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

Reply to:

1050 East Flamingo Road
Suite 319
Las Vegas, Nevada 89119
(Tel: (702) 388-6125
FTS: 598-6125

M E M O R A N D U M

DATE: August 15, 1988

FOR: John J. Linehan, Acting Chief, Operations Branch
Division of Waste Management

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

SUBJECT: NNWSI Site Report for the month of July, 1988

I. QUALITY ASSURANCE

A. As a result of quality assurance (QA) audit number 88-04 of the U.S. Geological Survey (USGS) by the DOE Waste Management Project Office (WMPO) during the period of June 9 to June 24, 1988, a limited stop work order (SWO) was issued to the USGS by the DOE-WMPO on July 26, 1988.

The SWO requires the USGS to discontinue the analysis, interpretation and publication of results in the following five technical areas:

8808220043

102
WM-11
NH03

- Site water level evaluation
- Current seismicity measurements
- Surface water run-off monitoring
- Transport of debris by severe run-off
- Studies of calcite and opaline silica vein deposits (trench 14 problem).

Data collection associated with the above will continue except for the calcite and opaline silica studies.

Twenty "Standard deficiency reports" (SDRs) were identified by the audit team. Originally, the team had assigned a severity level 1 (the most severe) to a number of SDRs. However, in the final audit report, all severity level ones were reduced to severity level two except for SDR number 156.

The letter to Dr. Larry Hayes, USGS Technical Project Office (TPO), informing him of the SWO was signed by Mr. Carl P. Gertz, Project Manager, WMPO. It is interesting to note that in WMPO Quality Management Procedure (QMP) 01-02, in section 4.0 "Responsibilities," it states in paragraph 4.5 "WMPO Project Manager:"

"In addition, the WMPO Project Manager has been designated as the Contract Administration Representative (CAR) by the Contract Administration Representative Authority (CARA) with the authority to recommend to the U. S. Department of Energy Nevada Operations Office (DOE/NV) Assistant Manager for Administration (AMA) that REECo, H&N, F&S or U.S. Geological Survey (USGS) activities be stopped or permitted to continue as appropriate. The actual stop work notification letter and letter closing the SWO (see section 5.10) shall be signed, dated and issued by the AMA." (Emphasis mine).

See also section 5.6 of QMP-01-02.

B. The NNWSI Project is working toward a fully qualified QA program. In order to have a fully qualified QA program in place by January 1, 1989, the following project tasks have been identified (from handout enclosed):

1. Network all new or restart of technical activities through 6/30/89.

2. Identify minimum technical and QA prerequisites for each technical activity.

3. Integrate items 1 and 2.

4. A schedule for development and implementation of a detailed readiness review plan and procedures submitted to OCRWM for approval.

5. Schedule of participants QA program plans and procedures.

6. Scheduled dates for DOE project approval of the contractors' QA procedures required to support technical activities.

7. Scheduled dates for the project office to submit QA program plans to OCRWM and to NRC for review.

8. Schedule of project audits of contractor Quality Assurance Plans (QAPs).

All of the above is to be completed by July 29, 1988.

To help make the above happen, (from the handout enclosed) a "fully qualified QA program" advisory group was established with the following individuals:

- V. Iorii, WMPO
- W. Mansel, WMPO
- W. MacNabb, SAIC
- J. Madsen, Mac Tech

In order to implement the plan to achieve a fully qualified QA program, the following must be accomplished (from the handout, enclosed):

Phase I

- Documentation
  - Top-level plans (PMP, CMP, etc.)
  - QAP (WMPO)
  - QAPP (WMPO, participants)
  - QA procedures (WMPO, participants)
  - Technical procedures (WMPO, participants)
- Organization - staffing
  - Participant organizations' documentation approved
  - Position descriptions (PDs) exist for elements of organization
- Indoctrimation and Training
  - QA orientation
  - Personnel qualifications/training/certification completed and filed.

- Information systems
  - Document control, records management

  - Comment tracking, audits, etc.

