were selected for permitting. Two other sites were suggested by Magma as potential drilling sites. Table 2 lists the locations of these five sites. The map number indicates the Project Office's order of drill site preference.

Table 2. Locations of potential prototype drill sites.

Map #	Location	Elev.	Remarks
1	SE1/4 SE1/4 sec. 28, T. 1 S., R. 13 E.	~4075'	~600' from south & east lines
2	SE1/4 NW1/4 sec. 28, T. 1 S., R. 13 E.	~4070'	~1700' from north line ~1980' from west line
3	SE1/4 NW1/4 sec. 33, T. 1 S., R. 13 E.	~4015'	~2500' from north line ~1300' from west line
4	SW1/4 NW1/4 sec. 6, T. 2 S., R. 13 E.	~4120'	~1850 from north line ~800 from west line
5	SE1/4 SW1/4 sec. 33, T. 1 S., R. 13 E.	~4150'	~200' from south line ~1700' from west line

SUMMARY

A summary of selection parameters for each of the five sites is presented in Table 3. Thickness of the tuff may range from 1250 to 2200'. Site 4 is located between two faults. Perched water will probably be encountered between 350' and 1000' below the surface in the area but is reportedly controllable by grouting. Accessibility varies to the sites. The roads to sites 1 and 2 are in excellent condition. The road to sites 3 and 5 will require some upgrading at the beginning of the road and major upgrading to reach site 5. The road to site 4 needs major upgrading. Permitting of any site is likely to be relatively easy but could require as long as 45 days. These factors indicate that site 1 is recommended as the primary site, and sites 2 and 3 are the secondary selections.

Table 3. Selection parameters for potential prototype drilling sites.

Hole #	Est. tuff thickness	Est. depth to perched water	Access	Land Ownership
1	2000'	350'	excellent	Forest Service (Withdrawal)
2	2200'	*	excellent	Magma unpatented claims
3	1625'	*	needs upgrading	Forest Service (Withdrawal)
4	1250'	*	major upgrading	Magma unpatented claims
5	1375'	*	major upgrading	Magma unpatented claims

* insufficient information

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Field Operations of Sample Management, T&MSS Contractor, 1989. Evaluation of some potential sites for prototype drilling on the southeastern U.S., Yucca Mountain Project: T&MSS Contractor, Yucca Mountain Project, Las Vegas, NV, 33 p.

Various well records, misc. dates. Ariz. Dept. Water Resources, Phoenix, AZ.

Webster, R., 11/89. Magma Copper Co., Superior, AZ, Pers. Comm.

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ISS CORE LOGGER

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Scale: 1" = 200'

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ded Tuff

Log Sources:

Magma Copper Co.

D. Peterson/USGS

J. Kepper/T&MSS

J. Moyer/T&MSS

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cated just south of Route 60. Thickness of upper most
eld data. Rock descriptions based on field observations

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han 6:1.

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C

FSN

YMP RECORD OF VERBAL COMMUNICATION

Time: 9:55 A.M.

FS-YRVC-00054

FROM Roy Long of DOE/YMPO

TO Eddie [illegible] of FSN

☒ By Telephone
☐ By Radio
☐ In Person

SUBJECT: DRY DRILLING AND CORING EQUIPMENT PROGRAM - PHASE 1e

☒ Received the following
☐ Issued the following

☒ INSTRUCTIONS ☐ AUTHORIZATION ☐ INFORMATION

The Dry Drilling and Coring Equipment Program - Phase 1e shall be revised from Rev. #6 dated 10/10/89 to Rev. #7 dated 12/04/89. This Revision #7 shall change the USW U7PS1-2 and USW U7PS1-3 bore hole programs to reflect a cementing/grouting operation for perched water.

The statement "If water is encountered..." will be changed to "If perched water is encountered prior to reaching total depth, the bore hole will be grouted.

ACTION COPIES	U. Clanton, DOE
	B. B. Grams, FSN
	R. L. Bullock, FSN
DISTRIBUTION	FSNRC
C. Mason, REECo	
J. Peck, SAIC	

SIGN OFF & DATE	
DOE	[illegible] 12/4/89
USER	
REECo	
FSN	Eddie [illegible] 12/4/89

FORM LV-186C

EXHIBIT D

FENIX & SCISSON OF NEVADA
ENGINEERS-CONTRACTORS

WBS 1.2.3.5.3
QA

TO: REECo DRILLING

W.O.: #3404-502

RE: DRY DRILLING AND CORING EQUIPMENT DEVELOPMENT PROGRAM-
PHASE 1e
USW UZPSI-2
USW-UZPSI-3
USW UZP-4
USU UZP-5
REVISION #7

CRITERIA LETTER:
Phase 1 of Unsaturated Zone Drilling and Coring Equipment Development, 04-10-89

LETTER:
Gertz/Carter, 04-10-89

LETTER:
Bullock/Gertz, 04-11-89

VERBAL:
Clanton/Wright, 10-06-89
Long/Wright, 12-04-89

DATE: December 4, 1989

LOCATION: To Be Determined

APPROVED BY:

12/4/89
FSN Drilling Engineer

12/4/89
FSN Quality Assurance

12-4-89
SAIC

12/4/89
DOE/YMPO

All work described in this program is QA Level III. Unless specified otherwise Lang will furnish services, permits, materials, and equipment under a subcontract to REECo for all work described in this work program.

Drill site selection is under study and all drilling equipment required for this program shall be available by November 20, 1989.

PROGRAM - PHASE 1e

USW UZPSI-2

1. Move in a Lang drill rig and necessary equipment on the proposed location. Rig up and drill a nominal 6-1/2 inch diameter hole to a maximum depth of 1700 feet using dry air and an air hammer. If perched water is encountered prior to reaching total depth, the hole will be grouted. The hole shall be plugged and abandoned according to state requirements.

2. Demobilize the drilling rig and equipment.

FSN Sr. Drilling Engineer Date

USW UZPSI-3

1. Move in a Lang drill rig and necessary equipment on the proposed location. Rig up and drill a nominal 6-1/2 inch diameter hole to a maximum depth of 1700 feet using dry air and an air hammer. If perched water is encountered prior to reaching total depth, the hole will be grouted. The hole shall be plugged and abandoned according to state requirements

2. Demobilize the drill rig and equipment.

FSN Sr. Drilling Engineer Date

USW UZP-4

1. Move in the LM-120 drill rig, 9-5/8 in. O.D. dual-wall drill pipe, CHD-134 coring equipment, compressors, and dust collector. Drill 20 inch hole to solid bedrock. Run 16-inch O.D. surface casing open-ended belled to bedrock and cement casing. Weld 16 inch flange to top of 16-inch casing and install drilling head.

2. With a 12-1/4 inch open-centered roller-cone bit on bottom, continuously wireline core with air below surface casing using the CHD-134 coring system and direct circulation.

3. At intervals to be determined the coring tools will be removed from the hole and the hole will be advanced to the bottom of the core hole using the 12-1/4 inch open-centered bit.

4. The hole shall be continuously wireline cored to the standing water level or to 1100 feet. Hole may be terminated at a shallower depth as determined by the User.

5. Drilling and coring parameters shall be closely monitored and documented to determine coring and drilling penetration rates.

6. At total depth run geophysical logs and surveys as specified by the User.

7. At total depth plug and abandon the hole as required.

FSN Sr. Drilling Engineer Date

USW UZP-5

1. Move in the LM-120 drill rig, 7 inch O.D. dual-wall drill pipe, CHD 101 coring equipment, compressors, and dust collector. Drill a nominal 14-3/4 inch hole to bedrock using air. Run 10-3/4 inch O.D. casing open-ended belled and cement casing. Weld 10-3/4 inch flange to top of 10-3/4 inch O.D. casing and install drilling head.

2. Using an 7 7/8 inch roller-cone bit, drill to 30 feet, trip out and run a tungsten carbide open-centered bit. Pick up CHD-101 coring tools and continuously wireline core to 1700 feet. Hole may be terminated at a shallower depth as determined by the User.

3. At intervals to be determined the coring tools will be removed from the hole and the hole will be advanced using the open-centered tungsten carbide bit or another type of bit as required.

4. Drilling and coring parameters shall be closely monitored and documented to determine coring and drilling penetration rates.

5. At total depth run geophysical logs and surveys as specified by the User.

6. At total depth plug and abandon the hole as required. Demobilize rig and equipment.

FSN Sr. Drilling Engineer Date

ADDITIONAL EQUIPMENT REQUIREMENTS

1. 600 FT. OF 7" X 4-1/2" Continuous Sample Recovery (CSR) Dual Wall Drill Pipe in 20 ft. lengths with thread protectors. This drill pipe must be compatible with the existing drill string purchased from Drill Systems, Inc. through Lang Exploratory Drilling for prototype drilling and coring tool development.

2. One set of pony subs with thread protectors for the 7" x 4-1/2" CSR Dual Wall Drill Pipe in lengths of 2-1/2 ft., 5 ft. and 10 ft. This drill pipe must be compatible with the existing Drill Systems, Inc. drill string.

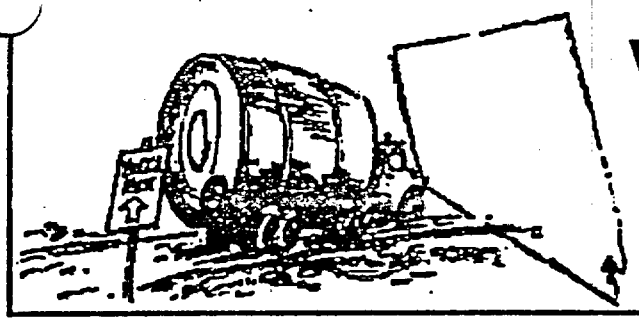
3. One set of pony subs with thread protectors for the 9-5/8" x 6" CSR Dual Wall Drill Pipe in lengths of 2-1/2 ft., 5 ft. and 10 ft. This drill pipe must be compatible with the existing Drill Systems, Inc. drill string.

4. 600 ft. of Longyear CHD 101 core rod in 3 meter lengths with thread protectors. This core rod must be compatible with the existing coring string purchased from Longyear through Lang Exploratory Drilling for prototype drilling and coring tool development.

5. Modification of the sample collector to increase efficiency of collecting and disposing of bulk cuttings samples. FSN will provide the design for this modification.

FSN Sr. Drilling Engineer Date

NEVADA NUCLEAR WASTE NEWS



Vol. 1 No. 1 December 1989

CALENDAR

Dec. 15	NV Commission on Nuclear Projects 10 a.m Las Vegas City Hall
Dec. 18	DOE/BLM Land Withdrawal Meeting 6 p.m. Reno-Sparks Convention Center
Dec. 19	DOE/BLM Land Withdrawal Meeting 6 p.m Henderson Convention Center

Public Meetings Dec. 18-19

DOE Asks for Withdrawal of Public Land

Two public meetings are scheduled in Henderson and Reno concerning 4,300 acres of public land that the U.S. Department of Energy wants to withdraw around Yucca Mountain. The land, currently managed by the Bureau of Land Management, includes part of the proposed site of the national high-level nuclear waste dump.

According to a BLM announcement, "The purpose of these public meetings is to gather information for consideration and incorporation into the withdrawal application case record...In other words, the proposed withdrawal will be solely for the purpose of maintaining the physical integrity of the subsurface environment from unplanned or unknown intrusions in order to ensure that scientific studies for site characterization are not invalidated."

"Even though the Department of Energy is saying this is not part of the Site Characterization Plan for Yucca Mountain, Nevadans should attend these meetings," said Judy Treichel, Executive Director of the Nevada Nuclear Waste Task Force.

"Every time a piece of Nevada is chipped away for this project, we are getting closer to a time when Nevadans may not have the option of accepting or denying this project. We cannot allow government bureaucracies to have the final word on Yucca Mountain. Nevadans need to speak up at public meetings like this."

The meetings are scheduled for:

Dec. 18	Reno - 6 p.m. Reno- Sparks Convention Center 4950 So. Virginia St.
Dec. 19	Henderson - 6 p.m. Henderson Convention Center 200 So. Water Street

Persons wishing to speak at these meetings should pre-register by calling (702) 646-8800 in Las Vegas; and (702) 328-6330 in Reno. They may also register at the door prior to the meeting. Persons who cannot attend the meetings can submit written comments until Dec. 29, 1989. Written comments should be addressed to State Director (NV-943), Bureau of Land Management, 850 Harvard Way, P.O. Box 12000, Reno, NV 89520.

For more information about these meetings call the Nevada Nuclear Waste Task Force at 1-800-227-9809 or (702) 878-0832, or Mary Clark at the BLM in Reno, (702) 328-6330.

Yucca Mtn Budget Cuts

The Administration's multibillion-dollar War on Drugs took its toll last month on the DOE's budget for the civilian high-level nuclear waste program, and DOE has announced the layoff of workers from the already stalled Yucca Mountain site characterization work.

Congress recently appropriated $346 million from the utility customer-funded Nuclear Waste Fund for DOE work during fiscal 1990, beginning on October 1 of this year.

(Cont'd on back page)

DOE Delays Yucca Mtn Again

Gov. Bob Miller has told the U.S. Department of Energy he will not bend to threats of a lawsuit to force Nevada to allow testing for siting the national high-level nuclear repository at Yucca Mtn. "We're not going to be influenced by threats when we have already taken conclusive and decisive action in expressing our opposition to the dump," Miller said.

He reacted forcefully after DOE Deputy Energy Secretary W. Henson Moore announced on Nov. 28 the federal government would sue Nevada to force issuance of permits for the project. Speaking at a nuclear industry convention in San Francisco, Moore said Nevada has 30 days to "decide to cooperate." If the state does not issue permits for more tests at Yucca Mtn., Moore said the Justice Department "will file suit in January, and we will get on with the program."

The threat of lawsuits is part of a DOE reorganization plan to get the Yucca Mtn. project back on track, according to John Tuck, the DOE Undersecretary of Energy. Tuck told reporters that Secretary of Energy James Watkins is "dissatisfied with earlier assessments," and the department never had "a good scientifically sound plan" after two years of study costing $500 million.

Last month Miller called on Watkins to abandon Yucca Mtn. because of numerous technical flaws and errors in the study of the site. Citing the state's legislative veto (see back page) in a letter and supporting documents, Miller said, "Even though the site is legally dead, this additional technical information is again offered to the Secretary so he,himself, can realize that he has the ability to stop the project."

Miller closed his letter saying Nevadans "are firmly resolved to oppose" the dump and that "such unwanted federal intrusion is without precedent in our nation's history."

Watkins has refused to kill the project, saying Congress has directed DOE to conduct studies solely at Yucca Mtn. But the reorganization plan is seen as an admission the Yucca Mtn. proposal is off-track for completion by 2003. In addition to the lawsuits, the new plan calls for completion by 2010; delays in test shafts until late 1992; cutbacks in contractors working on the project; speedy nomination of a nuclear negotiator and director of the Office of Civilian Radioactive Waste Management; and immediate work on siting for temporary nuclear waste storage: The so-called monitored retrievable storage (MRS) could be ready by 1998, according to DOE. (see back page)

YUCCA MOUNTAIN UNCERTAINTY BURDENS NUCLEAR UTILITIES

A Presidential Commission has reported to Congress that a Monitored Retrievable Storage facility for commercial nuclear reactor spent fuel, as proposed to the U.S. Department of Energy and authorized in the federal Nuclear Waste Policy Act, is not justified and should not be built. So far, it is unclear how Congress and the DOE will respond to this recommended reversal in interim storage planning.

The MRS Review Commission, established by the 1987 waste act amendment that also singled out Yucca Mountain as the sole high-level nuclear waste disposal site for study, ditched the MRS proposal because of its linkages in the law to progress on the Yucca Mountain disposal site.

"Because of delays already experienced in the repository schedule, and continued uncertainty surrounding the repository's (Yucca Mountain) location and date of operation, the value of the MRS would be greatly diminished if its construction were tied to the schedule of the repository," the report said. Meanwhile, the review commission did point out that most, if not all of the nation's 111 commercial reactors will run out of space in on-site spent fuel storage pools before any disposal facility could become available.

To meet this storage capacity need the Commission said that aside from utilities installing on-site dry spent fuel storage casks or vaults, the federal government should provide additional limited off-site storage capacity for utilities with special needs. One of the off-site approaches recommended would be for immediate acceptance of spent radioactive fuel if needed because of a safety emergency at a reactor. This facility is proposed to be paid from the Nuclear Waste Fund, which now charges utility ratepayers a fee for the DOE's nuclear waste disposal program.

The report also recommends that DOE build a small interim storage facility for spent fuel from reactors that cannot otherwise meet their on-site storage needs and continue to generate electricity. This facility would be paid for by the individual utilities when they use the storage service.

The report does not say how the government should decide where to locate these nuclear waste storage facilities, but the federal nuclear waste act prohibits placing an MRS facility in Nevada. In addition, Energy Secretary James Watkins has assured Governor Bob Miller, and the Nevada Congressional delegation, that Nevada would not be considered for interim storage of spent nuclear fuel.

FOR MORE INFORMATION ABOUT YUCCA MOUNTAIN

Nevada Nuclear Waste Task Force, Inc.
4550 W. Oakey Blvd. Suite 111
Las Vegas, NV 89102
(702) 878-1885
TOLL FREE 1-800-227-9809

Budget Cuts *(Cont'd from front page)*

Congress earlier had cut this year's program funds from a $500 million Administration proposed budget. But, when the White House went looking for money in the federal budget to fund its new anti-drug initiative, it singled out the DOE nuclear waste program to ante up another $46 million in spending authority.

Nevada's $23 million requested grant from the Waste Fund to oversee DOE's Yucca Mountain project was cut to $5 million in the Congressional appropriation to DOE. Another $6 million was authorized to be released to Nevada at the discretion of the Energy Secretary, but that money has not been offered yet. Last year's Nevada funding was a full $11 million. The $46 million reduction for DOE is not expected to further lower Nevada's grant funding.

AG Agrees: Site Vetoed

A formal legal opinion from Nevada Attorney General Brian McKay reinforces the state's ability to veto the DOE Yucca Mountain proposal, according to Gov. Bob Miller.

"Federal law allows Nevada to veto the dump, and we have done that," Miller said. "Congress failed to override the veto. Our message to the Department of Energy has been delivered: Find someplace else besides Nevada."

The federal nuclear waste law, which singled out Yucca Mountain as the sole proposed site, allows Nevada to file a notice of disapproval with Congress, and the notice stands as a veto unless overridden by Congressional vote within 90 days of receipt.

The Legislature approved, and Gov. Miller signed, Assembly Joint Resolution 4 and 6 and forwarded them to Congress in mid-April.

Miller asked for a legal opinion from the Attorney General to determine whether the DOE's pending State permit applications for work at Yucca Mountain are valid, given the fact that the State had successfully vetoed the site.

According to the opinion, the applications for an air quality permit, an underground injection permit, and a water appropriation are invalid, since Nevada has followed the legal process for vetoing the site.

"Nevada has followed the law, so should the DOE," Miller said. "Nevadans have said no. We have legally rejected the dump."

The Nevada Nuclear Waste News is prepared for the Nevada Nuclear Waste Project Office by the Nevada Nuclear Waste Task Force, Inc., funded through U.S. DOE grant #DE-FG08-85NV10461

Nevada Nuclear Waste Project Office
Agency for Nuclear Projects
Capitol Complex
Carson City, NV 89710
(702) 885-3744

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Permit No. 15

Office of Resource Mgt.
Nuclear Reg. Comm.
1050 E. Flamingo Rd., Suite 319
Las Vegas, NV 89109

ACTIVITY TO EVALUATE PRIORITIZATION OF SURFACE-BASED TESTING

- GUIDANCE RECEIVED FROM DOE/HQ ON OCTOBER 31, 1989

- PURPOSE OF TASK IS TO ENSURE THAT EARLY TESTING IS PRIORITIZED TO PROVIDE DATA NEEDED TO EVALUATE POTENTIALLY ADVERSE CONDITIONS

- GUIDANCE SUGGESTS LINK FROM THIS TASK TO MORE GENERAL EVALUATION OF SITE SUITABILITY SHOULD BE CONSIDERED

  - CONSIDER FEASIBILITY OF DEVELOPING EVALUATION CRITERIA FOR POTENTIALLY ADVERSE CONDITIONS

  - CRITERIA SHOULD LINK PRESENCE OF POTENTIALLY ADVERSE CONDITION TO POTENTIAL FOR NON-COMPLIANCE WITH PERFORMANCE OBJECTIVES

IMPLEMENTATION OF GUIDANCE BY YUCCA MOUNTAIN PROJECT

- INFORMAL DISCUSSIONS WITH YMP MANAGEMENT HAVE BEEN HELD TO DETERMINE AVAILABILITY OF KEY STAFF
- DOE/HQ GUIDANCE TRANSMITTED TO YMP TECHNICAL PROJECT OFFICERS WITH REQUEST FOR STAFF SUPPORT FOR TASK FORCE
- PROJECT OFFICE VIEWS THIS TASK AS PRIMARILY A REVIEW OF EXISTING INFORMATION, WITH DEVELOPMENT OF RECOMMENDATIONS AND OPTIONS FOR CONSIDERATION BY DOE MANAGEMENT

GENERAL ASSUMPTIONS USED IN SCOPING THE TASK

- TASK WILL UTILIZE ABOUT 5-7 FTE FOR ABOUT 10 MONTHS
- TASK IS TO BE GIVEN HIGH PRIORITY IN RESPONSE TO REQUESTS FROM THE NUCLEAR REGULATORY COMMISSION, ADVISORY COMMITTEE ON NUCLEAR WASTE, STATE OF NEVADA, AND EDISON ELECTRIC INSTITUTE TO PLACE EARLY FOCUS ON POTENTIALLY ADVERSE CONDITIONS
- LIMITED OR NO NEW EVALUATIONS/ANALYSES WILL BE PERFORMED; HOWEVER, AVAILABLE INFORMATION MAY BE REANALYZED OR REINTERPRETED
- A SMALL CORE TEAM WILL HAVE PRIMARY RESPONSIBILITY FOR CONDUCTING THE TASK

GENERAL ASSUMPTIONS USED IN SCOPING THE TASK (CONTINUED)

- A DECISION ANALYST WILL SERVE AS A MEMBER OF THE CORE TEAM TO ENSURE THAT STATE-OF-THE-ART TECHNIQUES FOR EVALUATING SUBJECTIVE/HIGHLY UNCERTAIN INFORMATION ARE USED

- AN INDIVIDUAL FROM EDISON ELECTRIC INSTITUTE'S SITE SUITABILITY TASK FORCE WILL SERVE AS AN ADVISOR TO THE CORE TEAM

- A YMP INTEGRATION TEAM WILL SERVE AS AN "EXPERT POOL" FOR THE CORE TEAM, PROVIDING EXPERTISE ON SITE, PERFORMANCE ASSESSMENT, AND ENGINEERING

- DRAFT IMPLEMENTATION PLAN IS IN REVIEW BY CORE TEAM AND IS DUE AT DOE/HQ ON DECEMBER 15, 1989

U.S. DEPARTMENT OF ENERGY

YUCCA
MOUNTAIN
PROJECT

ESF ALTERNATIVES STUDY

T. O. HUNTER

12-7-89

Sandia
National
Laboratories

ESF ALTERNATIVES STUDY

YMPO HAS ESTABLISHED AN EVALUATION TO INTEGRATE REPOSITORY AND ESF CONFIGURATION

- PROVIDE A CONSISTENT DESIGN BASIS UNDER CURRENT REQUIREMENTS AND QA PROGRAM

- REMOVAL OF NRC OBJECTIVES

  1. NEED FOR DOE TO DEMONSTRATE THE ADEQUACY OF BOTH THE ESF DESIGN AND THE DESIGN CONTROL PROCESS

     RECOMMENDATION: "The Title II design should ensure that... the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation."

  2. NEED TO IMPLEMENT A BASELINED QUALITY ASSURANCE PROGRAM BEFORE STARTING SITE CHARACTERIZATION

- NUCLEAR WASTE TECHNICAL REVIEW BOARD

  - "Re-examine the proposed ESF configuration, incorporating the use of an SBM to construct ES-1"

  - "Re-examine the incorporation of a ramp in the proposed ESF configuration, excavated by the use of the TBM..."