- Assessments, audits, surveillance
  - Required to evaluate the readiness of the QA program

Phase II

- QA integration with technical work
- Identify prerequisites and place on a logic diagram and schedule - results in a very busy presentation

- Alternative - develop a checklist of prerequisites to be met prior to authorization of work

Phase III

- QA readiness review (as appropriate) meeting the following criteria
- Restart of work halted by a formal stop work order

- Predetermined hold phases of design, construction and testing

- Large dollar value activities

II. GEOLOGY

A. On July 26 and 27, a "Dry Drilling and Coring Technology Workshop" was held at the SAIC offices in Las Vegas. The purpose of the workshop was to discuss the drilling needs of

the NNWSI participants (USGS, LANL, SNL) and to explore the dry drilling technology now being used at the NTS and available from the drilling industry. The final product of the workshop was to be the recommendation of a drilling system for the prototype vertical seismic profile (VSP) hole at the UZ-9 location.

USGS representatives discussed the surface based investigation needs for geology and for both saturated and unsaturated zone hydrology. LANL gave a presentation on geochemical studies and SNL discussed performance assessment.

A discussion of drilling experience and capabilities at the NTS followed with presentations by the USGS, LANL, F&S, and REECo. Reverse vacuum (UZ-1 and UZ-6) and ODEX drilling systems were described as well as prototype drilling used in G-Tunnel.

The drilling industry was represented by Drill Systems, Inc., Lang Exploratory Drilling, and Atlas Copco. Drill Systems, Inc. described dual-wall reverse circulation drilling, the downhole hammer and rotary cone coring with a wireline core barrel. Land Exploratory Drilling discussed DHH reverse circulation drilling and Atlas Copco described the ODEX system.

The recommended drilling system for the prototype hole, and for all other holes except shallow unsaturated zone (UZ) holes, is the dual-wall reverse air circulation system with either a wire-line core barrel or standard core barrel. It was recommended that the ODEX system be used for drilling shallow UZ holes.

The enclosed handouts give details of the discussions held during this day and a half meeting.

B. The "Sample Management Facility" (SMF) was officially opened on July 20. Over 100 local citizens took advantage of the opportunity to visit the NTS and attended the opening. As I've said before, it is an impressive facility.

The transfer of core continues. The schedules for the core transfer and for QA procedure approval are the same as last reported.

C. There still isn't a final decision as to whether or not the Project will release the full G-4 Forensic report to the staff. I will continue to work to bring this matter to a conclusion.

III. HYDROLOGY

The stop work order imposed on the USGS during July has an impact on the hydrology studies being conducted by the USGS. See the discussion in section I, Quality Assurance for a discussion of this impact.

IV. GEOCHEMISTRY

There is no new activity since last month's report.

V. REPOSITORY ENGINEERING

Enclosed is a handout from the July TPO meeting. It represents the project's initial inventory of the concerns and requests contained in the draft minutes for the July 18-19 Exploratory Shaft Meeting held in Rockville, Maryland. It is emphasized that this is an initial working list taken from draft minutes that have not been officially agreed to by the project.

The 100% Title one design review is scheduled for the week of August 8. It will be conducted in much the same way as the 50% design review. I plan to attend.

VI. WASTE PACKAGE

The work being performed in the area of the waste package is centered around finalizing the SCP and writing study plans. I'm not aware of any new work in this area.

Mike Cloninger, FTS: 544-7847, has joined the WMPO staff and will be responsible for waste package work.

VII. PERFORMANCE ASSESSMENT

The work being performed in the area of performance assessment is centered around finalizing the SCP, reviewing the ESF location from the waste isolation standpoint and quality assurance.

VIII. SITE ENVIRONMENTAL ACTIVITIES

There is nothing new since last month's report.

IX. LICENSING AND NRC-DOE INTERACTIONS

Meetings attended

- July 5 and 6; June TPO-Project Manager meeting.
- July 8; briefing on the core and sample problem by Mike Glora, Uel Clanton and Jack Kepper. An informal meeting with NRC technical and QA staff was suggested and discussed. It was later decided that a "site visit" meeting on this subject during the August-September time frame would not be possible.
- July 11; Monday morning meeting with Carl Gertz, WMPO Manager.