U.S. DEPARTMENT OF ENERGY

YUCCA MOUNTAIN PROJECT

ESF Alternatives Study

Chronology of Implementation Plan

8/25/89	Alternative Strategies Meeting, LV
10/5/89	Planning Meeting at DOE/HQ
10/18/89	Verbal assignment of task to SNL
11/7/89	Informal review of Plan
11/21-27/89	Technical, Management, and QA Review Plan
11/27/89	Comment Resolution Meeting
11/30/89	Plan Approved by SNL, Submitted to YMPO

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YUCCA MOUNTAIN PROJECT

ESF Alternatives Study

Tasks

1. Plan Management & Implementation
2. Develop Methodology/Rules for Evaluations of Options
3. Identify Requirements Basis for Evaluations
4. Identify Options to be Evaluated
5. Selection of Preferred Option
6. Prepare Study Report
7. Revise SDRD for Resumption of Design
8. Identify Revisions to RDR

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YUCCA MOUNTAIN PROJECT

ESF ALTERNATIVES STUDY

TASKS

1. PLAN MANAGEMENT & IMPLEMENTATION
   - DEVELOP AND APPROVE TASK PLANS
   - SCHEDULE/BUDGET
   - RECORDS MANAGEMENT
   - TRAINING

2. DEVELOP METHODOLOGY/RULES FOR EVALUATIONS OF OPTIONS
   - REPOSITORY OPTIONS
   - ESF OPTIONS

3. IDENTIFY REQUIREMENTS BASIS FOR EVALUATIONS
   - REQUIREMENTS FOR REPOSITORY
   - REQUIREMENTS FOR ESF
   - TESTING REQUIREMENTS

4. IDENTIFY OPTIONS TO BE EVALUATED
   - REPOSITORY UG CONFIGURATIONS AND ACCESSES
   - ESF OPTIONS

5. SELECTION OF PREFERRED OPTION
   - APPLICATION OF METHODOLOGY/RULES

6. PREPARE STUDY REPORT
   - PREPARE TEXT FOR EACH TASK
   - GRAPHICS/EDITORIAL SUPPORT
   - INDEPENDENT TECHNICAL REVIEW
   - MANAGEMENT APPROVAL/ACCEPTANCE

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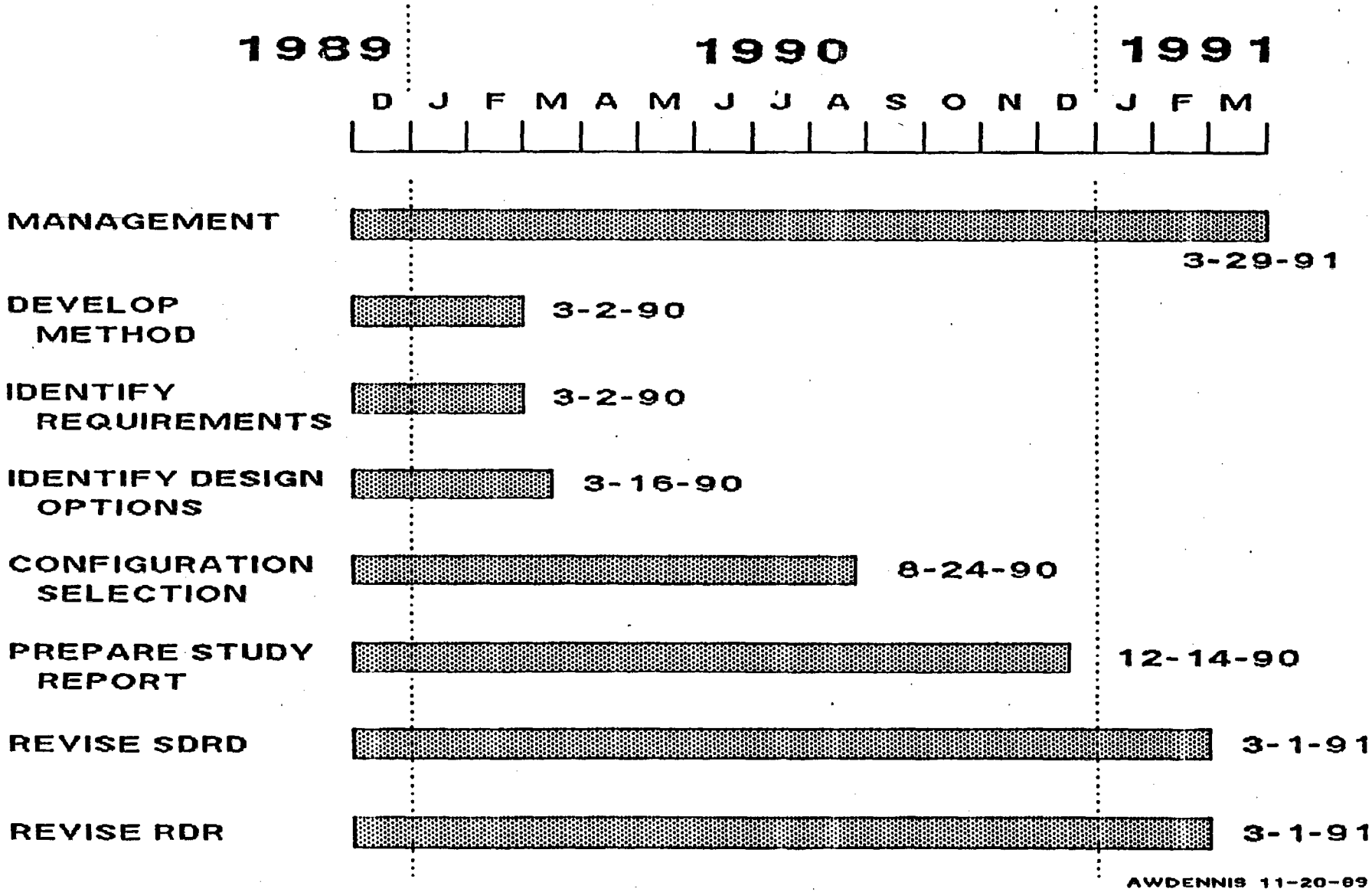
ESF Alternatives Study - Con't

Tasks

7. Revise SDRD for Resumption of Design
   - Establish Quantitative PA Requirements, As Required
   - Update Repository and Testing Interface Requirements, as Necessary
   - Verify Requirements
   - Prepare/Submit CR to CCB

8. Identify Revisions to RDR

ESF ALTERNATIVE STUDIES SCHEDULE



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YUCCA MOUNTAIN PROJECT

ESF Alternatives Study

QA

Basis for QA Program is SNL QAPP and Procedures

- Those "participants" with an "approved" QA Program will operate under their own program and interface with SNL through AP-5.19Q, Interface Control.
- Those "participants" without an "approved" QA Program will operate under SNL QA procedures.

First Time Application of Subpart G under NNWSI 88-9

- Work/Task Plans with QALAS and Grading
- Software QA
- Use of Data
- Formal Plans

  - Personnel Certification and Training
    - Implementing Instructions
      - Records
        - Peer Review
          - Document Preparation and Review
            - Audits & Surveillances

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YUCCA MOUNTAIN PROJECT

ESF ALTERNATIVES STUDY

OPTIONS

REPOSITORY/ESF LAYOUT

- ACCESS (SHAFT-RAMP)
- LOCATION OF ACCESS

CONSTRUCTION METHOD

- DRILL & BLAST
- MECHANICAL
  - TBM
  - V-MOLE
  - RAISE-BORER
  - ETC

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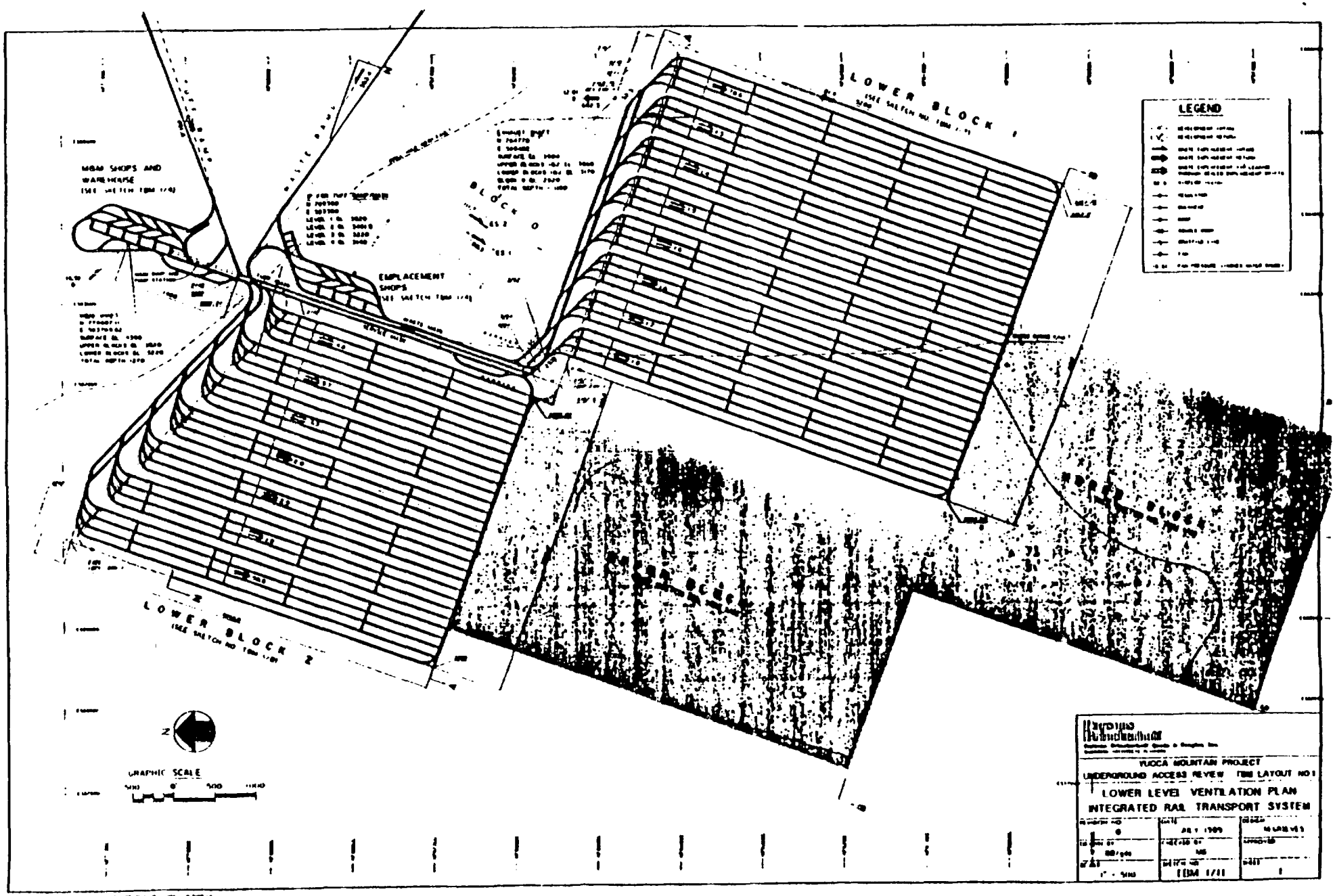
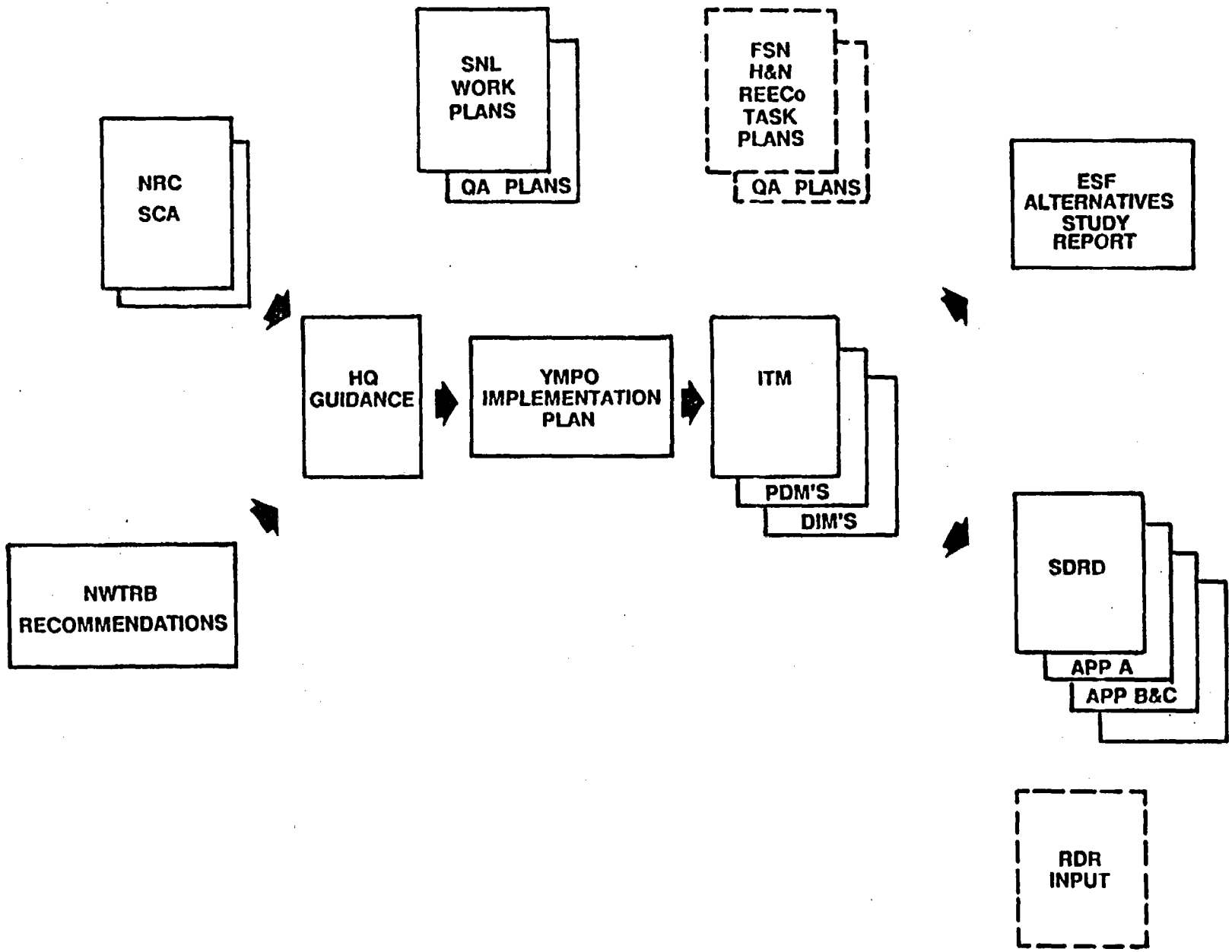
REQUIREMENTS

ALL REQUIREMENTS
- 10 CFR 60
- SCA COMMENTS
- NWTRB
- FUNCTIONAL REQUIREMENTS

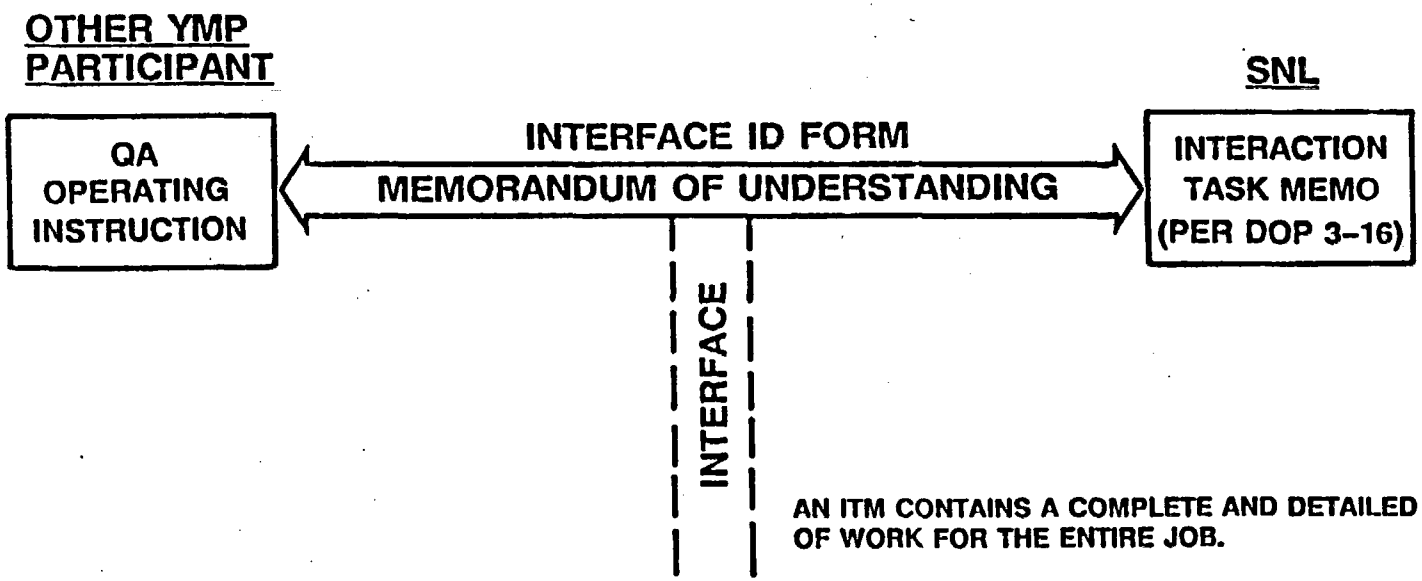
KEY REQUIREMENTS
(IMPACT ON OPTIONS)


LOWER BLOCK 1
LOWER BLOCK 2
MGM SHOPS AND WAREHOUSE
EMPLACEMENT SHOPS
LEGEND
GRAPHIC SCALE
YUCCA MOUNTAIN PROJECT
UNDERGROUND ACCESS REVIEW
LOWER LEVEL VENTILATION PLAN
INTEGRATED RAIL TRANSPORT SYSTEM

ESF ALTERNATIVES STUDY



YMPO
AP-5.19Q
INTERFACE CONTROL



AN ITM CONTAINS A COMPLETE AND DETAILED STATEMENT OF WORK FOR THE ENTIRE JOB.

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YUCCA MOUNTAIN PROJECT

ESF Alternatives Study

Task	Lead	Participant Lead
1. Plan Mgmt	Al Dennis (SNL)	
1.1 QA		- Richards (SNL - Heaney (SAIC)
1.2 Dev/Approve		- Dennis (SNL) - Dokuzoguz (SAIC)
1.3 Records		- Sharpton (SNL)
1.4 Training		- Tang (SNL)
2. Methodology	Costin (SNL)	- Voegele (SAIC) - Kalia (LANL) - Stanley (FSN) - Harig (PB) - Deklever (H&N) - Grams (REECO)
3. Requirements	Davenport (SAIC)	- Parsons (SAIC - Morales (SNL) - Hill (SNL) - Foster (SAIC) - Oliver (LANL) - Mirza (FSN) - Schreiner (H&N) - Schepens (REECO)

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YUCCA MOUNTAIN PROJECT

ESF ALTERNATIVES STUDY

TASK	LEAD	PARTICIPANT LEAD
4. OPTIONS ..	WAVRIK (SNL)	- CHYTROWSKI (FSN) - GRAVES (PB) - MUSICK (H&N) - ELKINS (LANL) - LUKE (SNL) - KOSS (REECO) - GARDINER (SAIC)
5. SELECTION	BAUER (SNL)	- HINKEBEIN (SNL) - PETERSON (SNL) - HARDIN (SAIC) - GRENIA (FSN) - MRUGALA (FSN) - KALIA/ELKINS (LANL) - MCNEELY (H&N) - GARDELLA (REECO)
6. REPORT	DENNIS (SNL)	ALL TASK LEADERS REVIEWERS (ALL PART.)
7. SDRD	MORALES (SNL)	- SMITH (SAIC) - MILLIGAN (LANL) - KENNEDY (FSN) - BRAKE (H&N) - PA STAFF (SNL)
8. RDR	HILL (SNL)	- STANDISH (SAIC) - (TBD) (PB)

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U.S. DEPARTMENT OF ENERGY

YUCCA MOUNTAIN PROJECT

ESF ALTERNATIVES STUDY

CURRENT STATUS:

ESF ALTERNATIVES STUDY IMPLEMENTATION PLAN	APPROVED BY SNL ACCEPTED BY YMPO SUBMITTED TO DOE/HQ
QA TRAINING OF PARTICIPANT PERSONNEL	TRAINING ON 12-6-89 VIDEO TAPES AVAILABLE AT YMP TRAINING CENTER
SNL WORK PLANS AND GRADING PACKAGE	SUBMITTED TO YMPO ON 12-8-89
SNL INTERACTION TASK MEMO	TRANSMITTED TO PARTICIPANTS 12-12-89

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YUCCA MOUNTAIN PROJECT

ESF ALTERNATIVES STUDY

IMPACTS

POSSIBLE MAJOR REVISIONS TO TEST PROGRAM

TITLE II DESIGN RESTART MOVED TO MARCH '91

CONSTRUCTION DATES ESTIMATED TO BE

SITE PREP 6-92
COLLAR 11-92

REPOSITORY CONFIGURATION MAY CHANGE

Surface based testing Program may change

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8.3.1.5.2.1 CHARACTERIZATION OF QUATERNARY REGIONAL HYDROLOGY (PALEOHYDROLOGY)

.1 -- Regional paleoflood evaluation

.2 -- Quaternary unsaturated zone hydrochemical analysis

.3 -- Evaluation of point discharge areas

.4 -- Analog recharge studies
a) chloride ion model
b) arid zone geochemistry

.5 -- *Studies of calcite and opaline silica vein deposits (Hydrogenic Deposits)*

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CONTRIBUTING ORGANIZATIONS TO PALEOHYDROLOGY

A. USGS/WRD
   1. NHP
   2. Nevada District
   3. CSM
   4. UNM

B. USGS/GD
   1. BIG
   2. BP&S
   3. BRG

C. LANL

SCIENTIFIC APPROACH

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

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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) Bedrock breccias
   c) Drusy quartz and other vug fillings

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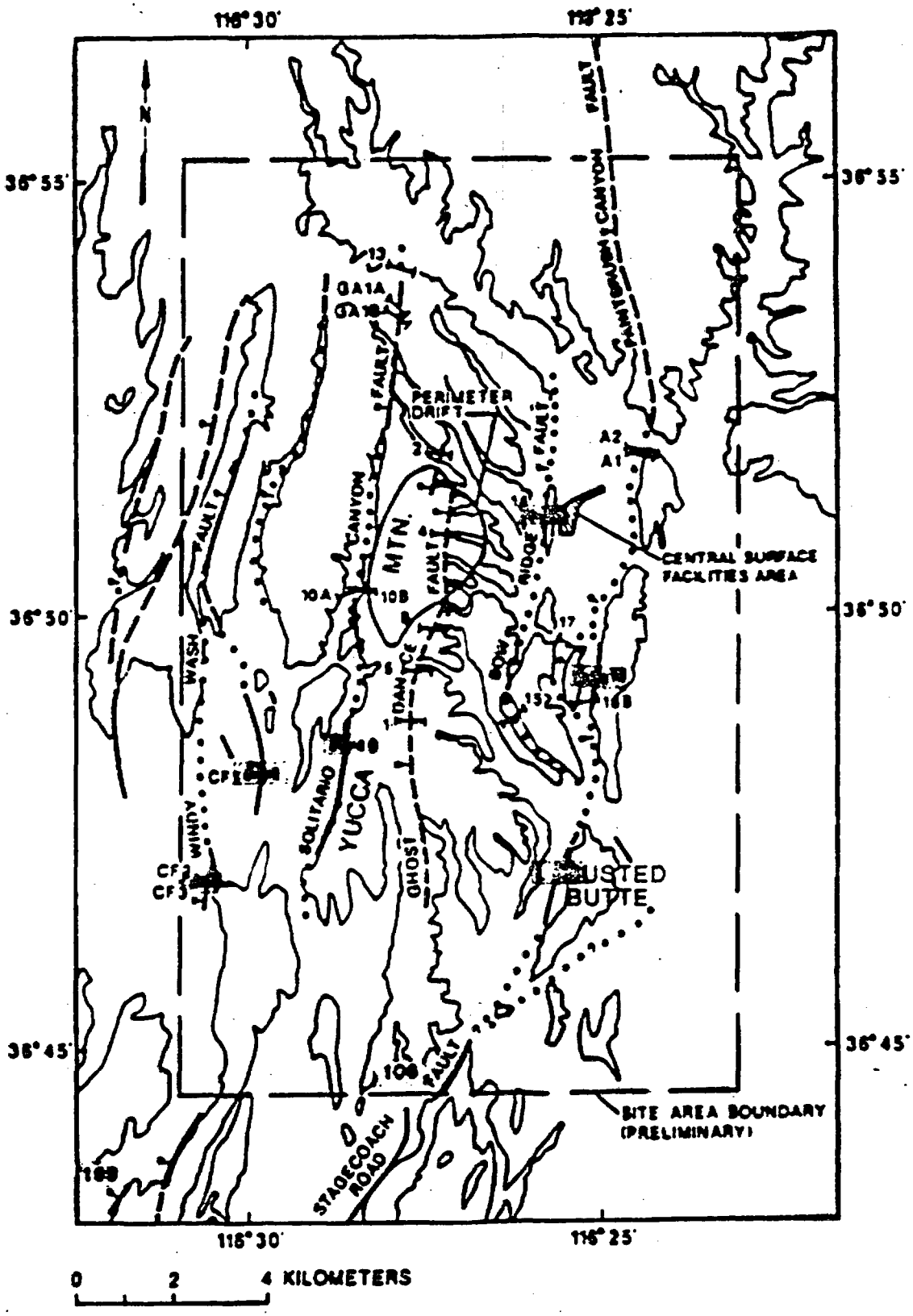
MODES OF ORIGIN FOR HYDROGENIC DEPOSITS

1. Pedogenic: Deposited by meteoric waters as part of the soil-forming process.
2. Cold springs: Groundwater 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.



[PICTURE OF SOUTH WALL OF TRENCH 14 FOLLOWS.]

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BEDROCK BRECCIAS

2 Categories:

1) Crushed-tuff-matrix breccia

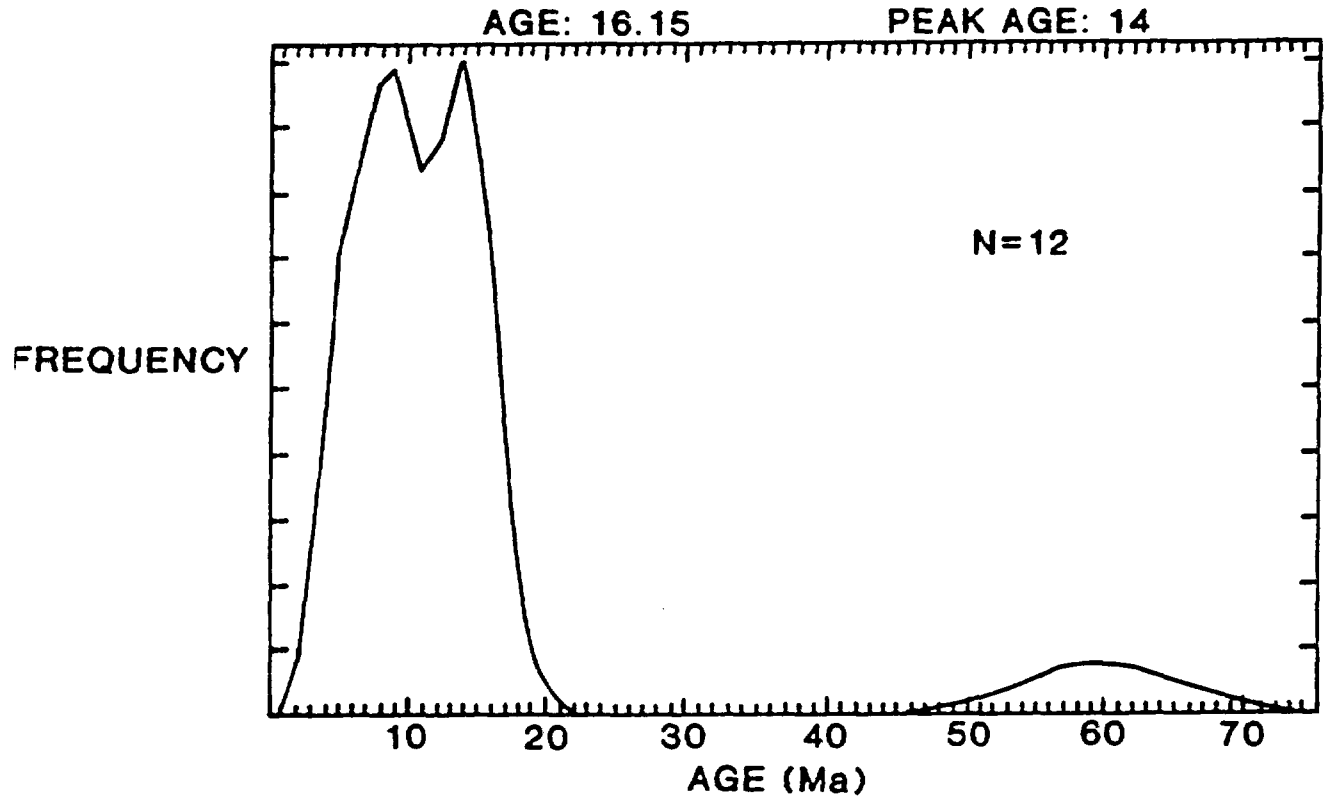
2) Authigenic mineral-cemented breccia

[PICTURE OF CRUSHED-TUFF-MATRIX BRECCIA FOLLOWS.]

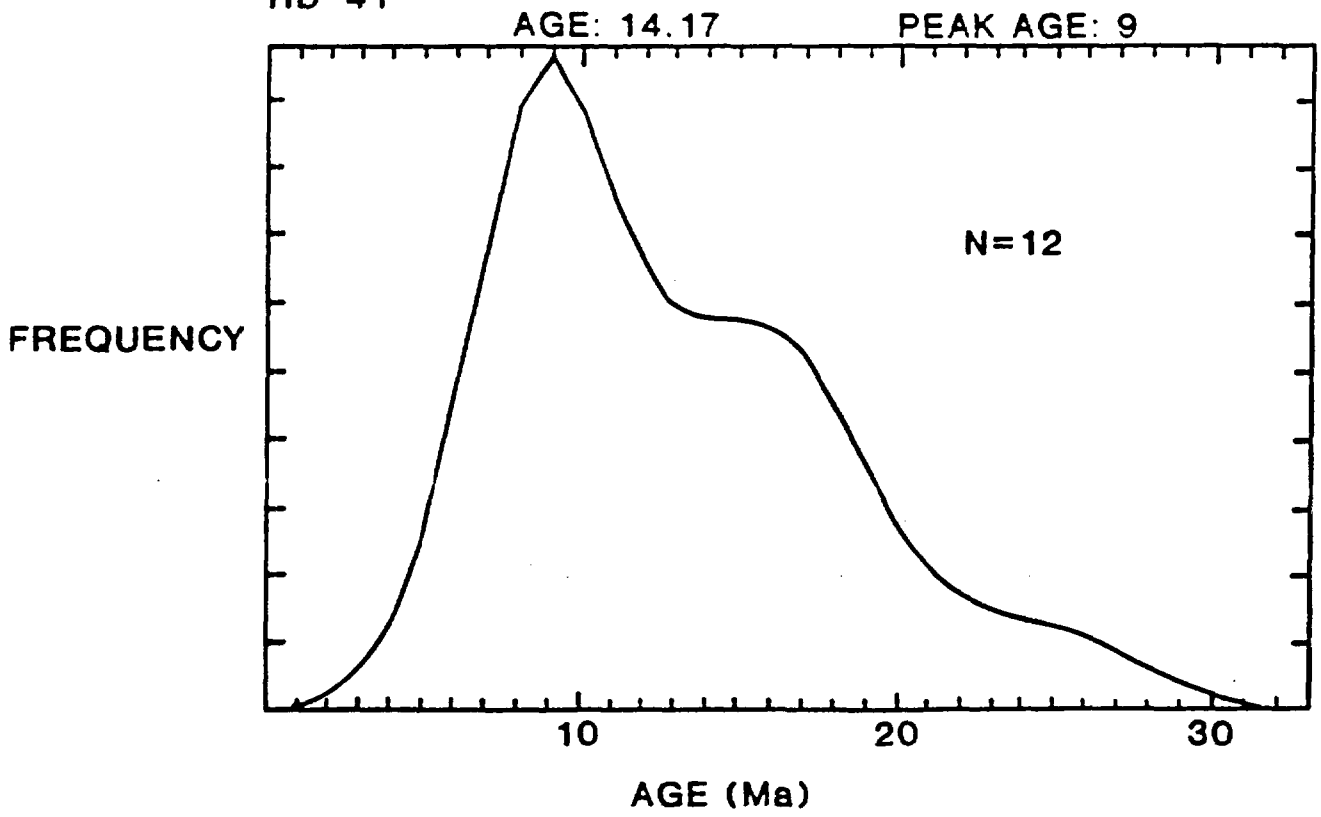
BEDROCK BRECCIAS

FISSION-TRACK ZIRCON AGES

BUSTED BUTTE HD-74



TRENCH 14
HD-41



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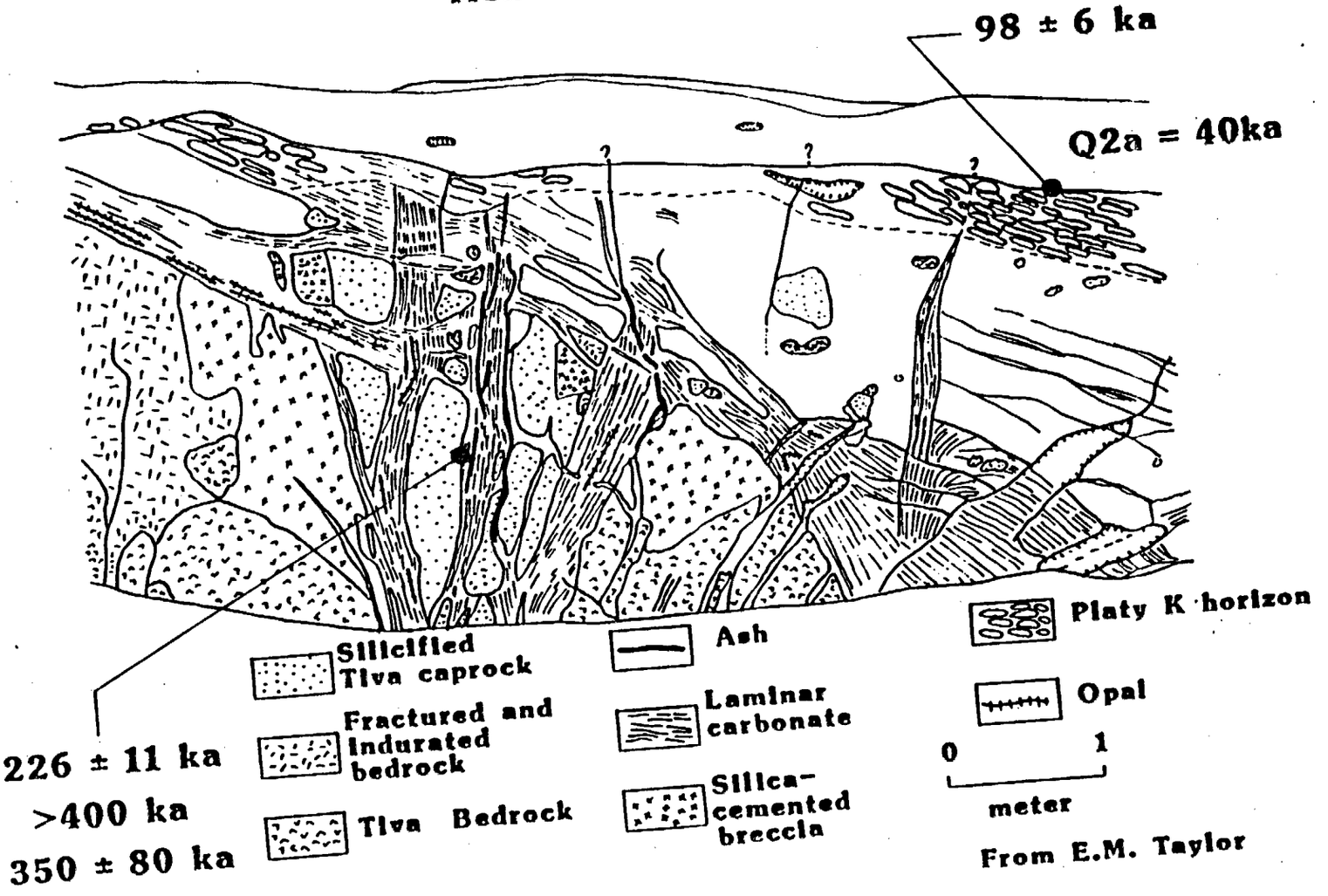
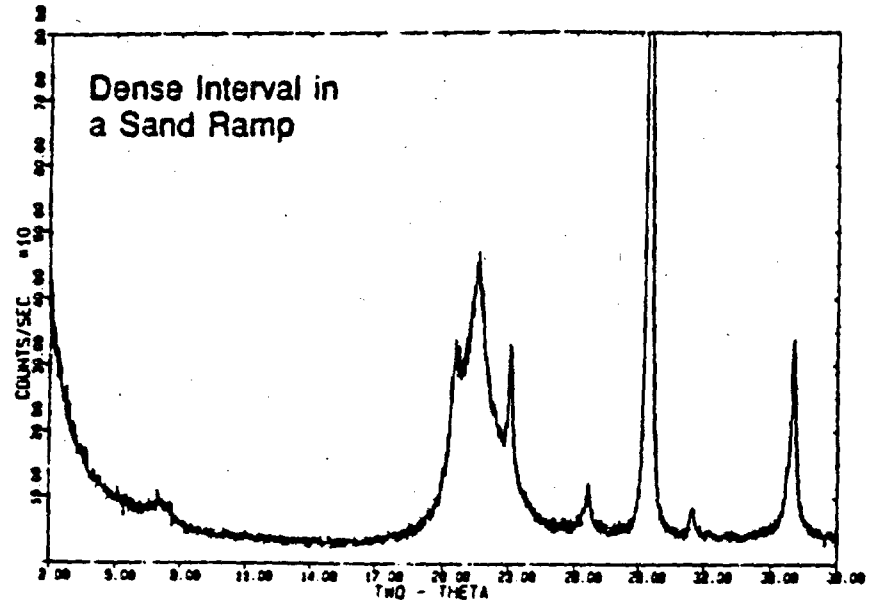
Trench 14, South Wall

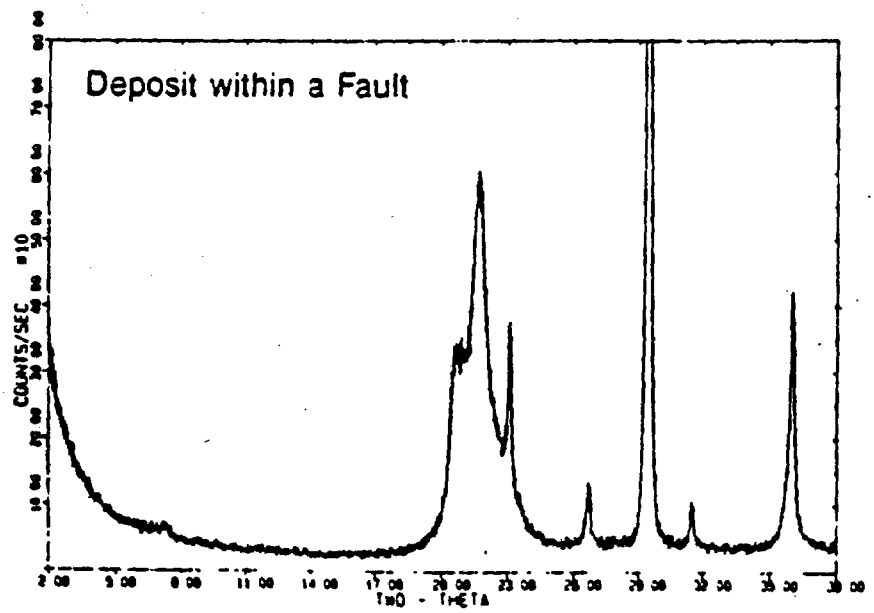


From E.M. Taylor

ASSOCIATIONS AND ASSEMBLAGES

	CALCITE	OPAL A	OPAL CT	OPAL C	QUARTZ	SEPIOLITE	CRYPTOMELANE	SULFUR PHASES
HYDROTHERMAL VEINS	×			×	×		×	
WARM SPRINGS		×						×
COLD SPRINGS AND SEEPS	×		×		×	×		
SOILS	×		×					
SAND RAMPS	⊗	⊗	⊗			⊗		
FAULTS	⊗	⊗	⊗			⊗		





[DETAILED PICTURE OF LAMINATED VEIN SHOWING AREAS STUDIED BY THIN SECTION AND PHOTOMICROGRAPH OF ROOT CROSS SECTION FOLLOW.]

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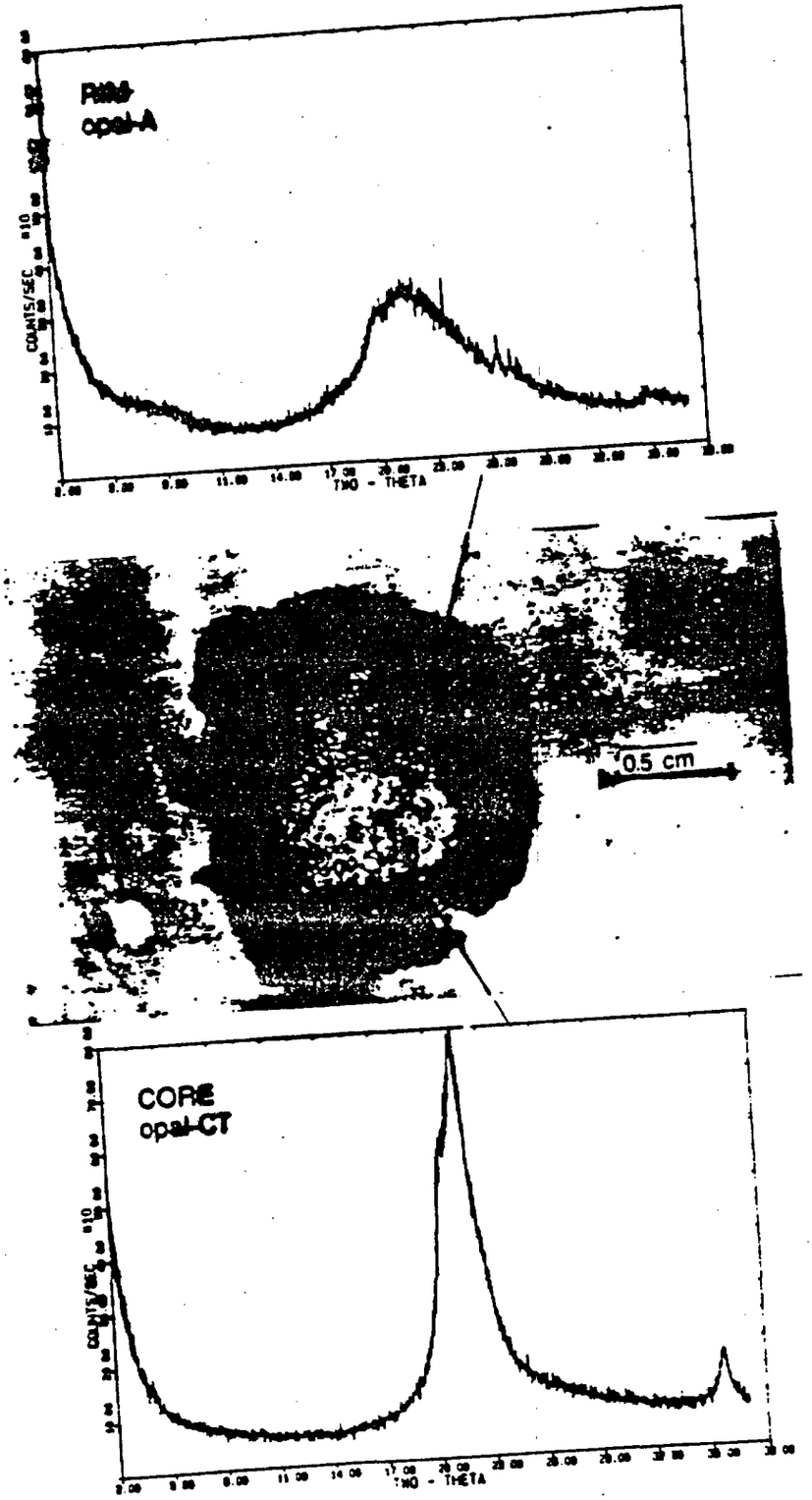
Rim
opal-A
COUNTS/SEC
TWO - THETA
0.5 cm
CORE
opal-CT
COUNTS/SEC
TWO - THETA

OSTRACODE STUDIES

- Two soil and six vein samples of carbonate from Trench 14 are apparently devoid of ostracodes and mollusks
- Two samples from Busted Butte yield same preliminary results
- Saturated residence time for the area of carbonate deposition must have been less that 2 months.
- Need to look for horizontal areas within veins at Trench 14 and Travertine Point

[PICTURE OF OSTRACODA FOLLOWS.]

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CHRYSOPHYTE CYSTS

- Opaline silica
- Resting stages of certain chrysophyte algae
- Quite small (2.5-2.0 μm in diameter)
- Wide morphological range
- Hundreds of different forms
- In the modern environment, cysts are far more common in places where relatively dilute surface waters are entering the hydrologic system (recharge areas) than in places where relatively concentrated groundwater is emerging from the hydrologic system (discharge areas).

[TWO PICTURES OF CHRYSOPHYTE CYSTS FOLLOW.]

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CHRYSOPHYTE CYSTS

- None found in 4 samples of soil
- None found in 4 samples of calcite-silica veins and 1 sample of volcanic ash.
- Two samples of calcite-silica veins have rare cysts
- Rare cysts have been found in dried mud from Trench1.

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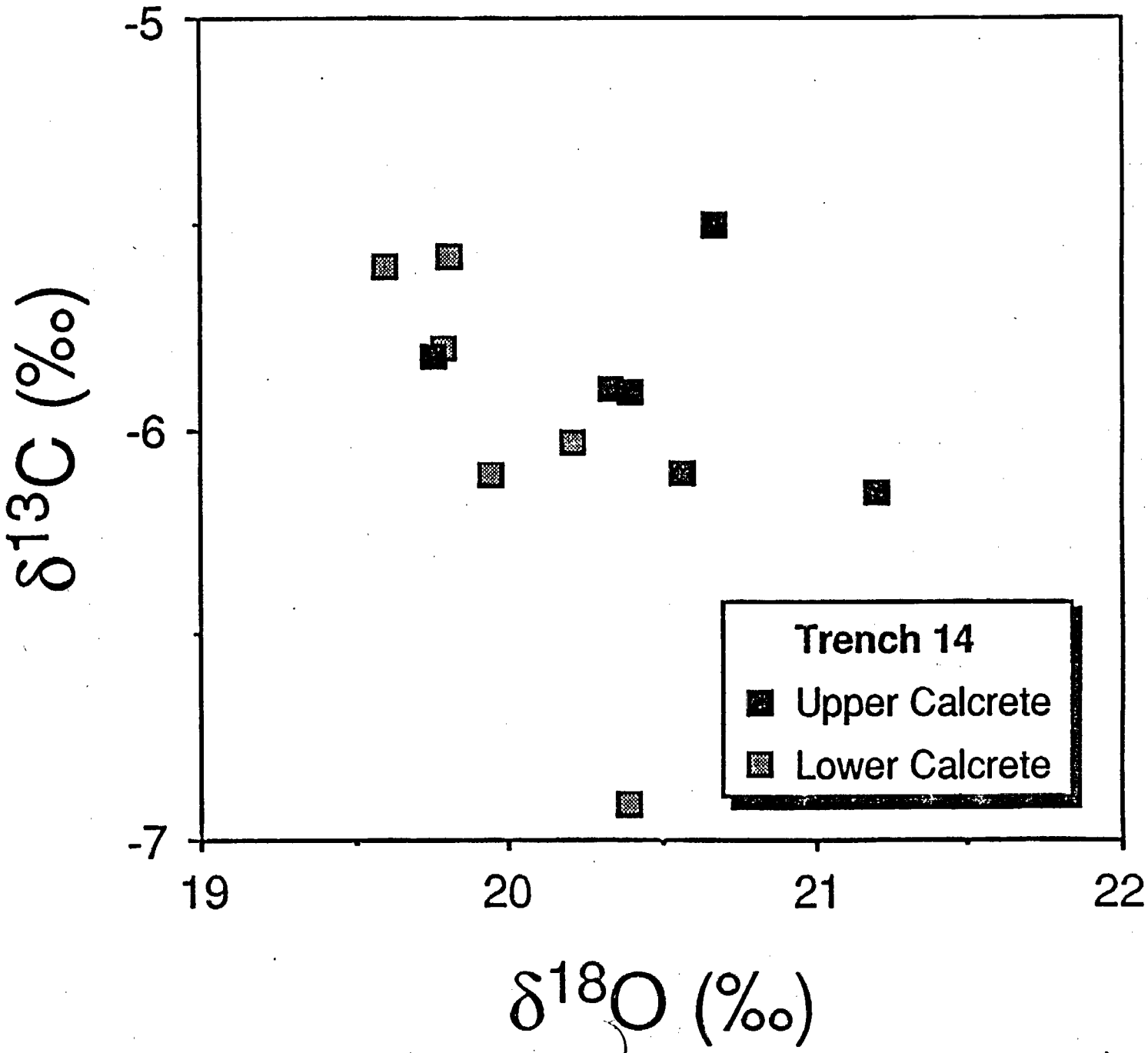
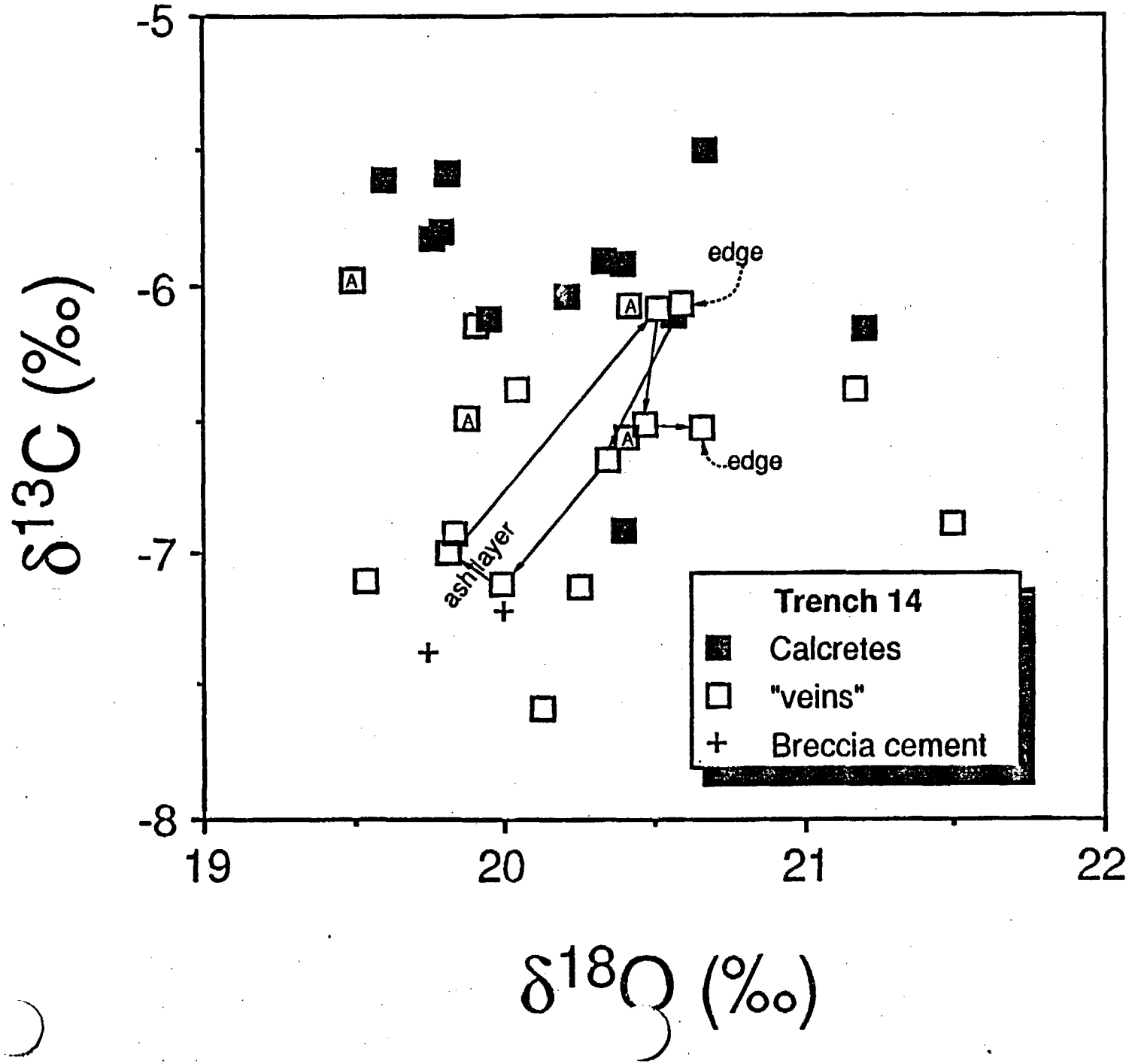
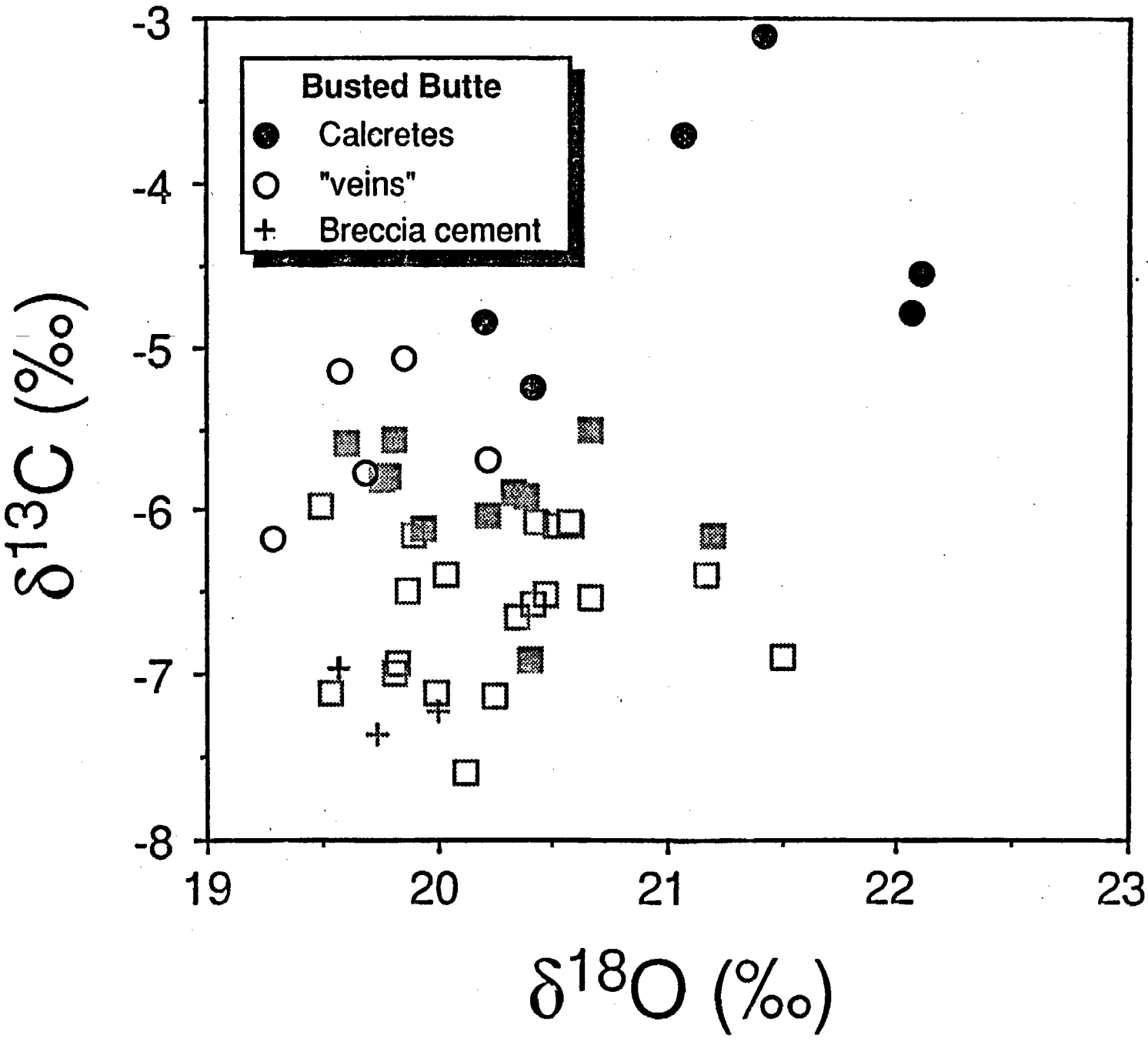