- July 20; Sample Management Facility open house.

- July 26-27; Dry drilling meeting.

- July 28; July TPO-Project Manager meeting.

X. SCP AND STUDY PLANS

The SCP is still on schedule. However, in order to issue the final SCP in December, the review process must be concluded in early September.

The status of the study plans is outlined in the WMPO weekly report that is forwarded weekly.

XI. STATUS INTERACTIONS

There were no state interactions during the month of July.

XII. MISCELLANEOUS

On July 27, I was informed that NRC Commissioner Kenneth Carr and Ms. Margaret Federline, Commissioner Carr's technical assistant, were planning a trip to Las Vegas on September 20. I was asked to prepare an agenda for this visit and coordinate with Mr. Carl Gertz, WMPO Manager.

On July 29, Mr. Gertz and I prepared a suggested agenda. I sent the suggested agenda to Ms. Federline on August 1 by overnight mail along with visitor badge request forms. These forms have been returned and the visitor badge requests have been sent to DOE security.

The suggested agenda includes visits to G-tunnel, Climax mine, the sample management facility, and Yucca Mountain. DOE-WMPO will present a briefing on NNWSI management structure and QA at the sample management facility.

This office has obtained red picture badges that allow access to the NTS for John Gilray and Nancy White.

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cc: With enclosures: K. Stablein, R. E. Adler, J. E. Latz

No enclosures: C. P. Gertz, R. R. Loux, M. Glora, D. M. Kunihero, R. E. Browning, G. Cook, L. Kovach, S. Gagner, K. Turner, J. Gilray

Enclosures: Agenda, 7/28/88 TPO Meeting; Project-Level Plans w/NNWSI Project Administrative Procedures Manual Table of Contents; 7/28 TPO Presentation by Carl Gertz; Current Staff Involvement with the Archetype Study Plans; 7/27/88 PM TPO Meeting Handout; USGS NNWSI Program Qualification Schedule; Major Changes in 88-9, Rev. 1; NNWSI Project evaluations of potential areas for cooperative interactions with Atomic Energy Canada, Limited; Workshop information dated 7/28/88; Handwritten list of 23 items w/attachments; Lang Exploratory Drilling info; Update of Information for a Deep Odex Exploratory Hole; Class XIII Rig Specifications; Agenda, 7/26/88 Dry Drilling and Coring Technology Workshop; Vacuum Drilling of Unsaturated Tuffs at a Potential Radioactive-Waste Repository, Yucca Mountain, Nevada (Merrick S. Whitfield, USGS); Overview of Dry Drilling Systems Used at NTS; Saturated Zone Studies (John B. Czarnecki, USGS); Los Alamos/NNWSI Prototype Testing; Surface Based Investigations Unsaturated Zone Drilling; Los Alamos Geochemistry Scientific Needs dated 7/26/88; Fully Qualified QA Program Group/Pilot Study Plan Group Status presented by Vince Iorii 7/26/88