-5
-6
-7
19
20
21
22
δ13C (‰)
δ18O (‰)
Trench 14
Upper Calcrete
Lower Calcrete


-5
-6
-7
-8
19
20
21
22
δ13C (‰)
δ18O (‰)
edge
edge
ash layer
A
A
A
A
Trench 14
Calcretes
"veins"
Breccia cement


Busted Butte
Calcretes
"veins"
Breccia cement
-3
-4
-5
-6
-7
-8
19
20
21
22
23
δ13C (‰)
δ18O (‰)

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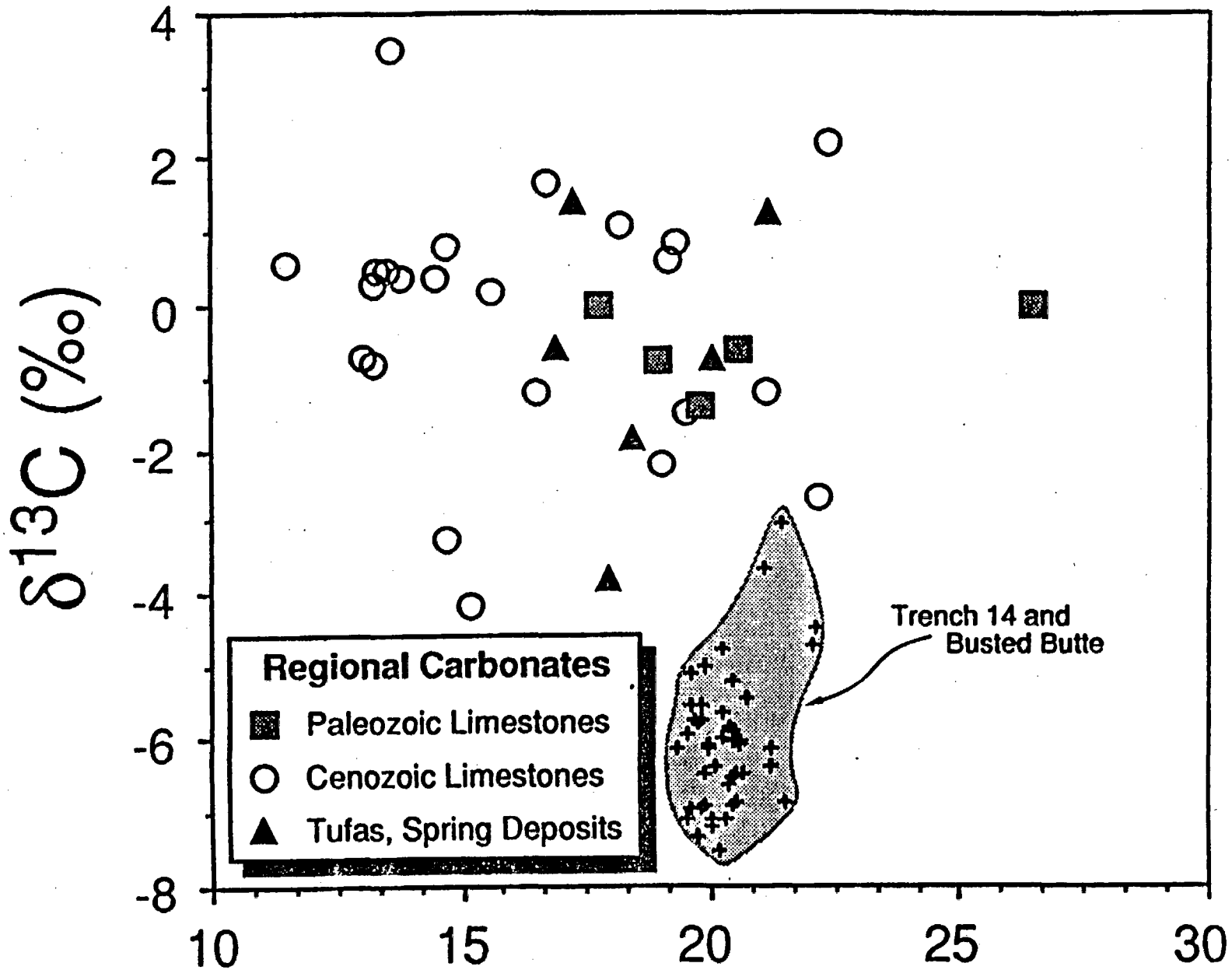
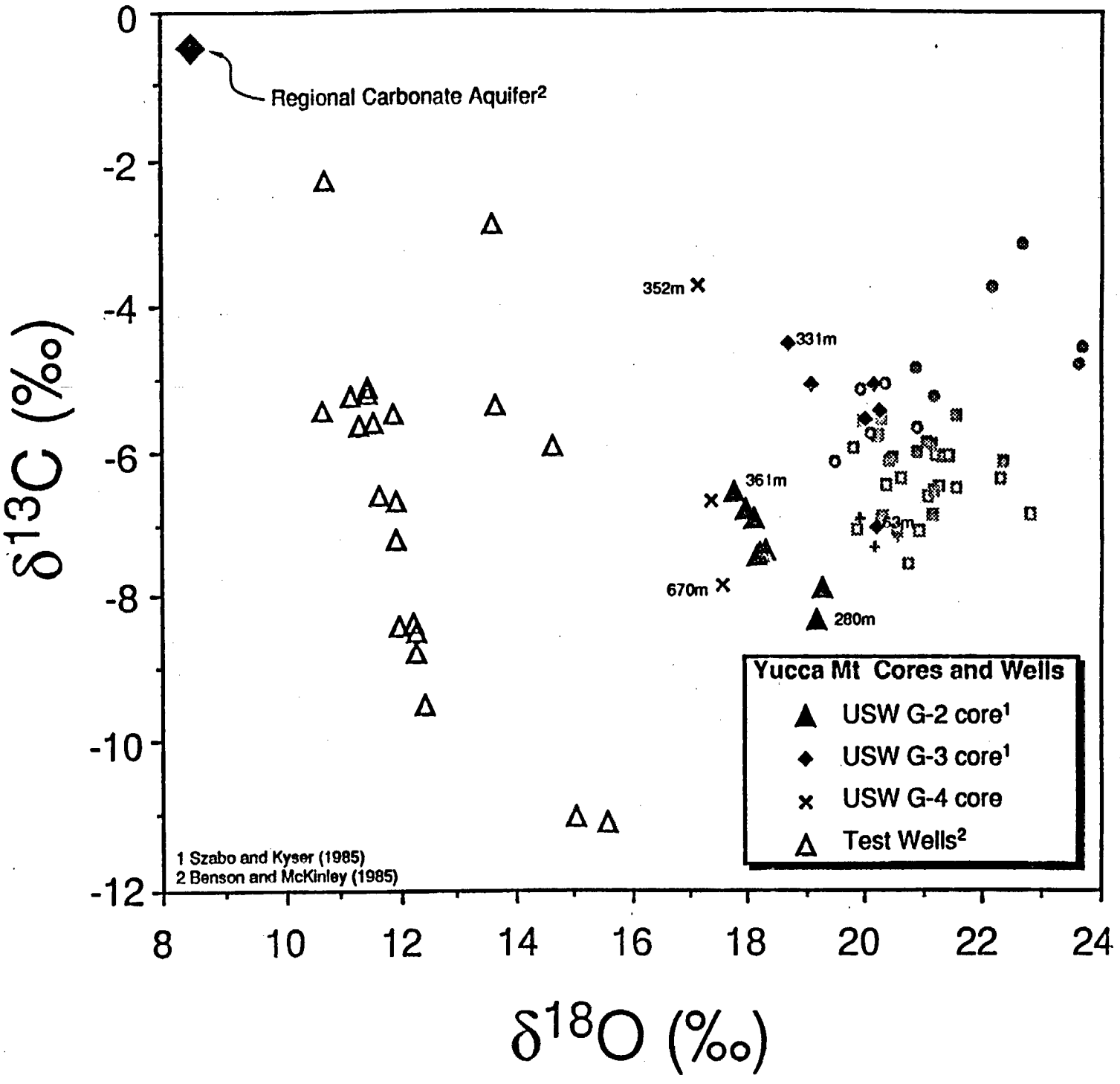
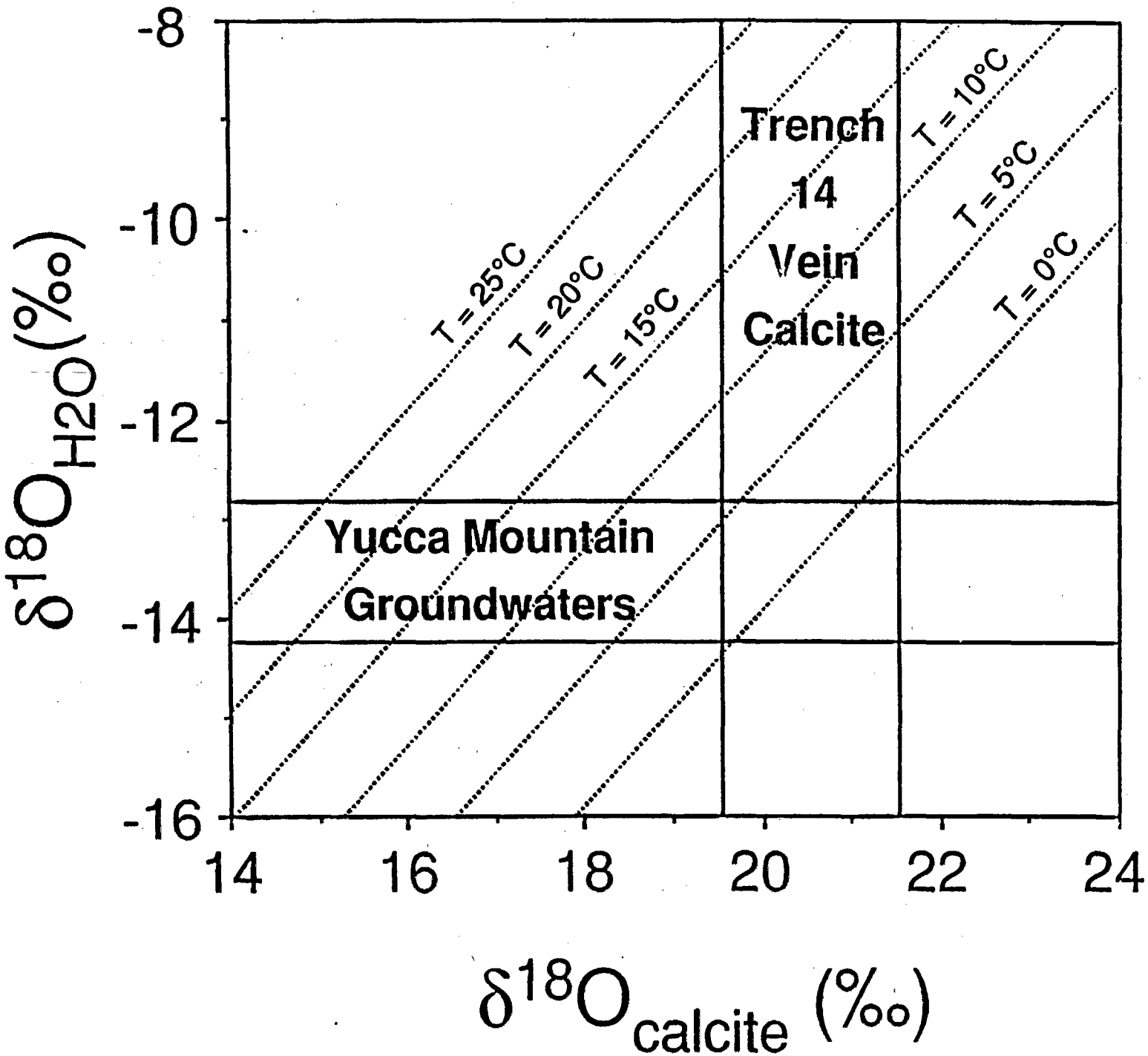
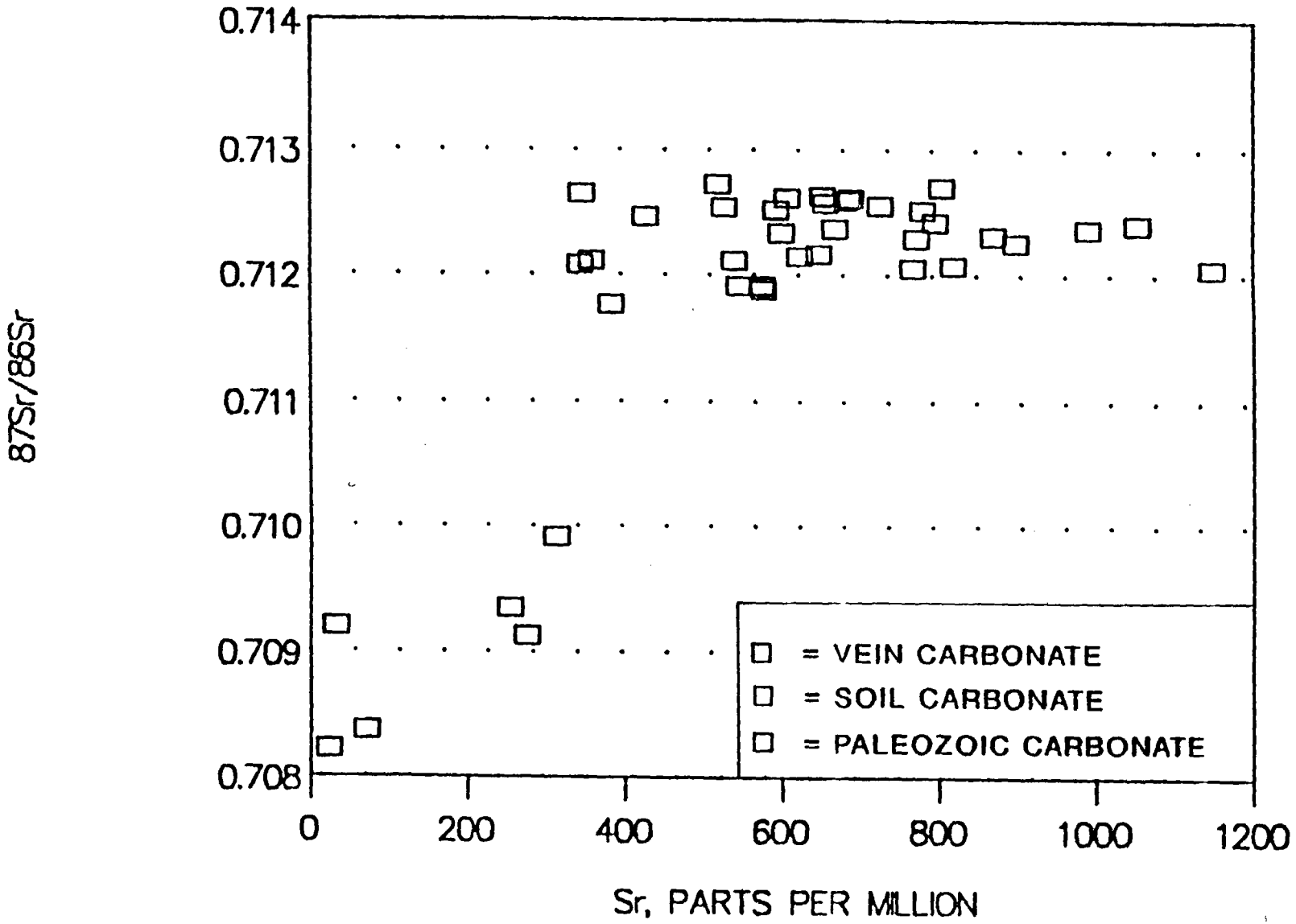

4
2
0
-2
-4
-6
-8
δ13C (‰)
10
15
20
25
30
Regional Carbonates
Paleozoic Limestones
Cenozoic Limestones
Tufas, Spring Deposits
Trench 14 and
Busted Butte


Regional Carbonate Aquifer2
352m
331m
361m
63m
670m
280m
Yucca Mt Cores and Wells
USW G-2 core1
USW G-3 core1
USW G-4 core
Test Wells2
1 Szabo and Kyser (1985)
2 Benson and McKinley (1985)
δ13C (‰)
δ18O (‰)
0
-2
-4
-6
-8
-10
-12
8
10
12
14
16
18
20
22
24

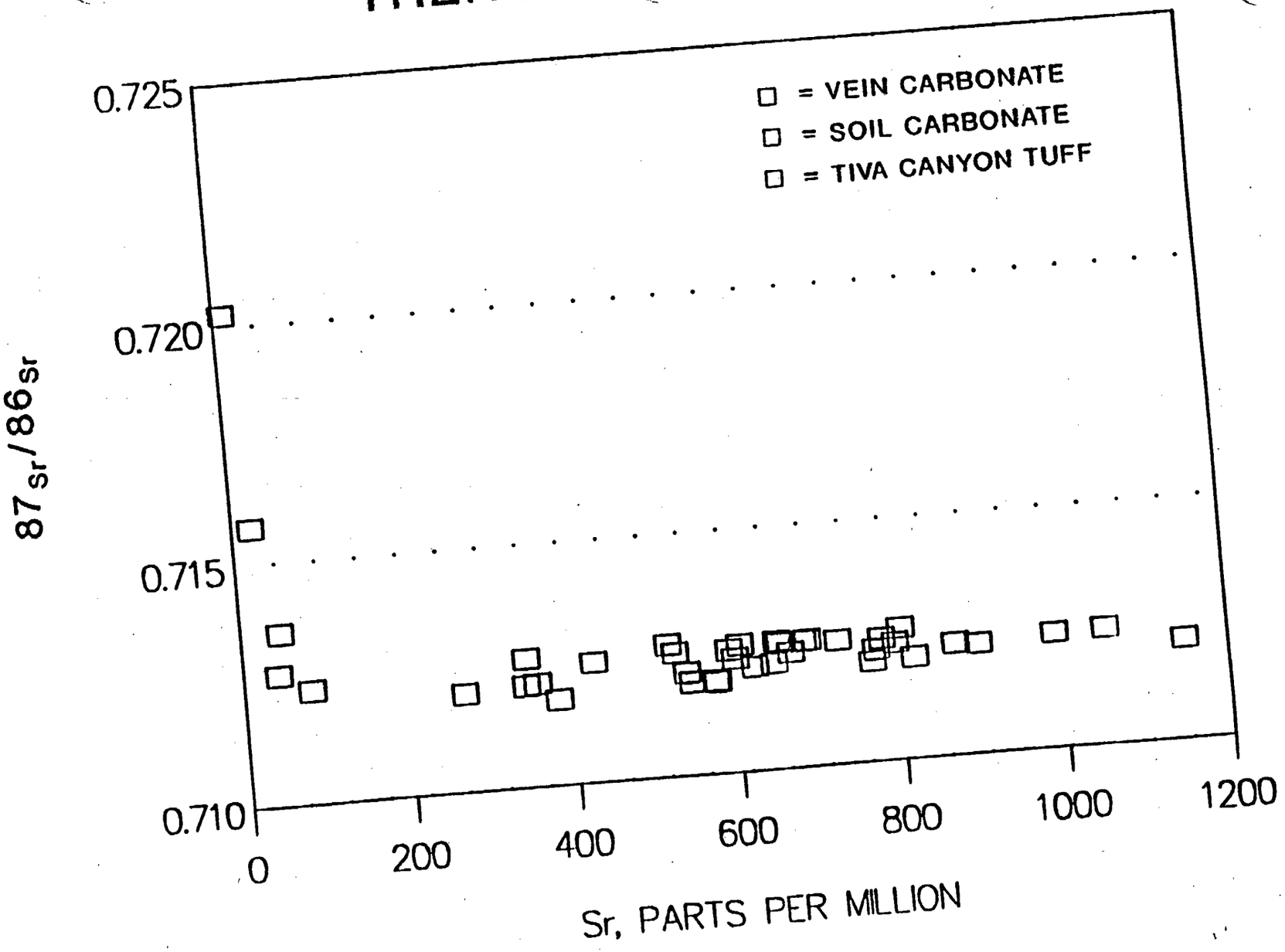

-8
-10
-12
-14
-16
14
16
18
20
22
24
$\delta^{18}O_{H2O}$ (‰)
$\delta^{18}O_{calcite}$ (‰)
T = 25°C
T = 20°C
T = 15°C
T = 10°C
T = 5°C
T = 0°C
Trench
14
Vein
Calcite
Yucca Mountain
Groundwaters

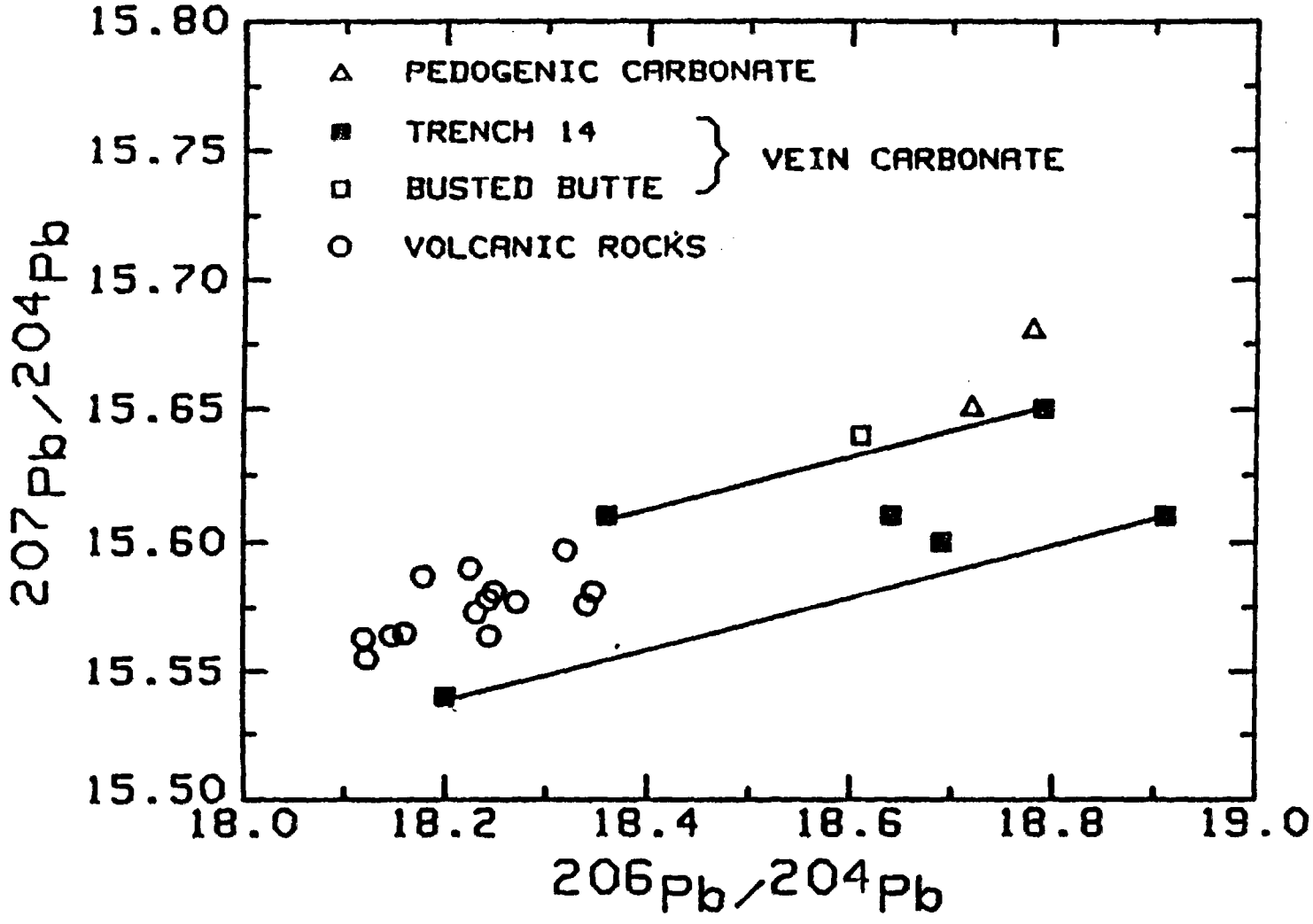
DEC - 9 1999

TIVA CANYON TUFF
TRENCHES 14 AND 14A



TRENCHES 14 AND 14A

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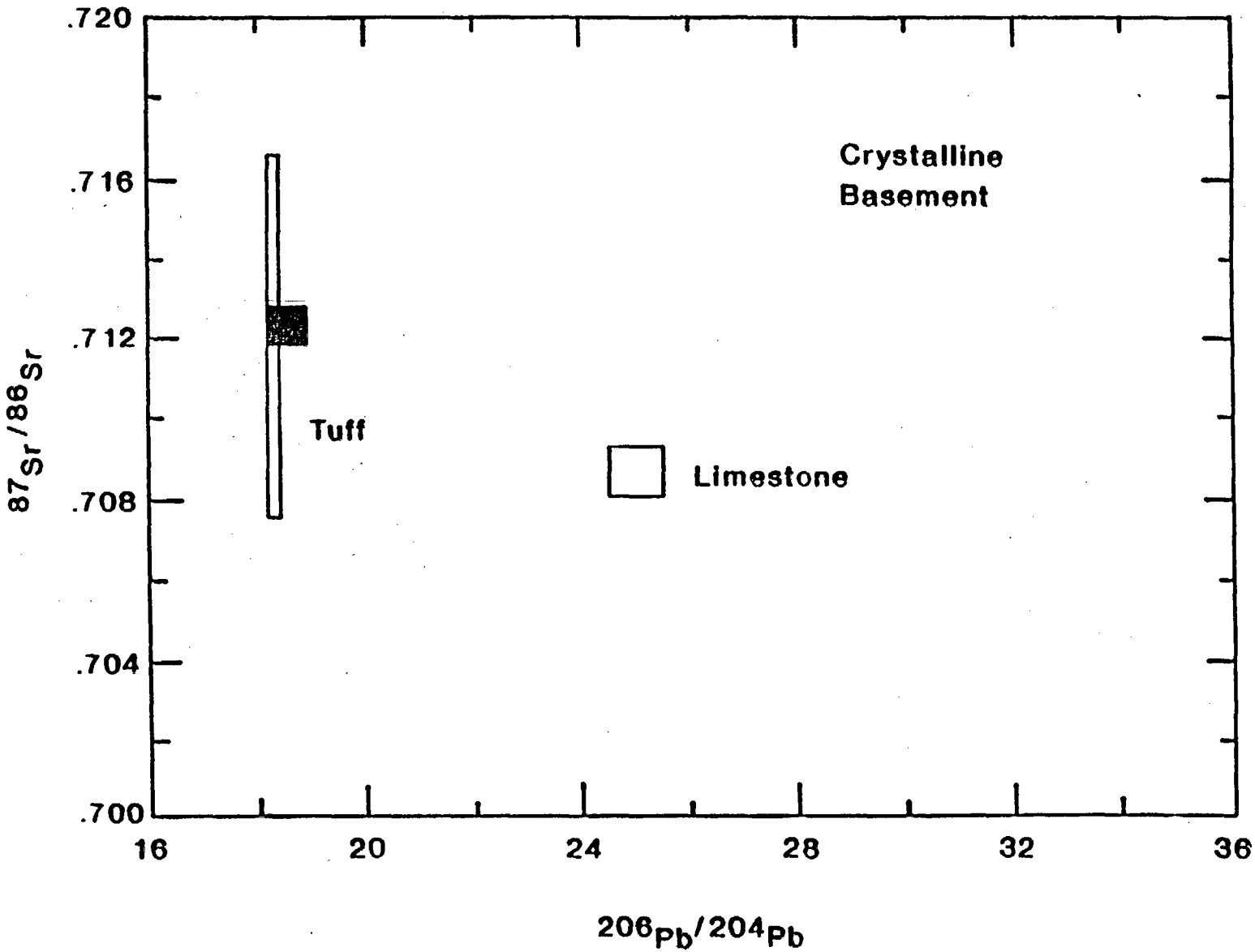
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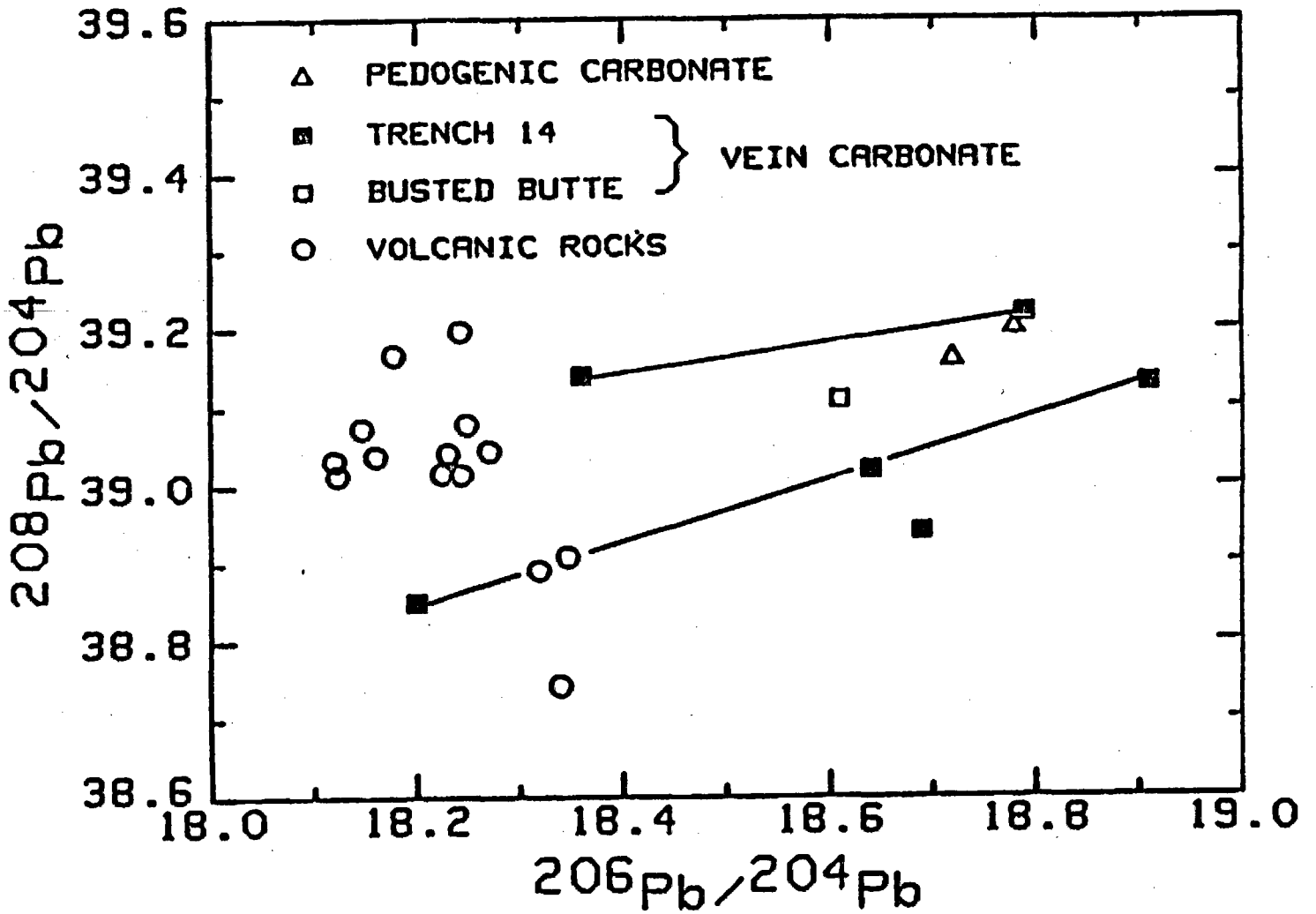
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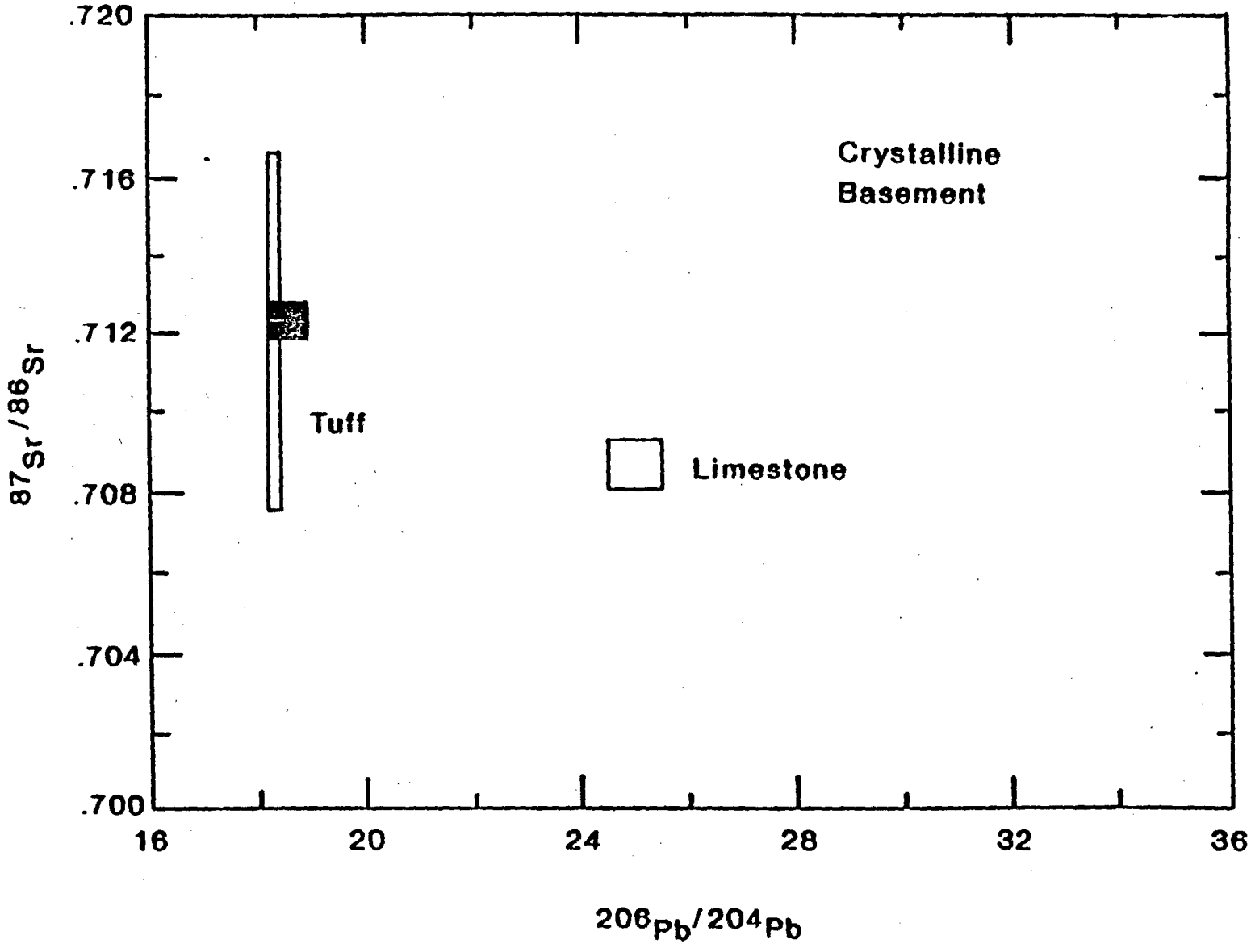
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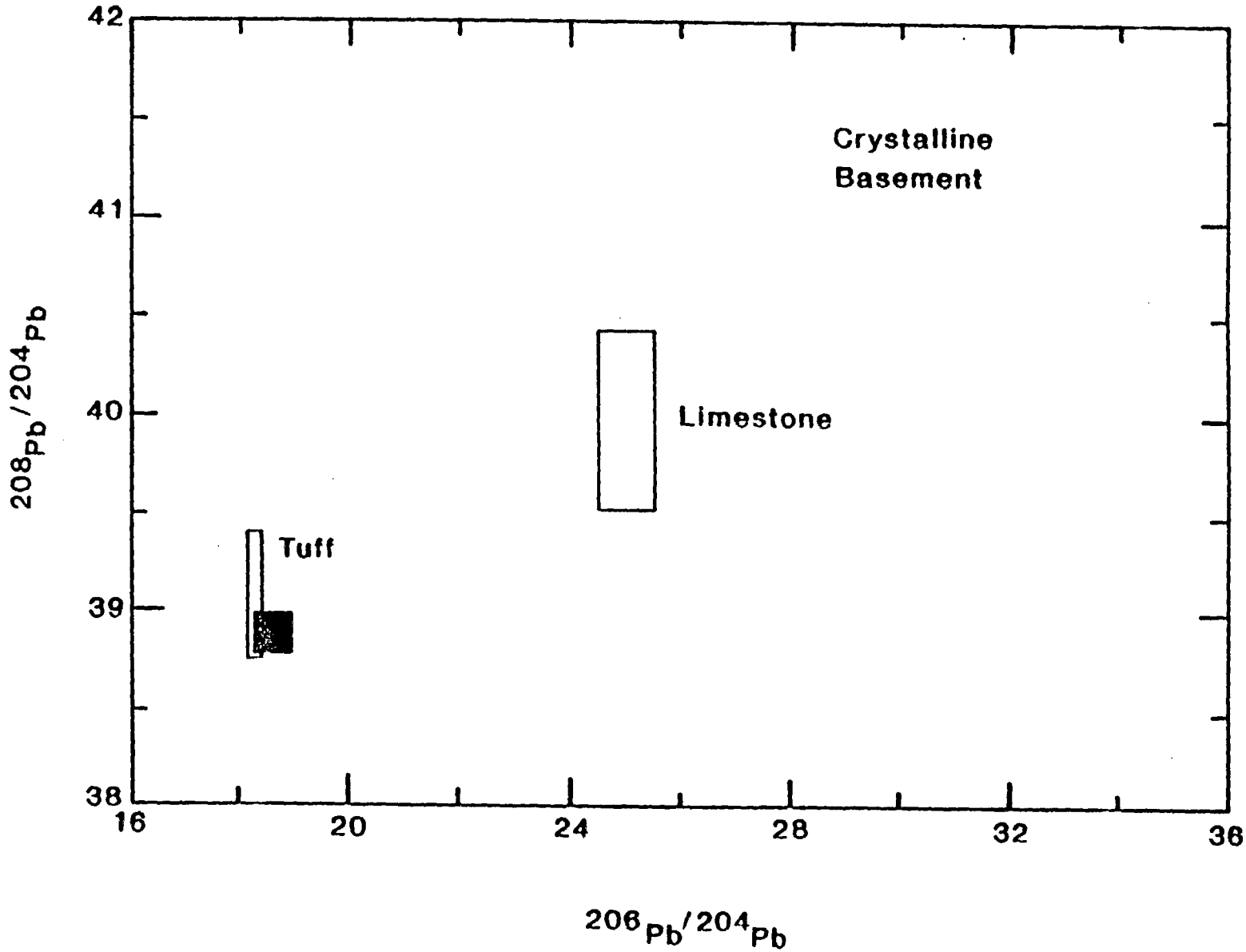
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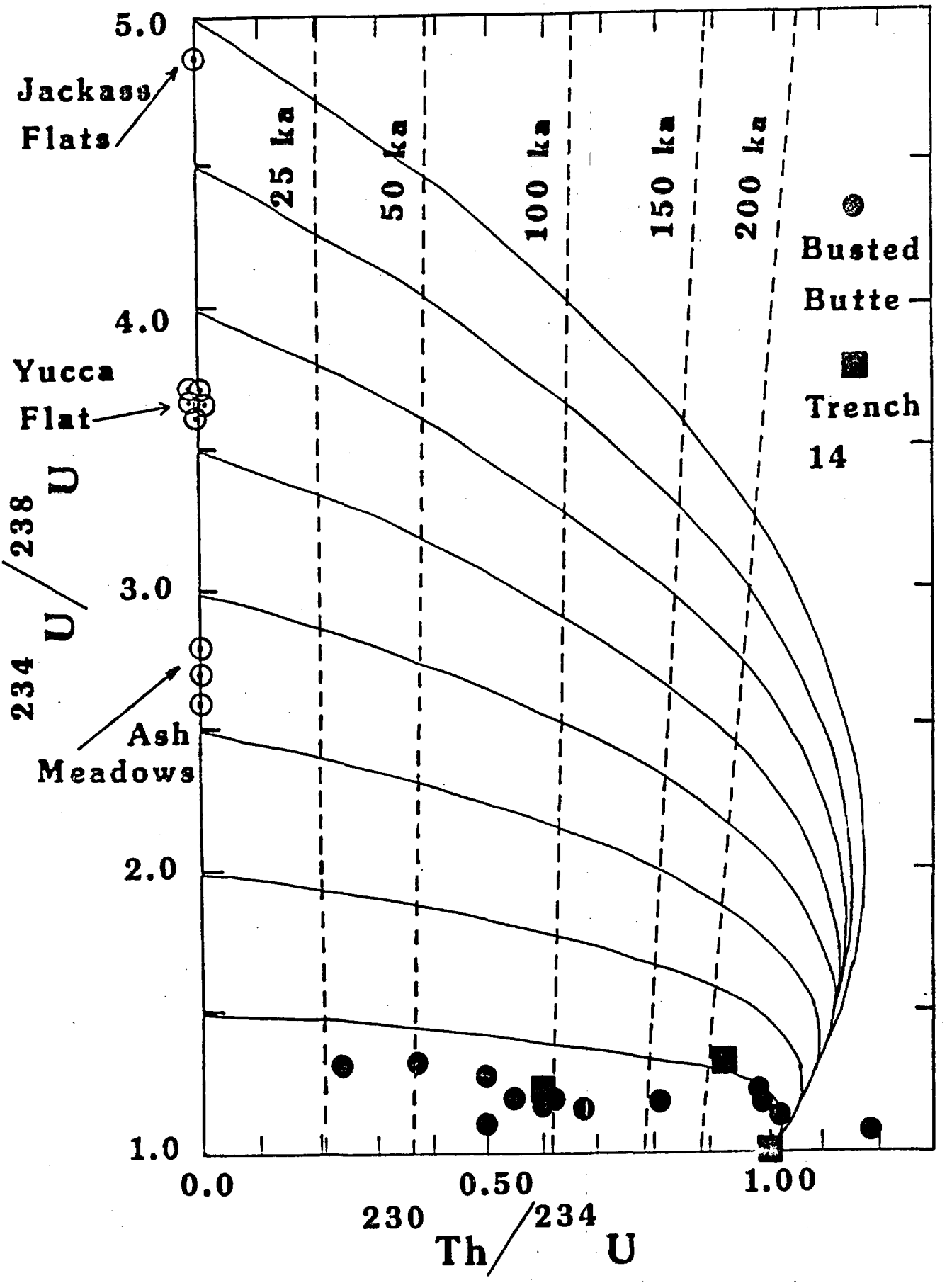
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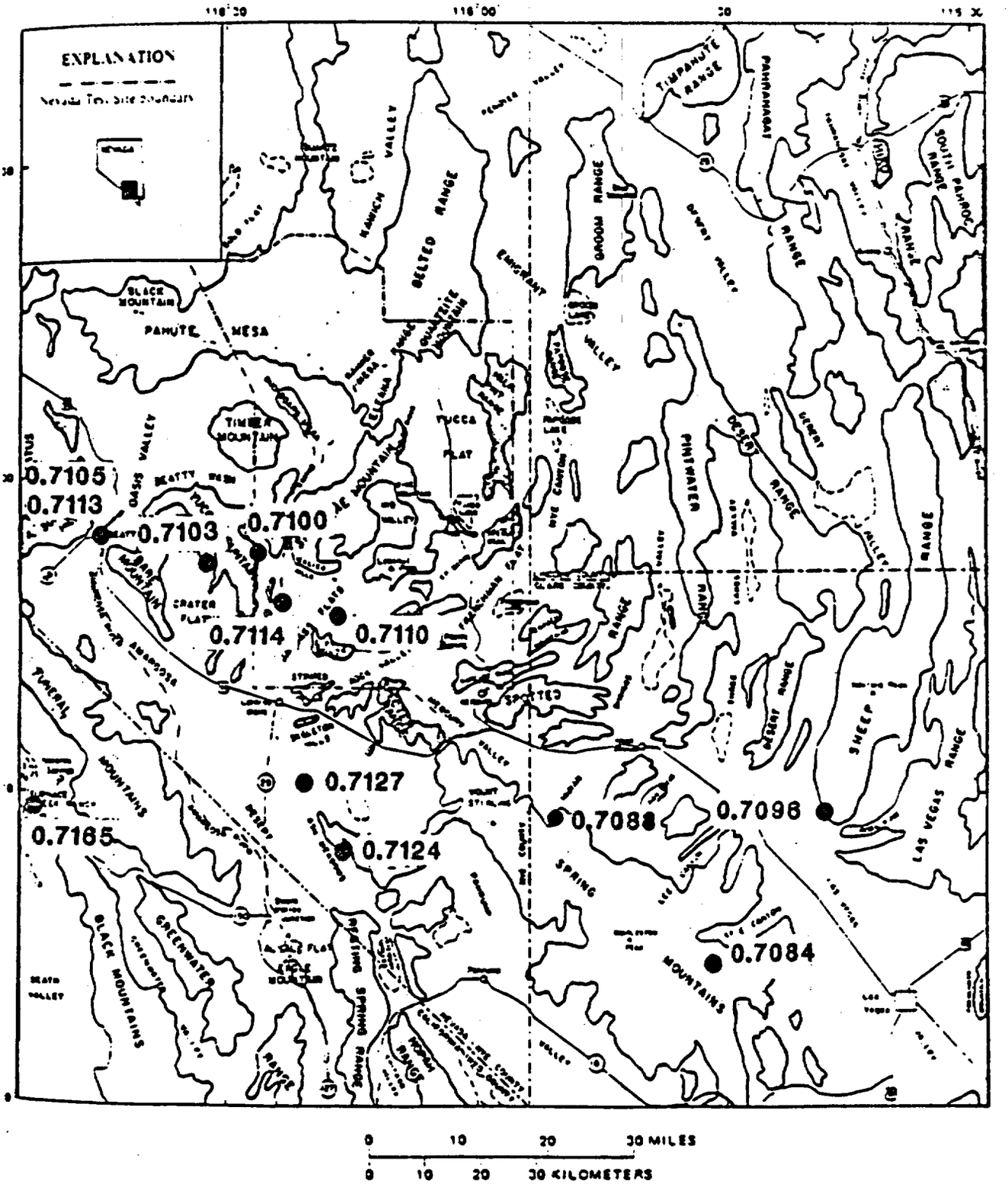
DEC - 8 1989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0 10 20 30 MILES
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Paul Priestholt

30-Nov-1989

YUCCA MOUNTAIN PROJECT

EXPLORATORY SHAFT FACILITY ALTERNATIVES STUDY

IMPLEMENTATION PLAN - REV. 0

NOVEMBER 30, 1989

EXECUTIVE SUMMARY

The Yucca Mountain Project will perform an evaluation, conducted under a quality assurance program that meets the requirements of NNWSI/88-9 to identify various Exploratory Shaft Facility configuration and construction method options, to evaluate those options, and to select a preferred option to be used as the basis for subsequent design efforts.

The Project Office has assigned the lead technical and coordination responsibility for the evaluation to Sandia National Laboratories (SNL). Other Project participants will be assigned by the Project Office, at the request of SNL, to perform individual tasks within this evaluation.

The evaluation will be performed by conducting several individual tasks as follows:

A survey will be made of existing design requirements, identifying those which may impact the selection of the preferred repository access configuration and construction methods and the repository/ESF interfaces. Similarly, those requirements which may impact the selection of the preferred ESF configuration and construction methods will also be identified. To the extent possible, these requirements will be quantified and traceability of the design inputs established.

A literature survey will be made of existing Yucca Mountain Project documents, and the repository and ESF options that were considered in the past will be identified. Additionally, all comments, concerns and issues raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, which may impact the selection of the preferred repository option or the preferred ESF configuration and construction option, will be identified.

Using the results from the bibliographic surveys described above, specific repository access and ESF options will be identified and will undergo an initial screening process in order to select viable options for further evaluation.

A methodology will be developed for use in the final evaluation of the viable repository access and ESF options. This methodology will consider both regulatory and non-regulatory evaluation criteria.

The evaluation of the repository access options will be conducted first, and the preferred repository option will be identified. Next, an evaluation of the viable ESF configurations and construction methods will be conducted using the preferred repository access option as part of the evaluation criteria.

Finally, a preferred ESF configuration and construction method will be identified and will be presented to DOE in a final report. This report will consolidate all the information used in the evaluation and will present the conclusions and recommendations pertaining to the preferred ESF configuration and construction method.

30-Nov-1989

EXPLORATORY SHAFT FACILITY (ESF) ALTERNATIVES STUDY

IMPLEMENTATION PLAN

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1.0 INTRODUCTION

1.1 Scope of Alternative Studies

These alternative studies are being undertaken to evaluate and identify a basis for the design and construction of an Exploratory Shaft Facility (ESF) at the Yucca Mountain site. The scope of these studies will be limited to the identification of the preferred repository options (accesses, construction methods, the identification of a preferred location or locations for the ESF accesses and underground facilities based on repository-ESF interface considerations) and the selection of the preferred ESF configuration and construction method(s). The repository options will be developed to the extent necessary to perform this evaluation of the ESF.

For the purposes of this evaluation, "configuration" includes the orientation, geometry, layout, and depth of the exploratory shaft facility; the location and means of access to the exploratory shaft facility; and the design of any engineered elements of the exploratory shaft facility. It also includes the strategy for and the sequencing of testing to be conducted in the exploratory shaft facility during site characterization.

1.2 Purpose of Implementation Plan

The purpose of this implementation plan is to identify (1) the Yucca Mountain Project (YMP) participant organization responsible for management of these studies, (2) the responsibilities of, and organizational interfaces between the YMP participant organizations conducting these studies, (3) the quality assurance requirements applicable to these studies, (4) the proposed schedule for initiation and completion of these studies, (5) the methodology proposed for use in conducting these studies, (6) the work to be performed as part of these studies, and (7) the final product for these studies.

2.0 PLAN MANAGEMENT AND IMPLEMENTATION

This section describes the overall management, coordination, and implementation process for performing the tasks identified in this plan.

2.1 Management

The Project Office has assigned the lead technical and coordination responsibility for this plan and its implementation to Sandia National Laboratories (SNL). The Project Office will maintain administrative control of this task. This administrative control will include approval of resource allocations and activity schedules. At the request of SNL, project participants will be assigned, at Project Office direction, to the individual tasks in accordance with their WBS responsibilities.

2.2 Organization

The Project participants will be organized according to the responsibility matrix plan contained in Exhibit A. This matrix identifies the technical lead and support roles for each task. The matrix organization will allow interactive participant coverage of the activities required by each of the tasks described in this plan.

2.2.1 Responsibilities

The responsibilities of the participants are as follows:

The Project Office is responsible for work authorization, budget allocation, review and acceptance of the implementation plan, review and acceptance of the task deliverables, acceptance of the final report, and for management and direction of SNL, the lead organization for the ESF alternatives study.

T&MSS, under the direction of the Project Office Engineering and Development (E&D) Division will assist the Project Office in the guidance, management and monitoring of the progress of this evaluation. Additionally, T&MSS will provide technical support, as required, to SNL during the performance of the tasks outlined in this plan.

Sandia National Laboratories (SNL) is responsible for managing, monitoring, controlling, and coordinating the activities of the Project participants involved in the ESF alternatives evaluation study. SNL will monitor and report the progress of the tasks to the Project Office at monthly meetings.

On a technical level, SNL is responsible for: certification of performance assessment computer codes; identification and quantification of design and construction requirements; verification of design inputs; identification of alternative repository options; development of evaluation criteria and methodology; selection of the preferred repository option and selection of the preferred ESF configuration and construction Methods. SNL will use Parsons-Brinckerhoff (PB), the repository underground facilities designer, to assist in the identification of alternative repository options, and support the selection of the preferred ESF option.

Los Alamos National Laboratory (LANL) is responsible for testing strategies including their application and location within the ESF, and will also support the selection of the preferred ESF option. Another major area of responsibility is verification that the preferred ESF configuration and construction methods are suitable for the intended use of this facility. The LANL Test Manager's Office (TMO) at Las Vegas will coordinate development of all test related material with respect to content and schedule, and will participate in the monthly meetings.