M. PRESCOTT

AGENDA

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

N-AD-028
/86

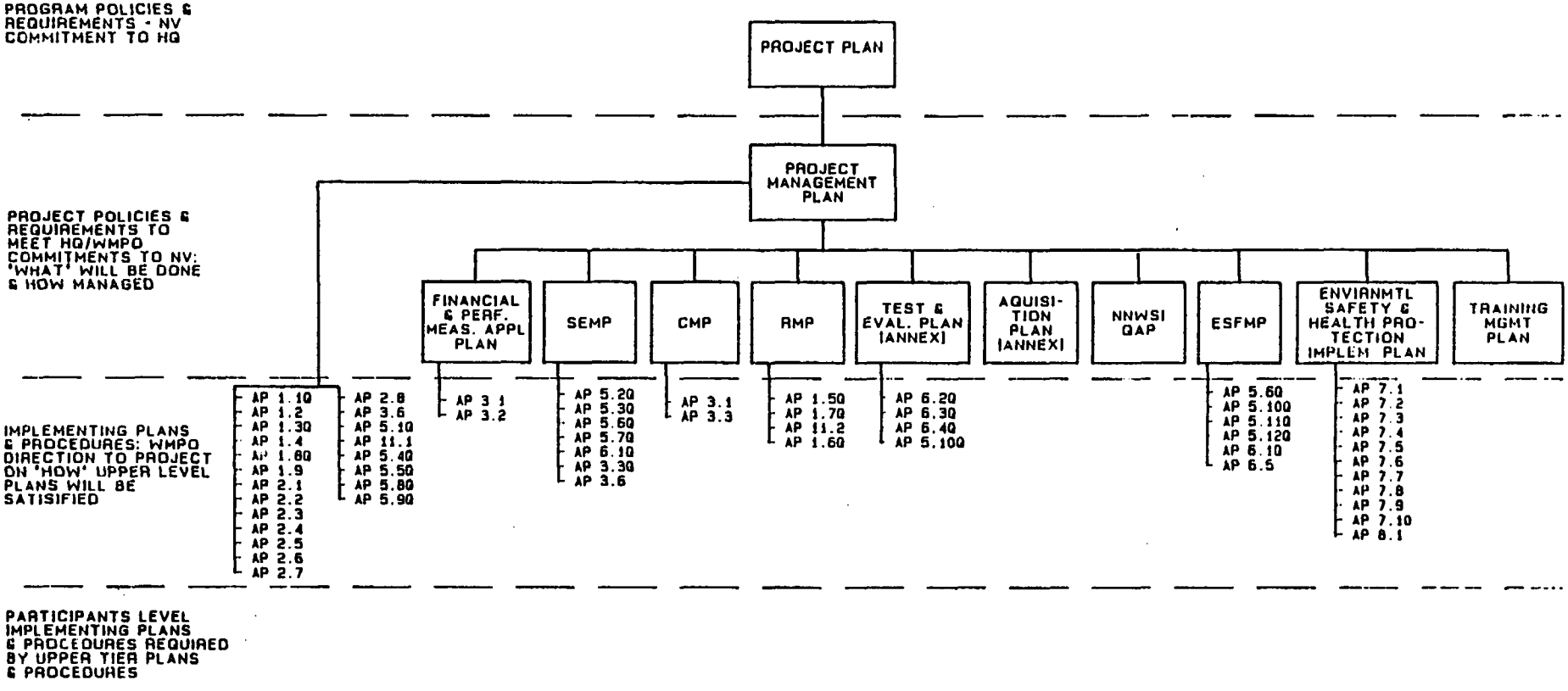
LOCATION: 101 Convention Center Drive
Las Vegas, Nevada

REVISED AGENDA
OPEN SESSION

DATE: 28-JUL-1988

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF. MATERIAL & COMMENTS
Thursday July 28 1:00- 2:00	LUNCH				
2:00- 2:05	INTRODUCTIONS/ROLES AGENDA/OUTCOMES	AROUND THE ROOM	ALL	AGREE TO AGENDA AND OUTCOMES	
2:05- 2:35	MANAGER FYIs	PRESENT FYIs	CARL GERTZ	UNDERSTAND STATUS OF FYI ITEMS	
2:35- 3:20	QA QUALIFICATION AND QA TECHNICAL PREREQUISITE NETWORKING FOR STUDY PLANS - STATUS	PRESENT QA-QUALIFIED NETWORK EXAMPLES - STATUS OF STUDY PLANS	VINCE IORII	RESPOND TO NRC REQUEST	
3:20- 3:30	BREAK				
3:30- 4:15	LONG RANGE PLANNING	PRESENT PLAN FOR CONDUCTING LONG RANGE PLANNING. DISCUSS PROCESS, SCHEDULE, PRODUCTS, AND TIES TO PILOT STUDY PLAN, SCP, AND QA NETWORKING ACTIVITIES	VINCE IORII	AGREE TO PROCESS AND PRODUCTS. AGREE TO SCHEDULE. ASSIGN STAFF	
4:15- 4:30	REVIEW UPCOMING AGENDA ITEMS. REVIEW ACTION ITEMS				