Holmes and Narver (H&N) and Fenix Scisson of Nevada (FSN), the ESF Architect Engineer(s) (A/Es), are responsible for the identification of the ESF configuration options and construction methods. The A/Es will also support the selection of the preferred ESF option. This task will involve identification of ESF options for the underground access, connecting drifts and openings, operational support functions, layout of surface facilities, and schedules and cost estimates. Additionally, the A/Es will provide support in their respective areas of expertise as needed, and will participate in the monthly meetings.

Reynolds Electrical and Engineering Company (REECo) will provide expertise in construction and installation techniques and will support the selection of the preferred ESF option, as required. This support will include identification of construction options, schedules, and cost estimates; construction related input to proposed layout configurations; and review and comments on proposed configurations. REECo will also participate in the monthly meetings.

The DOE/HQ Office of Facilities Siting and Development (RW-20) will have the option of (1) attending the monthly meetings as observers, (2) hosting the quarterly status meetings, and (3) participating in reviews. RW-20 will cooperate with the Project Office in the arrangement of any discussions of these studies with the Nuclear Regulatory Commission (NRC) or the Nuclear Waste Technical Review Board (NWTRB).

2.2.2 Organizational Interfaces

SNL will interface with the responsible project participants. During the performance of the assigned tasks, the participating Project organizations will interface with each other as required. Project organizations will interface with each other in accordance with AP-5.19Q, "Interface Control" which has been adopted by SNL as a controlling procedure.

Repository and ESF configurations will be coordinated, where appropriate, with surface based testing requirements and license application strategies.

2.3 Quality Assurance

The work described in this document will be conducted under a 10 CFR 60 Subpart G Quality Assurance Program, as implemented by the Yucca Mountain Project Quality Assurance plan, NNWSI/88-9, Rev. 2. Each participant will define that program as applied to their work by applying AP-5.4Q and AP-5.17Q. The appropriate portions of NNWSI/88-9, determined by the individual participants to be applicable to their work, will apply.

Any quality-affecting software used in the conduct of this work will be developed and controlled under a YMPO approved software QA plan.

Personnel from those participants that do not yet have a qualified QA program will be trained and conduct their activities under the Sandia National Laboratories QA program.

2.4 Task Plans

The participants assigned as technical leads may develop task plans for each task. These plans may include:

1. Purpose and scope.
2. Description of work to be performed.
3. Methods and procedures to be used.
4. Personnel assigned by activity or task.
5. Reports, products and reviews planned.
6. Quality Assurance.
7. Schedule.
8. Resource Requirements

Prior to initiation of technical activities, the task plans shall undergo an independent technical review and a QA review for inclusion of appropriate technical and QA requirements. Approval of the task plans shall be by the Technical Project Officer (TPO) of each organization proposing the work under their own QA program and by the SNL TPO.

2.5 Documentation

Work performed during the implementation of each of the tasks will be documented. The documentation shall provide sufficient detail to permit independent reviewers to comprehend the original determinations.

Documentation shall include the following completed items and sections as applicable:

1. Name of the task for which the work is performed.
2. Objective of the analysis, evaluation, or calculation.
3. Special directions given and by whom.
4. Method of analysis, evaluation, review, or calculation used.
5. Listing of information sources and specific data used.

6. Qualitative statement regarding the degree of uncertainty or maturity of the information sources.

7. Assumptions and their basis (rationale).

8. References (title [including accession number], revision number, author, and date), or other unique identifiers.

9. Special terms used.

10. Constants used.

11. Conclusions.

12. An orderly statement of analysis logic.

13. Authentication by the preparing parties.

2.6 Deliverables

The deliverables to be produced for each specific task will be identified in the task plans.

2.7 Schedule

The preliminary schedule for implementing this plan is contained in Exhibit B. The final schedule shall be developed by SNL before December 1, 1989. The final selection of the preferred ESF option will be available by December 30, 1990.

2.8 Records Management

Records Management will be in accordance with the procedure(s) identified as applicable by SNL.

2.9 Reviews

Independent reviews will be performed as Technical Reviews or Peer Reviews as applicable. Appropriate interim reviews may also be conducted. DOE/HQ will have the option of participating in these reviews.

3.0 DEVELOPMENT OF EVALUATION METHODOLOGY

This task will address the development of the methodology required for the evaluation of the repository and ESF options.

3.1 Evaluation Criteria

This section describes the methods and resources to be used for the development of the evaluation criteria.

3.1.1 Repository Evaluation Criteria

The repository system is divided into subsystems as described in the Repository Design Requirements document. Criteria will be developed for evaluation of the surface to underground access configurations and the repository/ESF interface subsystems. The requirements will be organized according to their hierarchy such that higher-level requirements are satisfied if it can be shown that each individual subordinate requirement is satisfied.

Evaluation criteria for determining whether the individual lower-level requirements are met will be developed for each physical subsystem to which a requirement applies. These criteria will be developed from the performance allocation tables in the SCP, appropriate design requirements documents, and qualitative professional judgment.
In addition to the regulatory criteria, non-regulatory criteria will be developed from the requirements identified in Section 4.0. These criteria will be based on such factors as industrial safety, cost, schedule, constructability, ventilation requirements, long-term drift maintenance, rock disturbance, water minimization, construction methods, and opening stability. These criteria will take into account comments and concerns raised by the NRC, the NWTRB, the State of Nevada, internal DOE reviews, and other sources.

3.1.2 ESF Evaluation Criteria

The development of evaluation criteria for the ESF will proceed in a manner similar to that described above for the repository configuration. A list of relevant ESF requirements will be developed. Comments from the NRC's Site Characterization Analysis (SCA) and testing related criteria will be included in the ESF evaluation criteria.

Additional criteria will be developed, as necessary, based on comments and concerns raised by the NRC, the NWTRB, the State of Nevada, internal DOE reviews, and other sources.

As a minimum, the following factors will be addressed by the ESF evaluation criteria:

1. Potential impacts of an ESF configuration and construction options on the ability of the site to isolate waste following permanent closure of the repository.

2. Potential impacts of an ESF configuration and construction options on radiological and nonradiological health and safety during repository construction, operation, decommissioning, and closure.

3. Ability of an ESF configuration to obtain data needed to design the repository and conduct performance assessments including, the ability to satisfy the requirements of the testing strategies outlined in the SCP, and the ability to obtain sufficient data representative of repository conditions.

4. Flexibility of an ESF configuration to allow performance of new testing not previously identified or described in the SCP (i.e., performance confirmation).

5. Flexibility of an ESF configuration to support modification of the configuration or construction methods during construction in response to conditions encountered, new or modified testing, or other requirements.

6. An ESF configuration's potential for construction-to-testing interference, operations-to-testing interference, and testing-to-testing interference.

7. Compatibility of an ESF configuration and construction options with repository design requirements and the preferred repository configuration.

8. Necessity for prototype testing or surface-based testing prior to design or construction of the ESF.

9. The technical and engineering considerations associated with the configuration and construction methods, including the risks associated with using state-of-the-art or prototype technology; water-usage; penetration rates; requirement for temporary versus permanent ground support; shaft or drift face accessibility; and power requirements.

10. Ability to conduct routine operations (e.g., transporting personnel, muck haulage, ventilation, hoisting, and sampling.)

11. Impacts on cost and schedule related to ESF configurations and construction methods, and to the repository configurations.

3.2 Application of Criteria

Detailed instructions for performing the evaluations of the configurations and construction options will be developed in accordance with the Task Plans and approved by the SNL TPO.

Instructions will be developed for application of the selection criteria to the viable repository and ESF options. The procedures for application of the evaluation criteria to these options will address the following:

1. Selection of the major areas of consideration and identification of their expected percentage of influence.

2. Identification of quantitative and qualitative criteria for each major area of consideration.

3. Development of criteria weighting.

3.3 Deliverables

The proposed deliverables resulting from this task are Chapter 2.0 of the final report and its supporting appendices, as indicated below:

2.0 Evaluation Methodology

- 2.1 Technical Approach
- 2.2 Assumptions
- 2.3 Evaluation Criteria
  - 2.3.1 Repository Evaluation Criteria
  - 2.3.2 ESF Evaluation Criteria
- 2.4 Acceptable Method(s) for Application of Evaluation Criteria
- 2.5 Acceptable Method(s) for Documentation of Results

4.0 EVALUATION OF REPOSITORY AND ESF DESIGN AND CONSTRUCTION REQUIREMENTS

The first part of this evaluation will be a review of existing program requirements documents and all comments and concerns relating to the repository and ESF design and construction. The purpose of this review is to identify those requirements which may impact the selection of the preferred repository access configuration and the ESF configuration and construction methods. Comments and concerns will include, but are not limited to, those raised by the Nuclear Regulatory Commission (NRC), the Nuclear Waste Technical Review Board (NWTRB), the State of Nevada, and the Department of Energy (DOE). This review will culminate in the preparation of two lists of requirements. The first list will contain those requirements impacting the selection of the preferred Yucca Mountain repository option. The second list will contain those requirements impacting the selection of the preferred ESF configuration and construction methods.

The applicable requirements will be reviewed to identify those which shall be quantified or be made site specific. Specific values, based on performance and design-related calculations, evaluations, and trade-off studies, will be established.

The resulting repository and ESF requirements lists will be used to support the evaluation of alternatives for the configuration and construction method. Additional requirements, identified as a result of tasks outlined above, will be incorporated into the existing project requirements documents as part of this ESF evaluations study prior to commencement of design leading to construction.
In parallel with the quantification efforts, SNL will provide traceability (verification) of design inputs.

4.1 Survey of Requirements

This section describes the general process for reviewing existing regulatory requirements and additional comments and concerns to produce a comprehensive list of requirements which are applicable to the repository and ESF design and construction.

4.1.1 Repository Requirements

SNL will perform a detailed review of Title 10 Chapter I Part 60 of the Code of Federal Regulations (10 CFR 60), the Generic Requirements for a Mined Geologic Disposal System -OGR/B2 (GR) and the draft Repository Design Requirements Document (RDR) (which is consistent with the GR) to ensure that the requirements which apply to the selection of the preferred repository access configuration and construction methods and repository/ESF interfaces have been adequately interpreted and translated into requirements. In addition, SNL will review all comments and concerns raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, to ascertain if any of the comments or concerns may affect the repository access and interface requirements. Sources of such comments and concerns may include the NRC's Site Characterization Analysis (SCA), written correspondence received from the NWTRB and the State of Nevada public meetings and hearings, and publicly released reports.
As a result of these reviews, SNL will identify and list the requirements which impact the selection of the preferred repository option. A summary of relevant comments and concerns will also be prepared.

4.1.2 ESF Requirements

SNL, supported by LANL, will perform a document review to ensure that all requirements which the ESF must satisfy are incorporated into the ESF SDRD. Documents to be reviewed will include upper-tier documents such as Appendix E of the GR and the draft RDR. Other documents, as identified in the work plans, will be reviewed for additional requirements which may potentially impact the ESF. The documents to be reviewed will be the latest versions available at the initiation of this task.

DOE will provide guidance as to which 10 CFR 60 requirements may impact the selection of the preferred ESF configuration. These requirements will be identified in an updated GR Appendix E or by guidance letter identifying those additional requirements not contained in the current version of GR Appendix E. The updated GR Appendix E will be approved prior to approval of the final report of this study. A review of comments and concerns raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, will be performed to ascertain if any of the comments or concerns may affect the design and construction of the ESF.

As a result of this review,SNL will identify and list the requirements which impact the selection of the preferred ESF configuration and construction method. A summary of relevant comments and concerns will also be prepared.

4.1.3 Testing Requirements

LANL will assume the lead in performing a document review to identify ESF test requirements, identified in the Site Characterization Plan (SCP) and study plans, which will impact the selection of the preferred ESF configuration and construction method. Specific requirements identified as a result of this effort will be incorporated into the ESF requirements list. Documentation to be reviewed will be identified in the work plans. In addition, LANL will review all comments and concerns raised by the NRC, NWTRB, the State of Nevada and the DOE with respect to testing to ascertain if any of the comments or concerns are applicable to the design and construction of the ESF.

As a result of this review, LANL will identify and list the testing requirements which impact the selection of the preferred ESF configuration and construction method. A summary of relevant comments and concerns will also be prepared. These requirements will be incorporated into the ESF requirements lists identified in Section 4.1.2.

4.2 Quantification of Requirements

Requirements identified in Section 4.1, which are expressed in a qualitative manner, will be reviewed to identify those which shall be assigned specific values. Based on analyses and trade-off studies identified in the work plans, values will be assigned to the identified requirements as necessary.

4.2.1 Repository and ESF Requirements

The requirements applicable to the selection of the preferred repository option and ESF configuration and construction methods will be reviewed by SNL and, where appropriate, be grouped into analysis categories such as thermomechanical, hydrological, geochemical, geotechnical and geological. Each of the categories will be segregated into analysis packages which will address one or more requirement.

Analyses will be performed for each analysis package to quantify the requirement it addresses over a range of alternate conditions that will cover the configurations identified in Section 5.1 and 5.2 and allow trade-off studies to be performed. The range of the input parameters and scope for each analysis will be established to assure that the requirements are adequately investigated.

4.2.2 Testing Requirements

LANL will be the technical lead responsible for quantifying the testing requirements identified in the SDRD. The requirements to be met by the ESF in support of the Integrated Data System (IDS) will also be identified. The requirements developed and quantified by LANL will be verified by the participating test organizations prior to incorporation into the appropriate requirements list.

4.3 Traceability of Repository and ESF Design Input Data

As part of the incorporation of the results of this study into the existing project requirements documents, the traceability of the repository and ESF design input data will be established and documented by SNL.

4.4 Revision of Requirements

As a result of the requirements surveys outlined in Section 4.1, requirements lists to be used in the selection of the preferred repository option and ESF configuration and construction methods will be developed. The RDR and the ESF SDRD will be updated to incorporate additional regulatory requirements as determined by these studies. These documents will then be reviewed, approved, and placed under change control.

4.5 Deliverables

The proposed deliverables resulting from this task are Chapter 3.0 of the final report and its supporting appendices, as indicated below:

3.0 Repository and ESF Design and Construction Requirements

3.1 Requirements impacting selection of the preferred repository option.

3.2 Requirements impacting the selection of the preferred ESF configuration and construction method(s).

Appendices

1. An appendix documenting the methods and procedures used to identify the requirements and comments and concerns which may impact the selection of the preferred repository option. A list of the requirements will be part of this appendix.

2. An appendix documenting the methods and procedures used to identify the requirements and the comments and concerns which may impact the selection of the preferred ESF configuration and construction method. A list of the requirements will be part of this appendix.

3. An appendix documenting the methods and procedures used to compile a list of quantified requirements which may impact the selection of the preferred repository option.

4. An appendix documenting the methods and procedures used to compile a list of quantified requirements which may impact the selection of the preferred ESF configuration and construction methods.

5. An appendix documenting the methods and procedures used to verify the design inputs which will be used in the evaluation of the preferred options.

6. An appendix identifying the computer codes to be used in the evaluation of the preferred options. The appendix will also identify the steps which were taken to use these codes.

Additional deliverables for this task are the revisions to the project requirements documents as outlined in Section 4.5.

5.0 IDENTIFICATION OF REPOSITORY ACCESS AND ESF OPTIONS

This task will identify repository access options and ESF configuration options and construction methods.

5.1 Repository Access and ESF Options

This section deals with the process of identification of the repository access options and the ESF configuration options and construction methods. This process will involve a literature survey for identification of existing concepts, identification and consideration of comments and concerns, and identification of new concepts.

5.1.1 Literature Survey

A survey of project documents will be conducted to identify those repository options and ESF configuration options and construction methods that have been considered in the past. The Yucca Mountain project documents to be considered may include reports, presentations, white papers, and letters. Document sources may include the project central records facility and the local record facility of the project participants involved with past design efforts.

The Literature Survey documentation will cover previous evaluations of repository layouts and ESF configuration options and construction methods. This will include the scope of the evaluations that were conducted, the methodologies that were used for the evaluations, and the results of the evaluations including recommendations. The QA controls under which the evaluations were conducted will also be reviewed. Guidelines will be developed to determine the quality of the concepts identified in the literature survey. A bibliographic summary of the relevant literature will be provided.

Additionally, the literature survey will identify the repository and ESF related comments, concerns, and issues raised by the NRC, NWTRB, the State of Nevada, and the DOE. This information will also be part of the bibliographic summary.

5.1.2 Identification of New Options

From the literature survey described in Section 5.1.1, specific repository and ESF options may be identified that require refinements. New options may also be identified which will address the more recent comments and concerns expressed by the NRC, NWTRB, the State of Nevada and DOE. The identification of these new options will be documented. Such documentation may include the development of sketches to describe the configuration and construction methods.

5.2 Deliverables

The proposed deliverables resulting from this task are Chapter 4.0 and 5.0 of the final report and their supporting appendices, as indicated below:

4.0 Identification of Alternative Repository Configurations

- 4.1 Repository Options Previously Considered
- 4.2 Repository Related Comments and Concerns
- 4.3 New Configurations and Construction Methods Identified

5.0 Identification of Alternative ESF Configurations and Construction Methods

5.1 ESF Configuration Options and Construction Methods Previously Considered

5.2 ESF Related Comments and Concerns

5.3 New Configurations and Construction Methods Identified

6.0 SELECTION OF PREFERRED CONFIGURATION AND CONSTRUCTION METHODS

This section defines the process for applying the evaluation methodology identified in Section 3.0 to the repository access options and ESF configuration options and construction methods listed in Section 5.0. The evaluation will be performed in two parts: (1) the ranking of the repository options and the selection of the preferred option, and (2) the ranking of ESF configurations and construction methods options and selection of the preferred configuration and construction method. The preferred repository option will then be used as part of the criteria for evaluating ESF configuration options and construction methods.

An evaluation group will be formed to evaluate the repository and ESF options developed in Section 5.0 in accordance with the evaluation methodology developed in Section 3.0. The detail of each of the option packages will be further developed to a level necessary for adequate evaluation. Each option will be depicted by sketches with brief descriptions of the functions and rationale for location of major features in the layout.

The members of the evaluation group shall perform the calculations and screenings necessary to obtain individual ranking component values for the options. The component values will be accumulated and an overall ranking developed for each option. Because this is a somewhat subjective process, each member of the evaluation group will be required to maintain a comprehensive record of all information relevant to the options evaluations, and the evaluation groups will be required to maintain detailed minutes of all meetings. All individual and group records must be made a part of the final record and must be available for independent review subsequent to the completion of these studies.

6.1 Performance Assessment

The performance assessment analysis of the repository and ESF options will at a minimum address the following areas:

1. Waste isolation.
2. Radiological safety.
3. Chemical and fluid transport.
4. Stress fields.
5. Temperature fields.
6. Zones of disturbance.
7. Closure of openings.

Appropriate models for the options will be used. Each model will be analyzed by the appropriate performance assessment techniques and a ranking developed based on the results obtained.

Documentation of performance assessment analyses will include the following:

1. Identification of performance assessment codes if any are used in the analysis.
2. Identification of configuration models to be used.
3. Identification of configuration-related functional design criteria to be used.
4. Development of assumptions for use with the performance codes.

Validation of the performance assessment codes used in the evaluation activities described in this plan will not have been completed when the final reports are prepared. The following paragraphs briefly describe the process applicable to software life cycles for codes that will be used.

Computer codes may be used in many of the analyses performed in evaluating alternative configurations. To ensure that the results of these analyses can be used with confidence, careful attention will be paid to the status of verification and validation of the codes. The procedures that currently govern analyses and software life cycle provide for this attention by calling for certification of codes; the procedures specify in detail how certification is to be achieved. Because all the analyses will follow those procedures, the required attention will be paid to verification and validation.

Briefly stated, the analysis and software procedures require that each analysis be accompanied by a Statement of Software Certification for each piece of Scientific and Engineering Software (SES) used in the analysis. The statement includes a description and review of the status of verification and validation of the piece of software. It explains why the current status is appropriate for the analysis, and it outlines the additional efforts, if any, that must be made to bring the status to a more appropriate level. The statement is reviewed and becomes a part of the analysis records, allowing future reviews and critiques of the analysis to have access to the thinking by which the use of the software was justified.

The procedures require that certification be done in this way because they recognize that verification and validation must be interpreted separately for each problem to which a code is applied. (Validation is the process by which a model is shown to represent correctly the processes it is intended to represent.) Validation of these codes requires data which is not yet available, but will be collected during Site Characterization. Therefore, validation cannot take place until such time as the actual data is available. Each analysis must be accompanied by an assessment of the validity of its models for the intended purposes. The assessment of validity will be a Statement of Analysis-Specific Software Certification, to be prepared for each code for its intended use. The certification will include the following information:

1. The name, version, release number, and qualification status of each piece of Scientific and Engineering Software (SES) to be used in the analysis.

2. An identifying number associated with the analysis (e.g., Problem Definition Memo (PDM) number, Design Investigation Memo (DIM) number), the Work Breakdown Structure (WBS) number, and the extent to which the software is subjected to QA requirements (i.e., Q or Non-Q).

3. Identification of all non-SES calculations, non-calculational software, and auxiliary software used in conjunction with an SES code for the analysis. Such software is included in the certification by reference.

4. A summary of the verification and validation analyses that have been completed and a statement of conclusions drawn from them concerning the adequacy of the code for meeting the objective of the analysis.

5. A summary of additional application-verification and validation activities, if any are needed, including references to current plans for evaluating the adequacy of the code for meeting the objective of the analysis.

6. Tentative plans for efforts to ensure that the results of the analysis will be controlled in such a way that the results of future application-verification and validation work will be compared with the results of this analysis and previous analyses. The intent of such control is to ensure that all analyses are evaluated for the effect of limitations or faults found in subsequent application-verification testing.

7. The basis supporting the certification of the software for the specific physical problem, including reasons why the code, in its present state of development and documentation, is appropriate for the analysis.

6.2 Preferred Repository Option

The evaluation group will review each of the viable repository options and will select the preferred repository access configuration and construction method.

6.3 Preferred ESF Configuration and Construction Methods

The preferred repository option identified in Section 6.2 above shall become part of the evaluation criteria used in the ranking process of the viable ESF configuration options and construction methods. The evaluation group will review each of the viable ESF configuration options and construction methods and list them in order of their ranking. The preferred ESF option will be selected.

6.4 Deliverables

The proposed deliverables resulting from this task are Chapter 6.0 of the final report and its supporting appendices, as indicated below:

6.0 Selection of Preferred Configuration and Construction Method

6.1 Preferred Repository Access Configuration and Construction Method

6.2 Preferred ESF Configuration and Construction Method

Appendices

1. Repository Selection Process Documentation

   a. Repository evaluation group selection process and qualifications.

   b. Report on the performance and results of the repository layouts ranking process and identification of the preferred repository option.

   c. Description of the selected repository access configuration and construction method.

2. ESF Selection Process and Documentation

   a. ESF evaluation group selection process and qualifications.

   b. Report on the performance and results of the ESF layouts and construction options ranking process and identification of the preferred ESF configuration and construction options.

   c. Description of the selected ESF configuration and construction methods.

7.0 REPORTS

The results of the ESF alternative evaluations will be presented in three documents. These documents are: the revised editions of the RDR and the SDRD, and the Alternative Studies Report.

7.1 Revised RDR and SDRD

The revisions for Project requirements documents as identified in Section 4.6 will be incorporated into the RDR and SDRD and the revised documents will be issued in accordance with approved Project procedures.

7.2 Alternatives Study Report Organization, Format and Content

This section outlines the organization, format and content in the final report to be presented to DOE.

7.2.1 Organization and Format

The organization and format of the final report should be in accordance with SNL editorial policies.

7.2.2 Contents of Final Report

The body of the report should consolidate the information, conclusions and recommendations provided by the deliverables that are identified in Sections 3.0, 4.0, 5.0 and 6.0 of the implementation plan. The suggested table of contents for the final report is as follows:

TABLE OF CONTENTS

EXECUTIVE SUMMARY

ACRONYMS AND ABBREVIATIONS

FORWARD

1.0 INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Scope of Study

1.4 Organization of Study

2.0 EVALUATION METHODOLOGY

2.1 Technical Approach

2.2 Assumptions

2.3 Evaluation Criteria

2.3.1 Repository Evaluation Criteria

2.3.2 ESF Evaluation Criteria

2.4 Acceptable Method(s) for Application of Evaluation Criteria

2.5 Acceptable Method(s) for Documentation of Results

3.0 REPOSITORY AND ESF DESIGN AND CONSTRUCTION REQUIREMENTS

3.1 Requirements Impacting Selection of the Preferred Repository Option

3.2 Requirements Impacting the Selection of the Preferred ESF Configuration and Construction Method(s)

4.0 IDENTIFICATION OF ALTERNATIVE REPOSITORY CONFIGURATIONS

4.1 Repository Options Previously Considered

4.2 Repository Related Comments and Concerns

4.3 New Configurations and Construction Methods Identified

5.0 IDENTIFICATION OF ALTERNATIVE ESF CONFIGURATIONS AND CONSTRUCTION METHODS

5.1 ESF Configuration Options and Construction Methods Previously Considered

5.2 ESF Related Comments and Concerns

5.3 New Configurations and Construction Methods Identified

6.0 SELECTION OF PREFERRED CONFIGURATIONS AND CONSTRUCTION METHODS

6.1 Preferred Repository Access Configuration and Construction Method

6.2 Preferred ESF Configuration and Construction Method

7.0 APPENDICES

Appendices shall include, but not be limited to, those identified in Sections 3.0, 4.0, 5.0, and 6.0 of this plan, and this implementation plan.

PLAN ASSIGNMENTS RESPONSIBILITY MATRIX

SECTION	PROJECT MANAGEMENT DIRECTION & INTEGRATION	MANAGEMENT LEAD	TECHNICAL LEAD	SUPPORT INPUT	WBS NO.
2.0 PLAN MANAGEMENT AND IMPLEMENTATION	P.O./T&MSS	SANDIA			
2.1 Management	.....		SANDIA	(T)	1.2.6.1
2.2 Organization	.....		SANDIA	(T,LA,H,F,R)	1.2.6.1
2.2.1 Responsibilities					
2.2.2 Organizational Interfaces					
2.3 Quality Assurance	.....		SANDIA	(F,T)	1.2.6.1
2.4 Work Plans	.....		SANDIA	(T,LA,H,F,R)	1.2.6.1
2.5 Documentation	.....		SANDIA	(TBD)	1.2.6.1
2.6 Deliverables	.....		SANDIA	(TBD)	1.2.6.1
2.7 Schedule	.....		SANDIA	(T,LA,H,F,R)	1.2.6.1
2.8 Records Management	.....		SANDIA	(T,LA,H,F,R)	1.2.6.1
3.0 DEVELOPMENT OF EVALUATION METHODOLOGY	P.O./T&MSS	SANDIA			
3.1 Evaluation Criteria					
3.1.1 Repository Evaluation Criteria	.....		SANDIA	(F,LA,PB)	1.2.1.4
3.1.2 ESF Evaluation Criteria	.....		SANDIA	(F,LA,R)	1.2.6.1
3.2 Application of Criteria					
3.2.1 Quantitative and Qualitative Criteria	.....		SANDIA	(TBD)	1.2.1.4
3.2.2 Performance Assessment	.....		SANDIA	(TBD)	1.2.6.1/1.2.1.4
3.3 Deliverables	.....		SANDIA	(TBD)	1.2.6.1/1.2.1.4

NOTE: 1) P-Project Office T-T&MSS S-SANDIA LA-LOS ALAMOS F-FSN H-H&N R-REECo PB-Parsons Brinckerhoff
2) 1.2.1.4 Systems Performance assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESF Management and Integration

EXHIBIT A
30 NOVEMBER 1989

PLAN ASSIGNMENTS RESPONSIBILITY MATRIX

SECTION	PROJECT MANAGEMENT DIRECTION & INTEGRATION	MANAGEMENT LEAD	TECHNICAL LEAD	SUPPORT INPUT	WBS NO.
4.0 EVALUATION OF REPOSITORY AND ESF DESIGN AND CONSTRUCTION REQUIREMENTS	P.O./T&MSS	SANDIA			
4.1 Survey of Requirements					
4.1.1 Repository Requirements	.....		SANDIA	(T,LA,PB)	1.2.4.7
4.1.2 ESF Requirements	.....		SANDIA	(T,LA)	1.2.6.1
4.1.3 Testing Requirements	.....		LOS ALAMOS	(TBD)	1.2.6.1
4.2 Quantification of Requirements					
4.2.1 Repository and ESF Requirements	.....		SANDIA	(LA,F,H,R,PB)	1.2.4.7
4.2.2 Testing Requirements	.....		LOS ALAMOS	(TBD)	1.2.6.1
4.3 Traceability of ESF and Repository Design Input Data	.....		SANDIA	(LA,F,H,R,PB)	1.2.1.4/1.2.6.1
4.4 Revision of Requirements	.....		SANDIA	(T,LA,PB)	1.2.6.1
4.5 Deliverables	.....		SANDIA	(T,LA,F,H,PB)	1.2.6.1
5.0 IDENTIFICATION OF REPOSITORY ACCESS AND ESF OPTIONS	P.O./T&MSS	SANDIA			
5.1 Repository Access and ESF Options					
5.1.1 Literature Survey	.....		SANDIA	(F,H,LA,PB)	1.2.4.3
5.1.2 Identification of New Options	.....		SANDIA	(F,H,LA,PB)	1.2.4.3
5.2 Deliverables	.....		SANDIA	(LA,H,R,S,F,PB)	1.2.6.1

NOTE: 1) P=Project Office T=T&MSS S=SANDIA LA=LOS ALAMOS F=FSN H=H&N R=REECo PB=Parsons Brinckerhoff
2) 1.2.1.4 Systems Performance assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESF Management and Integration

EXHIBIT A
30 NOVEMBER 1989

PLAN ASSIGNMENTS RESPONSIBILITY MATRIX

SECTION	PROJECT MANAGEMENT DIRECTION & INTEGRATION	MANAGEMENT LEAD	TECHNICAL LEAD	SUPPORT INPUT	WBS NO.
6.0 SELECTION OF PREFERRED CONFIGURATION AND CONSTRUCTION METHODS	P.O./T&MSS	SANDIA			
6.1 Performance Assessment	.....		SANDIA	(LA,FSN,PB)	1.2.1.4
6.2 Preferred Repository Option	.....		SANDIA	(TBD)	1.2.1.4/1.2.1.3
6.3 Preferred ESF Configuration and Construction Methods	.....		SANDIA	(TBD)	1.2.6.1
6.4 Deliverables	.....		SANDIA	(TBD)	1.2.6.1
7.0 REPORT	P.O./T&MSS	SANDIA			
7.1 Revised PDR and SDRD	.....		SANDIA	(TBD)	1.2.1.4/1.2.6.1
7.2 Alternative Studies Report Organization, Format, and Content	.....		SANDIA	(TBD)	1.2.6.1
7.2.1 Organization and Format					
7.2.2 Contents of Final Report					
EXHIBITS					
A. Responsibility Matrix for Plan	.....		SANDIA	(TBD)	1.2.6.1
B. Implementation Plan Schedule	.....		SANDIA	(TBD)	1.2.6.1

NOTE: 1) P-Project Office T-T&MSS S-SANDIA LA-LOS ALAMOS F-FSN H-HSN R-REECo PB-Parsons Brinckerhoff
2) 1.2.1.4 Systems Performance assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESF Management and Integration

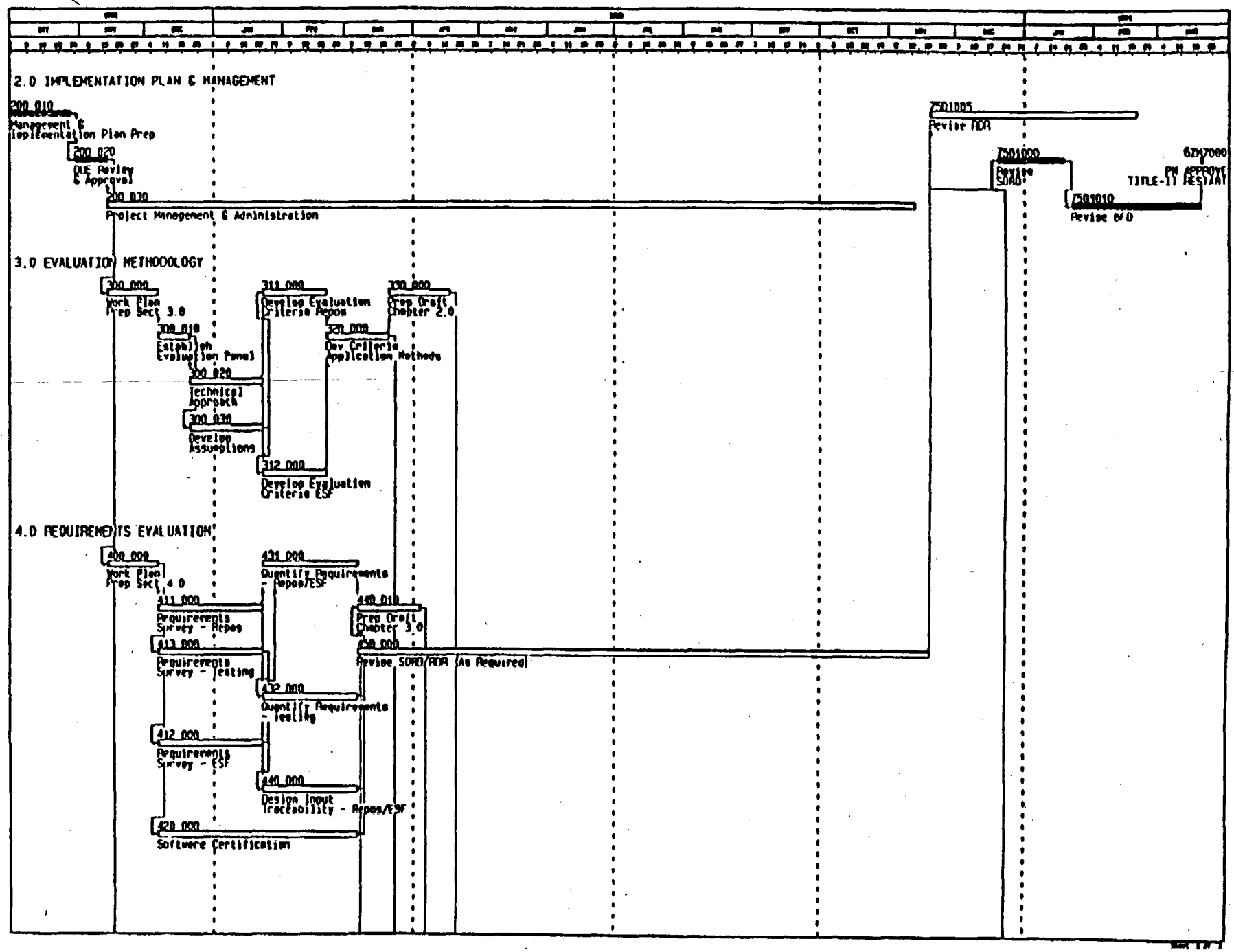


EXHIBIT B
30 NOVEMBER 1989

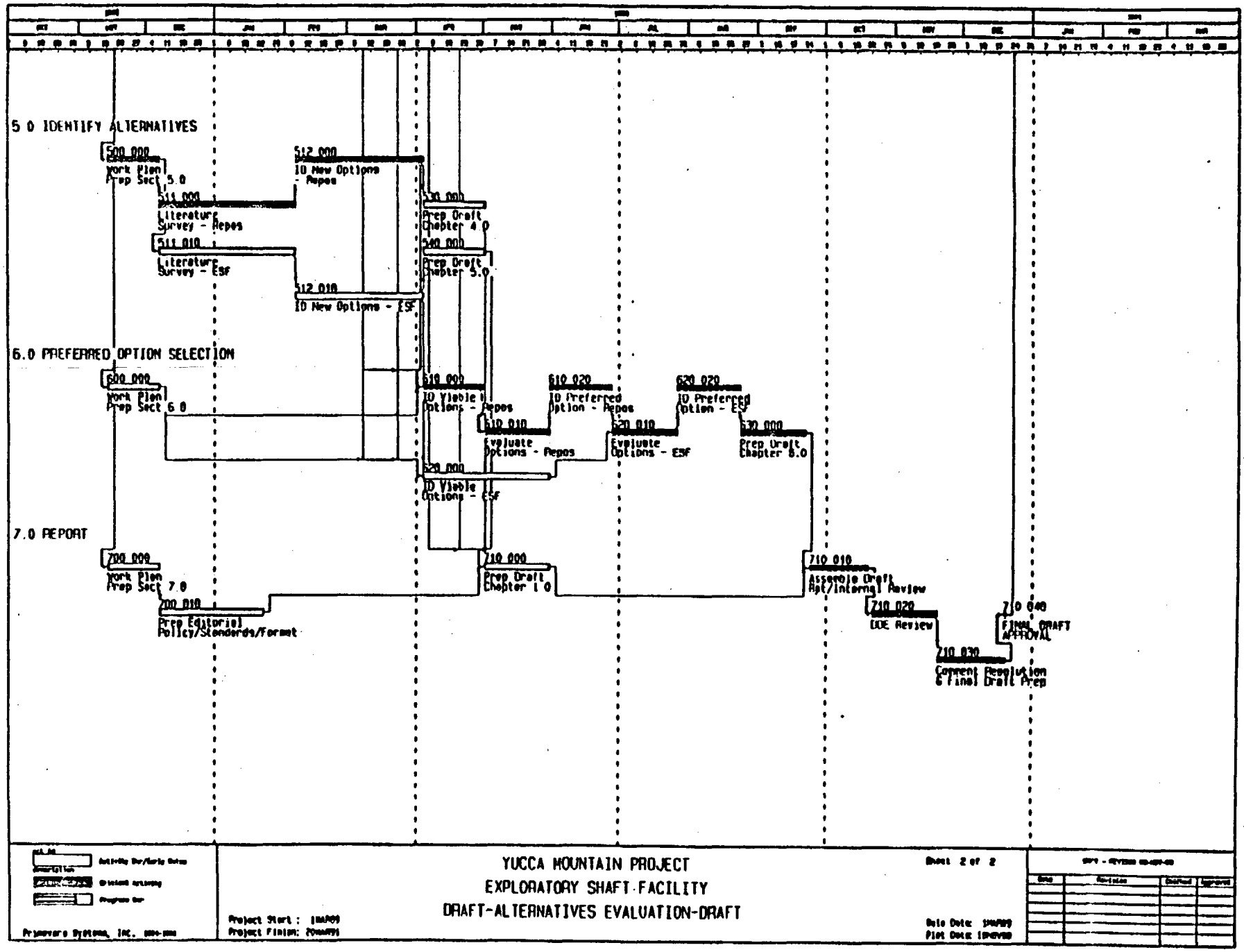


EXHIBIT B
30 NOVEMBER 1989

TPO PRESENTATION

PRESENTED BY

CARL GERTZ
PROJECT MANAGER

DECEMBER 8, 1989

AGENDA

- SITE CHARACTERIZATION PREREQUISITES
- 60-DAY REPORT
- OUTREACH ACTIVITIES

PROJECT MUST MEET PREREQUISITES BEFORE STARTING NEW SURFACE-BASED CHARACTERIZATION ACTIVITIES

- LAND ACCESS (COMPLETED 10/89)
- SCP REVIEW BY NRC (COMPLETED 7/89)
- STUDY PLANS ON TRENCHING IN MIDAY VALLEY AND QUATERNARY REGIONAL HYDROLOGY APPROVED BY NRC (12/89)
- ENDANGERED SPECIES ACT (DESERT TORTOISE-BIOLOGICAL ASSESSMENT SUBMITTED 10/89)
- FULLY QUALIFIED QA PROGRAM ACCEPTED BY NRC FOR WORK TO BE PERFORMED
- ENVIRONMENTAL COMPLIANCE AND PERMITTING

DOE ANNOUNCED NEW STEPS LAST WEEK TO KEEP PROGRAM MOVING FORWARD

- LITIGATE TO RESOLVE PERMIT ISSUE
- REVISE APPROACH AND SCHEDULE
- STREAMLINE MANAGEMENT APPROACH
- SEPARATE LINK BETWEEN MRS AND REPOSITORY

DOE TO SUE STATE OF NEVADA TO OBTAIN APPROPRIATE PERMITS

- DOE HAS TRIED TO WORK WITH STATE; WOULD PREFER COOPERATIVE APPROACH
- PERMITS NEEDED TO START NEW SITE CHARACTERIZATION WORK
  - NEW SCIENTIFIC STUDIES ARE ESSENTIAL TO DETERMINE YUCCA MOUNTAIN'S SUITABILITY
- STATE SAYS RECENT LEGISLATIVE ACTIONS PROHIBIT ISSUANCE OF PERMITS
- LAWSUIT TO BE FILED IN 30 DAYS

REVISED APPROACH AND SCHEDULE ANNOUNCED FOR YUCCA MOUNTAIN CHARACTERIZATION

- NEAR–TERM STUDIES EMPHASIZE SURFACE–BASED ACTIVITIES (TRENCHES, DRILL HOLES)
  - PRIORITIZES WORK TO BE DONE
- SCHEDULE ASSUMES SITE WORK BEGINS IN JANUARY 1991
  - EXPLORATORY SHAFT FACILITY CONSTRUCTION BEGINS NOVEMBER 1992
- IF SUITABLE, REPOSITORY OPERATIONS WOULD BEGIN IN 2010

OCRWM PROGRAM REVIEW

- DELAYS RESULTING FROM EXTENDING DURATIONS OF SITE-CHARACTERIZATION AND REPOSITORY-DEVELOPMENT ACTIVITIES ATTRIBUTABLE TO:
  - UNDERESTIMATION OF IMPACT OF REQUIREMENTS FOR QA AND DESIGN CONTROL ON REPOSITORY SCHEDULE
  - MISPERCEPTION THAT PROGRAM WAS SIMPLY A CONSTRUCTION PROJECT RATHER THAN A FIRST-OF-ITS-KIND SCIENTIFIC ENDEAVOR
- DELAY IN START OF NEW SCIENTIFIC INVESTIGATIONS AT YUCCA MOUNTAIN ATTRIBUTABLE, IN PART, TO:
  - UNWILLINGNESS ON PART OF STATE OF NEVADA TO ALLOW SITE INVESTIGATIONS

YUCCA MOUNTAIN PROJECT OFFICE TO REPORT DIRECTLY TO THE DOE PROGRAM DIRECTOR IN WASHINGTON, D.C.

- PROJECT OFFICE WILL CONTINUE TO COORDINATE CLOSELY WITH NEVADA OPERATIONS OFFICE
- ROLE OF ALL CONTRACTORS WILL BE REVIEWED TO ELIMINATE DUPLICATE WORK
- DOE HOPES NEW DIRECTOR CONFIRMED BY CONGRESS EARLY NEXT YEAR
- DOE WORKING WITH WHITE HOUSE TO NAME NEGOTIATOR

DOE AGREES WITH MONITORED RETRIEVABLE STORAGE (MRS) REVIEW COMMISSION; SEEKS TO SEPARATE LINK BETWEEN MRS AND DEVELOPMENT OF PERMANENT REPOSITORY

- CURRENT LAW SAYS MRS CANNOT BE BUILT UNTIL REPOSITORY CONSTRUCTION LICENSE ISSUED BY NRC
- DOE COMMITTED TO ACCEPT SPENT FUEL IN 1998 AT AN INTERIM STORAGE FACILITY

PROJECT IMPACTED BY REDUCED FISCAL YEAR 1990 FUNDING AND REDEFINED PRIORITIES

- 1990 YUCCA MOUNTAIN BUDGET REDUCED BY 10% - 15%
  - SOME REDUCTIONS/REASSIGNMENTS ANTICIPATED
- MAJOR REPOSITORY AND WASTE PACKAGE STUDIES DEFERRED
- TESTING IN G-TUNNEL SUSPENDED
- CLIMAX TUNNEL CLOSED
- ESF DESIGN WORK STOPPED; ALTERNATE ESF CONCEPTS TO BE STUDIED

OUTREACH ACTIVITIES IN NOVEMBER

- GIRL SCOUTS OF NEVADA
- SOUTHERN NEVADA EXECUTIVE COUNCIL
- NATIONAL ASSOCIATION OF PURCHASING AGENTS OF SOUTHERN NEVADA
- PUBLIC FORUM PANEL AT THE UNIVERSITY OF NEVADA, RENO
- AMERICAN NUCLEAR SOCIETY 1989 WINTER MEETING
- U.S. COUNCIL ON ENERGY AWARENESS PROGRAM COMMITTEE
- SYMPOSIUM IN HONOR OF PROFESSOR THOMAS PIGFORD
- SOUTHERN NEVADA FEDERAL EXECUTIVE ASSOCIATION

UPCOMING INTERACTIONS

- NEVADA COMMISSION ON NUCLEAR PROJECTS-DECEMBER 15, 1989

- BLM LAND WITHDRAWAL PUBLIC MEETINGS
  DECEMBER 18, 1989-RENO
  DECEMBER 19, 1989-LAS VEGAS

^{36}Cl STUDIES OF WATER MOVEMENTS FOR THE YUCCA MOUNTAIN PROJECT

EDWARD NORRIS
LOS ALAMOS NATIONAL LABORATORY

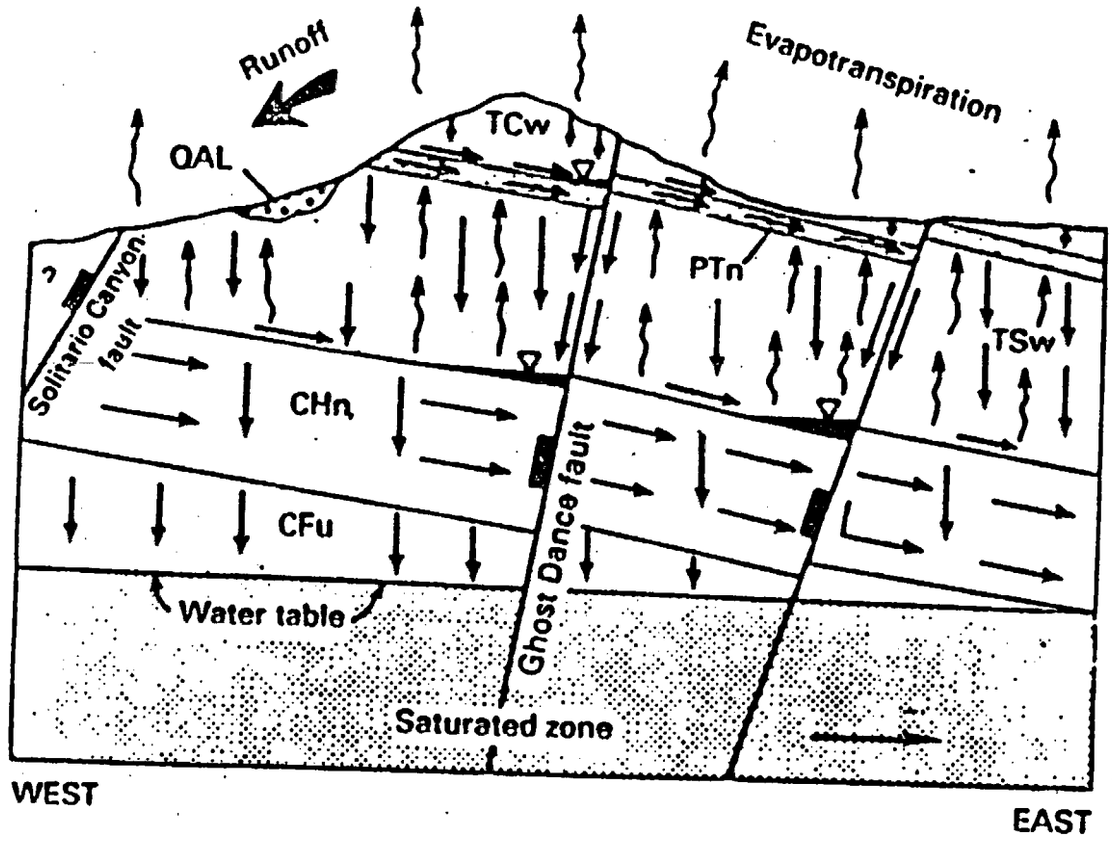
YUCCA MOUNTAIN PROJECT
DIRECTOR'S AND TECHNICAL PROJECT OFFICERS' MEETING
LAS VEGAS, NEVADA

NOVEMBER 3, 1989

PURPOSE

CHARACTERIZE WATER MOVEMENTS AT A POTENTIAL HIGH-LEVEL NUCLEAR WASTE REPOSITORY

- INFILTRATION
- PERCOLATION
- FAULT AND FRACTURE FLOW
- HYDROLOGIC FLOW



QAL	Alluvium
TCw	Tiva Canyon welded unit
PTn	Paintbrush nonwelded unit
TSw	Topopah Spring welded unit
CHn	Calico Hills nonwelded unit
CFu	Crater Flat (undifferentiated) unit

Liquid-water flow

Water-vapor flow

Normal fault

Possible perched-water zone

CHLORINE CHARACTERISTICS USEFUL FOR TRACING WATER

GEOCHEMICAL FORM IS CHLORIDE

SOLUBLE IN WATER

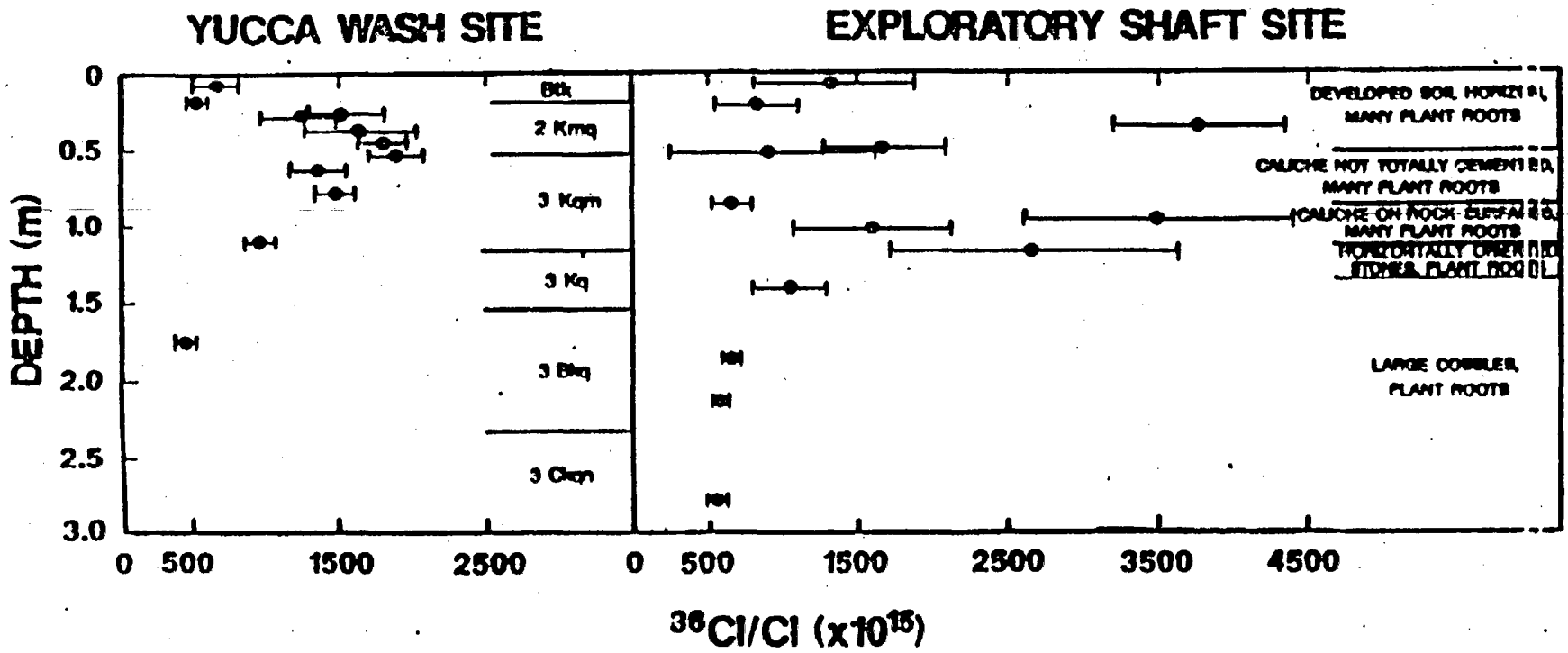
NONSORBING

NONVOLATILE

^{36}Cl HALF-LIFE IS 3×10^5 yr

QUANTITATIVE ASSAY BY ACCELERATOR MASS SPECTROMETRY

EPIGENE SOURCES OF ^{36}Cl
- COSMOGENIC FALLOUT
- BOMB PULSE FALLOUT


YUCCA WASH SITE
EXPLORATORY SHAFT SITE
DEPTH (m)
0
0.5
1.0
1.5
2.0
2.5
3.0
Btk
2 Kmq
3 Kqm
3 Kq
3 Bkq
3 Ckqn
DEVELOPED SOIL HORIZONS
MANY PLANT ROOTS
CALICHE NOT TOTALLY CEMENTED
MANY PLANT ROOTS
CALICHE ON ROCK SURFACE
MANY PLANT ROOTS
HORIZONTALLY OPEN
STONES, PLANT ROOTS
LARGE COBBLES
PLANT ROOTS
0
500
1500
2500
3500
4500
$^{36}Cl/Cl$ ($x10^{15}$)