PROJECT-LEVEL PLANS AND EXAMPLES OF
NNWSI ADMINISTRATIVE PROCEDURES



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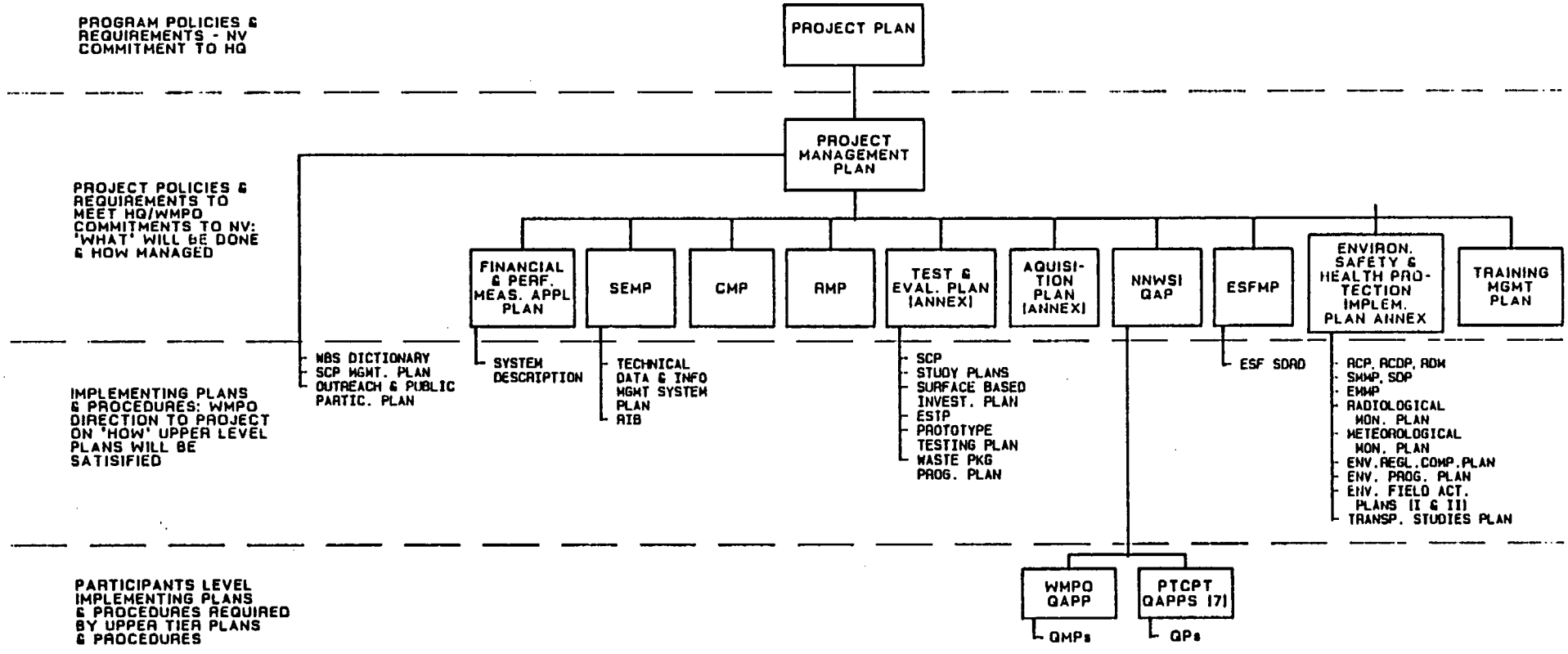
PROJECT-LEVEL PLANS AND EXAMPLES OF LOWER-TIER TECHNICAL OR DESCRIPTIVE DOCUMENTS