INFILTRATION

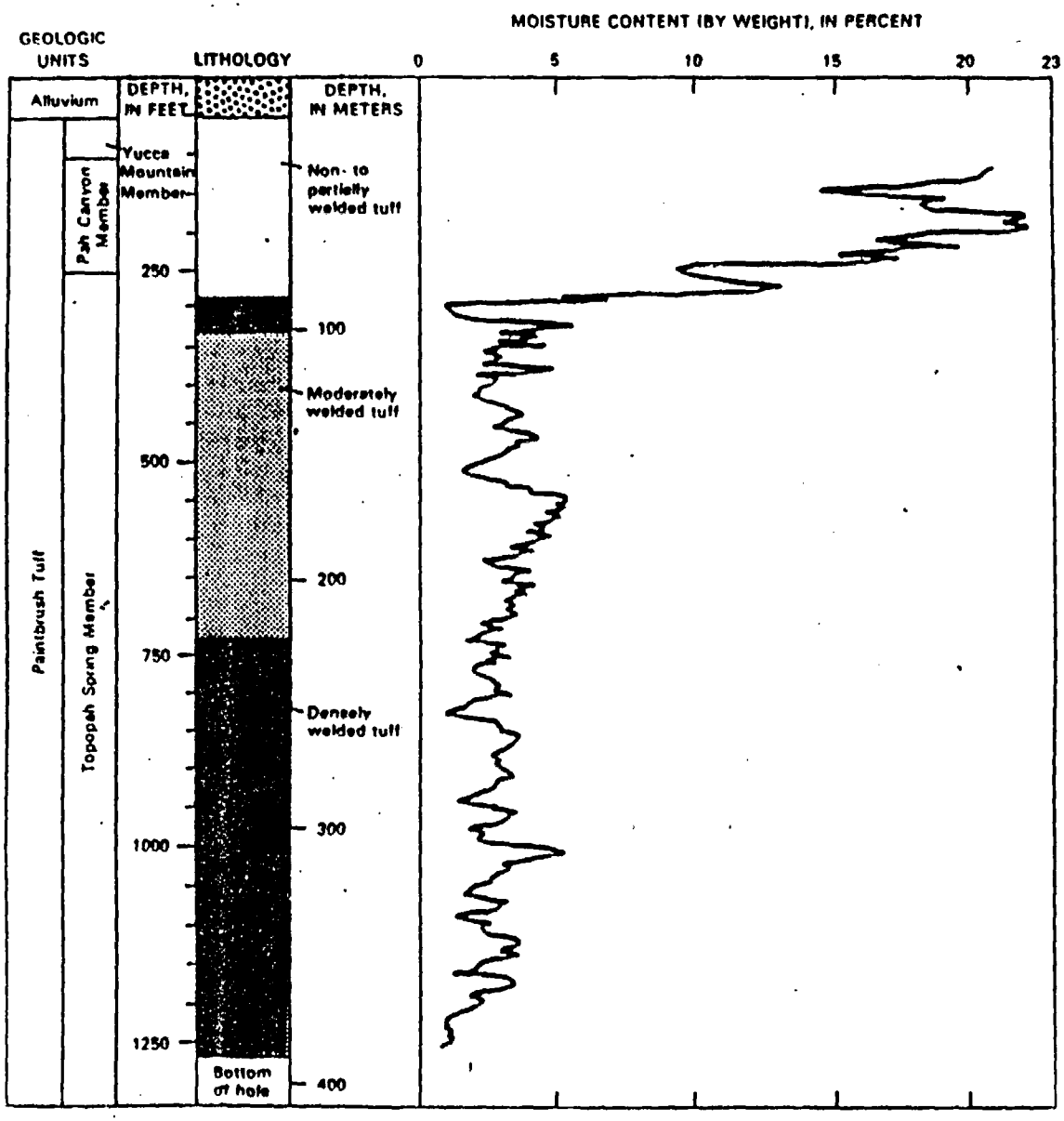
BOMB PULSE MEASURED AT TWO YUCCA MOUNTAIN SITES

YUCCA WASH

- INFILTRATION RATE 1.8 mm/yr
- BOMB PULSE INTEGRAL $(6\pm1) \times 10^{12}$ ATOMS $^{36}Cl/m^2$

COYOTE WASH

- HYDROLOGIC ACTIVITY AFTER BOMB PULSE FALLOUT
- BOMB PULSE INTEGRAL $(4\pm2) \times 10^{10}$ ATOMS $^{36}Cl/m^2$


GEOLOGIC UNITS
LITHOLOGY
MOISTURE CONTENT (BY WEIGHT), IN PERCENT
0
5
10
15
20
23
Alluvium
DEPTH, IN FEET
DEPTH, IN METERS
Yucca Mountain Member
Pah Canyon Member
Paintbrush Tuff
Topopah Spring Member
Non- to partially welded tuff
Moderately welded tuff
Densely welded tuff
250
500
750
1000
1250
100
200
300
400
Bottom of hole

PERCOLATION

GOAL:

MEASURE $^{36}Cl/Cl$ IN TUFF AS A FUNCTION OF DEPTH
USE ^{36}Cl HALF-LIFE FOR RATE OF DOWNWARD MOVEMENT

DATA FOUND TO VARY WITH TUFF PARTICLE SIZE:

SAMPLE	SHATTERBOX TIME (min)	$^{36}Cl/Cl$ (x 10^{15})
250-255	0	436 ± 25
250-255A	5	193 ± 7
250-255B	10	91 ± 4
250-255D	15	36 ± 11
250-255E	20	25 ± 5

PERCOLATION

HYPOTHESIS:

METEORIC PLUS HYPOGENE SOURCES OF ^{36}Cl

CURRENT WORK TO SEPARATE SOURCES:

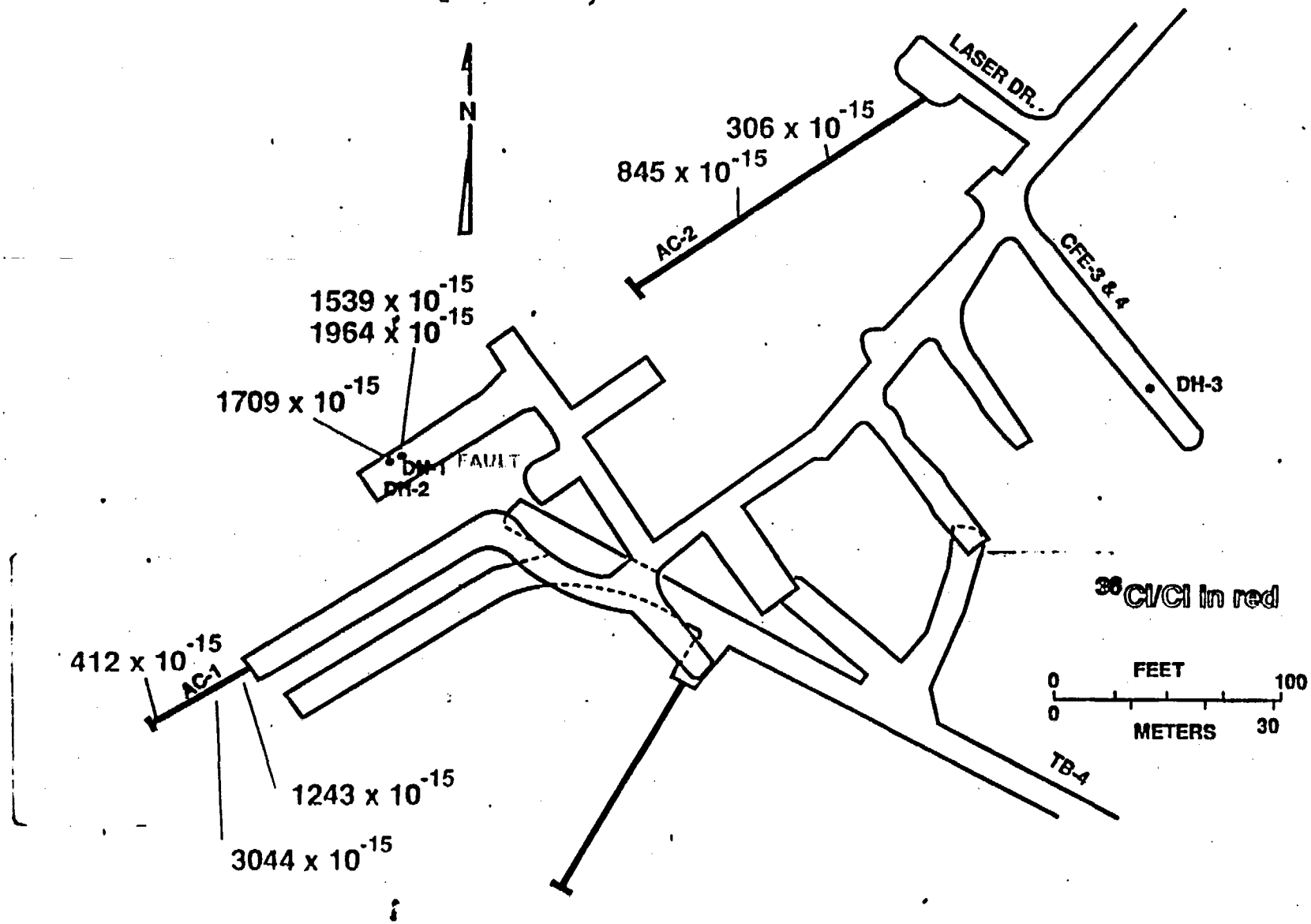
MEASURE $^{36}Cl/Cl$ AND Cl/Br IN TWO SAMPLES FROM SAME DEPTH
- ONE SAMPLE WITH NO SHATTERBOX TIME;
- ONE SAMPLE WITH 3- min SHATTERBOX TIME

FAULT AND FRACTURE FLOW

UZ-1 $^{36}Cl/Cl$ DATA

DEPTH (ft)	$^{36}Cl/Cl$ (x 10^{15})	$^{36}Cl/Cl$ (x10^{15}) (3-min Shatterbox)
97-101	11 400±360	
170-176	2498±198	
250-255	436±25	
395-400	390±48	
495-500	403±42	
500-502	2046±103	1885±150
1020-1025	245±38	159±12
1195-1200	454±61	340±15
1220-1225	102±11	

PLAN VIEW, G-TUNNEL



G-TUNNEL, NEVADA TEST SITE

SAMPLE	FEET AND DIRECTION FROM FAULT		$^{36}Cl/Cl$ (x 10^{15})
DH-1	17.4	WEST	1539 ±101
DH-1	17.4	WEST	1964 ±75
DH-2	25.6	WEST	1709 ±70
AC-1	141.4-146.9	WEST	1243±87
AC-1	146.9-155.6	WEST	3044±360
AC-1	183.7-191.4	WEST	412 ±18
AC-2	180.5-189.1	EAST	845 ±76
AC-2	232.5-242.5	EAST	306±22

HYDROLOGIC FLOW

WELL	$^{36}Cl/Cl$ (x 10^{15})
J-13	531±41
USW-H 3	279 ±30
UE-25b#1	370

J-13 WATER APPEARS TO BE CONTEMPORARY. THE OTHER TWO WATER SAMPLES INDICATE THE POSSIBILITY OF ~3 x 10^5 -yr-OLD WATER. $^{36}Cl/Cl$ PROFILES ALONG FLOW PATH ARE NEEDED FOR INTERPRETATION.

INTERACTIONS

YUCCA MOUNTAIN PROJECT

J. CZARNECKI, USGS	REGIONAL HYDROLOGY
P. KAPLAN, SNL	PERFORMANCE ASSESSMENT
B. TRAVIS, LANL	TRACR3D
M. RAY, LANL	AIR CORING TEST

OTHER INTERESTS

B. SCANLON, U.T.	TEXAS LOW-LEVEL NUCLEAR WASTE SITE
T. BEASLEY, DOE/EML	^{36}CI AT INEL

SUMMARY

INFILTRATION

MEASURED RATE OF ~1.8 mm/yr FROM BOMB PULSE

PERCOLATION

^{36}CI/CI VARIES WITH PARTICLE SIZE

FAULT AND FRACTURE FLOW

BOMB PULSE DETECTED AT 500 ft BENEATH YUCCA MOUNTAIN AND 1300 ft BENEATH RAINIER MESA

STUDIES OF SOLUTE TRANSPORT MAY BE POSSIBLE IN G-TUNNEL

HYDROLOGIC FLOW

^{36}CI/CI PROFILES ALONG FLOW PATH MAY SHOW THAT WATER IN SATURATED ZONE BENEATH YUCCA MOUNTAIN IS OLD

TPO PRESENTATION

PRESENTED BY

CARL GERTZ
PROJECT MANAGER

NOVEMBER 3, 1989

Attachment 2

TPO PRESENTATION

PRESENTED BY

CARL GERTZ
PROJECT MANAGER

NOVEMBER 3, 1989

AGENDA

- ROWR FOR NELLIS RANGE
- BIOLOGICAL ASSESSMENT OF DESERT TORTOISE
- PROTOTYPE DEVELOPMENT PROGRAM
- CURRENT ISSUES
- POSSIBLE SECRETARIAL INITIATIVES
- OUTREACH ACTIVITIES

BUREAU OF LAND MANAGEMENT SIGNED THE RIGHT-OF-WAY RESERVATION (ROWR) FOR THE U.S. AIR FORCE NELLIS RANGE ON OCTOBER 10, 1989

- ROWR ALLOWS YUCCA MOUNTAIN PROJECT ACCESS TO LAND
- DOE HAS NOW COMPLETED ALL LAND ACCESS REQUIREMENTS FOR SITE CHARACTERIZATION ACTIVITIES IN THE YUCCA MOUNTAIN AREA

BIOLOGICAL ASSESSMENT OF THE EFFECTS OF SITE CHARACTERIZATION ACTIVITIES ON THE ENDANGERED DESERT TORTOISE SUBMITTED TO U.S. FISH AND WILDLIFE SERVICE (USF&WS) IN RENO ON OCTOBER 10, 1989

- PROJECT ACTIVITIES IN THE YUCCA MOUNTAIN AREA MAY AFFECT THE DESERT TORTOISE
- PROJECT CONCLUDED THE POTENTIAL EFFECTS WILL BE LIMITED AND NOT THREATEN THE EXISTENCE OF THE SPECIES IN THE AREA
- USF&WS HAS 90 TO 150 DAYS TO ISSUE AN OPINION ON WHETHER THE PROJECT'S PLANS ARE SUFFICIENT TO PROTECT THE TORTOISE

PROTOTYPE DEVELOPMENT PROGRAM

ISSUES OF CURRENT INTEREST

- NEVADA ATTORNEY GENERAL OPINION ON STATE VETO OF REPOSITORY
- AGREEMENT WITH UNIVERSITY OF NEVADA SYSTEM TO DO RESEARCH
- H&N PERSONNEL ISSUES
- MRS COMMISSION REPORT

THE MRS REVIEW COMMISSION WAS CREATED BY CONGRESS IN THE 1987 AMENDMENTS ACT TO DETERMINE WHETHER AN MRS SHOULD BE PART OF THE NATION'S INTEGRATED NUCLEAR WASTE DISPOSAL SYSTEM

- COMMISSION SUPPORTS THE NATIONAL POLICY OF GEOLOGIC DISPOSAL
- COMMISSION RECOMMENDS CONSTRUCTION OF TWO SMALL FACILITIES TO HANDLE WASTE IN EMERGENCY AND INTERIM SITUATIONS
- COMMISSION RECOMMENDS CONGRESS SHOULD LOOK AT INTERIM STORAGE AGAIN BY THE YEAR 2000

MRS REVIEW COMMISSION CONCLUSIONS

- BOTH THE NO-MRS AND MRS OPTIONS ARE SAFE
- THE NET COST OF A WASTE MANAGEMENT SYSTEM WITH AN MRS WOULD BE LOWER THAN PREVIOUSLY ESTIMATED
- NO TECHNICAL BASIS EXISTS THAT WOULD CAUSE THE MRS ALTERNATIVE TO BE CHOSEN IN PREFERENCE TO THE NO-MRS ALTERNATIVE
- DOES NOT RECOMMEND A LINKED MRS AS REQUIRED BY CURRENT LAW AND AS PROPOSED BY DOE
- SOME INTERIM STORAGE FACILITIES ARE IN THE NATIONAL INTEREST TO PROVIDE FOR EMERGENCIES --

MRS REVIEW COMMISSION RECOMMENDATIONS

- CONGRESS AUTHORIZE CONSTRUCTION OF AN EMERGENCY STORAGE FACILITY WITH A CAPACITY LIMIT OF 2,000 MTU
- CONGRESS AUTHORIZE CONSTRUCTION OF A USER-FUNDED INTERIM FACILITY WITH A CAPACITY LIMIT OF 5,000 MTU
- CONGRESS SHOULD RECONSIDER THE SUBJECT OF INTERIM STORAGE BY THE YEAR 2000

POSSIBLE SECRETARIAL INITIATIVES

- RELATIONSHIP WITH WIPP
- DIRECT LINE REPORTING
- INDEPENDENT REVIEW OF MANAGEMENT STRUCTURE
- REVIEW OF SCHEDULE
- EARLY EMPHASIS ON SURFACE BASED TESTING TO IDENTIFY POTENTIALLY ADVERSE CONDITIONS

OUTREACH ACTIVITIES IN OCTOBER

- LAS VEGAS REVIEW JOURNAL EMPLOYEES
- SOUTHERN NEVADA CONTRACTORS' NEWSPAPER EDITORIAL BOARD
- JOINT POWER GENERAL CONFERENCE EDUCATION SEMINAR

OTHER INTERACTIONS

- EDISON ELECTRIC INSTITUTE BRIEFING
- BRITISH BROADCASTING COMPANY (BBC) DOCUMENTARY FILMING

UPCOMING INTERACTIONS

- NEVADA GIRL SCOUTS SCIENCE PROGRAM
- SOUTHERN NEVADA EXECUTIVE COUNCIL
- NATIONAL ASSOCIATION OF PURCHASING AGENTS OF SOUTHERN NEVADA
- PUBLIC FORUM PANEL AT THE UNIVERSITY OF NEVADA, RENO
- PRESENTATION TO NEVADA SCIENCE TEACHERS
- AMERICAN NUCLEAR SOCIETY 1989 WINTER MEETING
- U.S. COUNCIL ON ENERGY AWARENESS PROGRAM COMMITTEE
- BLM MEETINGS (LV AND RENO) ON DOE LAND WITHDRAWAL (NOV. 29 & 30, 1989)

ONGOING STUDY PLANS

STUDY PLANS IN REVIEW CYCLE:

- o CHARACTERIZATION OF RUN-OFF AND STREAMFLOW (8.3.1.2.1.2)*
- o CHARACTERIZATION OF PERCOLATION IN THE UNSATURATED ZONE (8.3.1.2.2.3)
- o CHARACTERIZATION OF GASEOUS-PHASE MOVEMENT IN THE UNSATURATED ZONE (8.3.1.2.2.6)
- o HYDROCHEMICAL CHARACTERIZATION OF THE UNSATURATED ZONE (8.3.1.2.2.7)*
- o CHARACTERIZATION OF THE SITE SATURATED-ZONE GROUNDWATER FLOW SYSTEM (8.3.1.2.3.1)*
- o HISTORY OF MINERALOGIC AND GEOCHEMICAL ALTERATION (8.3.1.3.2.2)
- o KINETICS AND THERMODYNAMICS OF MINERAL EVOLUTION (8.3.1.3.3.2)
- o CONCEPTUAL MODEL OF MINERAL EVOLUTION (8.3.1.3.3.3)
- o BATCH SORPTION STUDIES (8.3.1.3.4.1)
- o BIOLOGICAL SORPTION AND TRANSPORT (8.3.1.3.4.2)
- o DEVELOPMENT OF SORPTION MODELS (8.3.1.3.4.3)
- o DYNAMIC TRANSPORT COLUMN EXPERIMENTS (8.3.1.3.6.1)
- o DIFFUSION (8.3.1.3.6.2)
- o RETARDATION SENSITIVITY ANALYSIS (8.3.1.3.7.1)
- o PALEOENVIRONMENTAL HISTORY (8.3.1.5.1.4)
- o PROBABILITY OF VOLCANIC ERUPTION PENETRATING THE REPOSITORY (8.3.1.8.1.1)
- o CHARACTERIZATION OF VOLCANIC FEATURES (8.3.1.8.5.1)*
- o LABORATORY DETERMINATION OF MECHANICAL PROPERTIES OF FRACTURES (8.3.1.15.1.4)
- o CHARACTERIZATION OF FLOOD POTENTIAL (8.3.1.16.1.1)
- o HISTORICAL AND CURRENT SEISMICITY (8.3.1.17.4.1)
- o QUATERNARY FAULTING (8.3.1.17.4.6)*
- o CHARACTERIZATION OF CHEMICAL AND MINERALOGICAL CHANGES IN THE POSTEMPLACEMENT ENVIRONMENT (8.3.4.2.4.1)
- o HYDROLOGIC PROPERTIES OF THE WASTE PACKAGE ENVIRONMENT (8.3.4.2.4.2)

STUDY PLANS APPROVED AND SENT TO THE NRC:

- o WATER MOVEMENT TRACER TESTS (8.3.1.2.2.2)
- o MINERALOGY, PETROLOGY, AND CHEMISTRY ALONG TRANSPORT PATHWAYS (8.3.1.3.2.1)
- o CHARACTERIZATION OF STRUCTURAL FEATURES (8.3.1.4.2.2)*
- o CHARACTERIZATION OF QUATERNARY REGIONAL HYDROLOGY (8.3.1.5.2.1)*
- o LOCATION AND RECENCY OF FAULTING (IN MIDWAY VALLEY) (8.3.1.17.4.2)*
- o Excavation Investigation

STUDY PLANS TO BE DEVELOPED:

- o CHARACTERIZATION OF METEOROLOGY FOR REGIONAL HYDROLOGY (8.3.1.2.1.1)*
- o CHARACTERIZATION OF THE GROUND-WATER FLOW SYSTEM (8.3.1.2.1.3)
- o CHARACTERIZATION OF UNSATURATED-ZONE INFILTRATION (8.3.1.2.2.1)
- o DISSOLVED SPECIES CONCENTRATION LIMITS (8.3.1.3.5.1)
- o COLLOID BEHAVIOR (8.3.1.3.5.2)
- o EFFECTS OF VOLCANIC ERUPTION PENETRATING THE REPOSITORY (8.3.1.8.1.2)
- o UNDERGROUND NUCLEAR EXPLOSION SOURCES (8.3.1.17.3.2)
- o GEODETIC LEVELING (8.3.1.17.4.10)

* CONTAINS NON-SURFACE DISTURBING FIELD ACTIVITIES

STRAWMAN LIST OF PRIORITY STUDY PLANS (NON-ONGOING) CONTAINING NON-SURFACE DISTURBING FIELD ACTIVITIES

- CHARACTERIZATION OF SATURATED ZONE HYDROCHEMISTRY (8.3.1.2.3.2)
- CHARACTERIZATION OF VERTICAL AND LATERAL DISTRIBUTION OF STRATIGRAPHIC UNITS (8.3.1.4.2.1)

NOTE: BOTH OF THESE STUDY PLANS NEED TO BE DEVELOPED

NWTRB PRESENTATION
DETAILED AGENDA
DECEMBER 11–12, 1989

MONDAY, DECEMBER 11, 1989

8:30	INTRODUCTION AND OPENING REMARKS	MAXWELL B. BLANCHARD, DOE
9:00	CHARACTERIZATION OF INFILTRATION	DR. ALAN FLINT, USGS
	• CONCEPTUAL MODEL OF INFILTRATION • CURRENT UNDERSTANDING • FUTURE PLANS	
10:30	BREAK	
10:45	MEASUREMENT OF UNSATURATED ZONE HYDROLOGIC PROPERTIES	
	• OVERVIEW OF MATRIX PROPERTIES	DR. ALAN FLINT, USGS
	• AIR PERMEABILITY TESTING – ROLE OF FRACTURES	ROBERT C. TRAUTZ, USGS
	• IN SITU MONITORING — MEASURING FLUID-FLOW POTENTIAL FIELD	JOSEPH P. ROUSSEAU, USGS
11:45	LUNCH	

NWTRB PRESENTATION
DETAILED AGENDA
DECEMBER 11–12, 1989

MONDAY, DECEMBER 11, 1989 (CONTINUED)

12:45 IMPORTANCE OF FRACTURE VS. MATRIX FLOW

- CONCEPTUAL MODELS FOR FRACTURE/ MATRIX FLOW — PAUL G. KAPLAN, SNL
- RESULTS AND IMPLICATIONS OF EXPERIMENTAL STUDIES AND FIELD OBSERVATIONS
  - CHLORINE ISOTOPIC MEASUREMENTS — DR. A. EDWARD NORRIS, LANL
  - OBSERVATIONS CONCERNING AIR FLOW AND WATER FLOW IN FRACTURES — EDWIN P. WEEKS, USGS

2:30 RADIONUCLIDE GAS RELEASES

- REVIEW OF GASEOUS ISOTOPES — RICHARD A. VAN KONYNENBURG, LLNL
- PRELIMINARY STATUS OF CARBON-14 MODELING — DR. BEN ROSS, DISPOSAL SAFETY INC.
  - CARBON-14 MIGRATION
  - CHEMISTRY MODELING
  - GAS-FLOW MODELING

NWTRB PRESENTATION
DETAILED AGENDA
DECEMBER 11–12, 1989

MONDAY, DECEMBER 11, 1989 (CONTINUED)

3:30 BREAK

3:45 OVERVIEW OF MODEL VALIDATION STRATEGY -- BUILDING "REASONABLE ASSURANCE" — DR. DWIGHT HOXIE, USGS

- RECORD OF MODEL DEVELOPMENT
- LAB/FIELD INVESTIGATIONS
- SENSITIVITY AND UNCERTAINTY ANALYSES
- FORMAL TECHNICAL REVIEWS
- EXAMPLES OF VALIDATION

5:00 WRAP–UP & ADJOURN

NWTRB PRESENTATION

DETAILED AGENDA

DECEMBER 11–12, 1989

TUESDAY, DECEMBER 12, 1989

8:30 APPLICABILITY OF LABORATORY EXPERIMENTS — DR. AREND MEIJER, LANL; DR. ROBERT S. RUNDBERG, LANL

- PHYSICAL AND CHEMICAL PROCESSES DETERMINING MOBILITY
- FACTORS CONTROLLING SORPTIVE BEHAVIOR
- EXPERIMENTAL K_D DETERMINATION – CRUSHED ROCK AND ROCK COLUMN EXPERIMENTS

10:30 BREAK

10:45 OVERVIEW OF EFFECTS OF REPOSITORY DEVELOPMENT — DR. WILLIAM E. GLASSLEY, LLNL

- LABORATORY AND FIELD EVIDENCE: THERMO–HYDROLOGICAL, MECHANICAL, AND GEOCHEMICAL EFFECTS OF REPOSITORY DEVELOPMENT (NEAR- AND FAR–FIELD)
- RADIONUCLIDE BEHAVIOR AT ELEVATED TEMPERATURES; COLLOID BEHAVIOR — DR. DAVID E. HOBART, LANL

11:45 ADJOURN