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NNWSI PROJECT ADMINISTRATIVE PROCEDURES MANUAL

TABLE OF CONTENTS

Category/Title		Implementation Status
AP 4	PROCUREMENT	
AP 5	PROJECT CONTROL	
AP-5.1Q	Project Commitment Tracking System (PCTS) Procedures	In Preparation
AP-5.2Q	Technical Information Flow to and from the NNWSI Site and Engineering Properties Data Base	In Preparation
AP-5.3Q	Information Flow into the NNWSI Project Reference Information Base	In Preparation
AP-5.4Q	QALAs for NNWSI Project Activities	In Preparation (repl. SOP)
AP-5.5Q	Software Quality Assurance	In Preparation (repl. SOP)
AP-5.6Q	Exploratory Shaft Facility Technical Elements Baseline and Interface Control Procedure	7/5/88 (Rev. 0) Issued
AP-5.7Q	Site Integration Interface Control	In Preparation (repl. SOP)
AP-5.8Q	QA Management Assessment	In Preparation
AP-5.9Q	Acceptance of Data and Data Interpretation Not Generated Under the NNWSI Project QA Plan	In Preparation (repl. SOP)
AP-5.10Q	Use of NTS Contractors on the NNWSI Project	In Preparation
AP-5.11Q	Calibration of Measuring and Test Equipment by NTS Support Contractors	In Preparation
AP-5.12	T&MSS Technical Support Representatives for the NNWSI Project Exploratory Shaft Facility	6/17/88 (Rev. 0) Issued
AP-5.13Q	Readiness Review	In Preparation
AP-5.14Q	Design Reviews	In Preparation
AP 6	OPERATIONAL PROCEDURES	
AP-6.1Q	Technical Assessment Reviews for the NNWSI Project Exploratory Shaft Facility (ESF)	In Preparation
AP-6.2Q	Field Logging and Documentation of NNWSI Project Borehole Samples	In Preparation
AP-6.3Q	Use of the Sample Management Facility by NNWSI Project Participants	In Preparation
AP-6.4Q	Preparation of Pre-drilling Documentation for NNWSI Project Boreholes	In Preparation
AP-6.5	Cost Estimating for the Nevada Nuclear Waste Storage Investigations (NNWSI) Project Exploratory Shaft Facility (ESF)	In Preparation
AP-6.6Q	Field Collection, Documentation, and Specimen Removal of Exploratory Shaft and Drift Rock	In Preparation

Category/Title		Implementation Status
AP 7	NRC INTERACTION PROCEDURES	
AP-7.1	Conduct and Documentation of NRC Meeting	In Preparation
AP-7.2	Attendance at Technical Meetings with the NRC Conducted by Other Projects	In Preparation
AP-7.3	Scheduling and Preparation for NNWSI Project/NRC Technical Meetings	In Preparation
AP-7.4	Scheduling and Preparation for NNWSI Project/NRC Management Meetings	In Preparation
AP-7.5	Controlling Data Release	In Preparation
AP-7.6	Communications with the NRC	In Preparation
AP-7.7	NNWSI Project Interactions with the NRC Onsite Representative (OR)	In Preparation
AP-7.8	Report Inventory	In Preparation
AP-7.9	Field and Laboratory Testing Schedule	In Preparation
AP-7.10	Data Catalog	In Preparation
AP 8	LAND USE	
AP-8.1	Compliance with Land Use Agreements and Permits	To be Prepared
AP 9	PUBLIC AFFAIRS	
AP-9.1	NNWSI Project Participant and Public Interaction	1/15/85
AP-9.2	Nevada State Information Meetings	To be Prepared
AP 10	GENERAL	
AP 11	WMPO/T&MSS INTERACTION	
AP-11.1	Electronic Transfer of Correspondence Files	4/11/88 (Rev. 0) Issued
AP-11.2	Access to NNWSI Project Records by Non-Project Participants	In Preparation

TPO PRESENTATION

PRESENTED BY

Carl Gertz

JULY 28, 1988

AGENDA

- USGS LIMITED STOP WORK ORDER
- RECENT CONGRESSIONAL ACTIONS
- SAMPLE MANAGEMENT FACILITY OPEN HOUSE

NNWSI PROJECT
QUALITY ASSURANCE
LIMITED STOP WORK ORDER ISSUED

PRESENTED BY

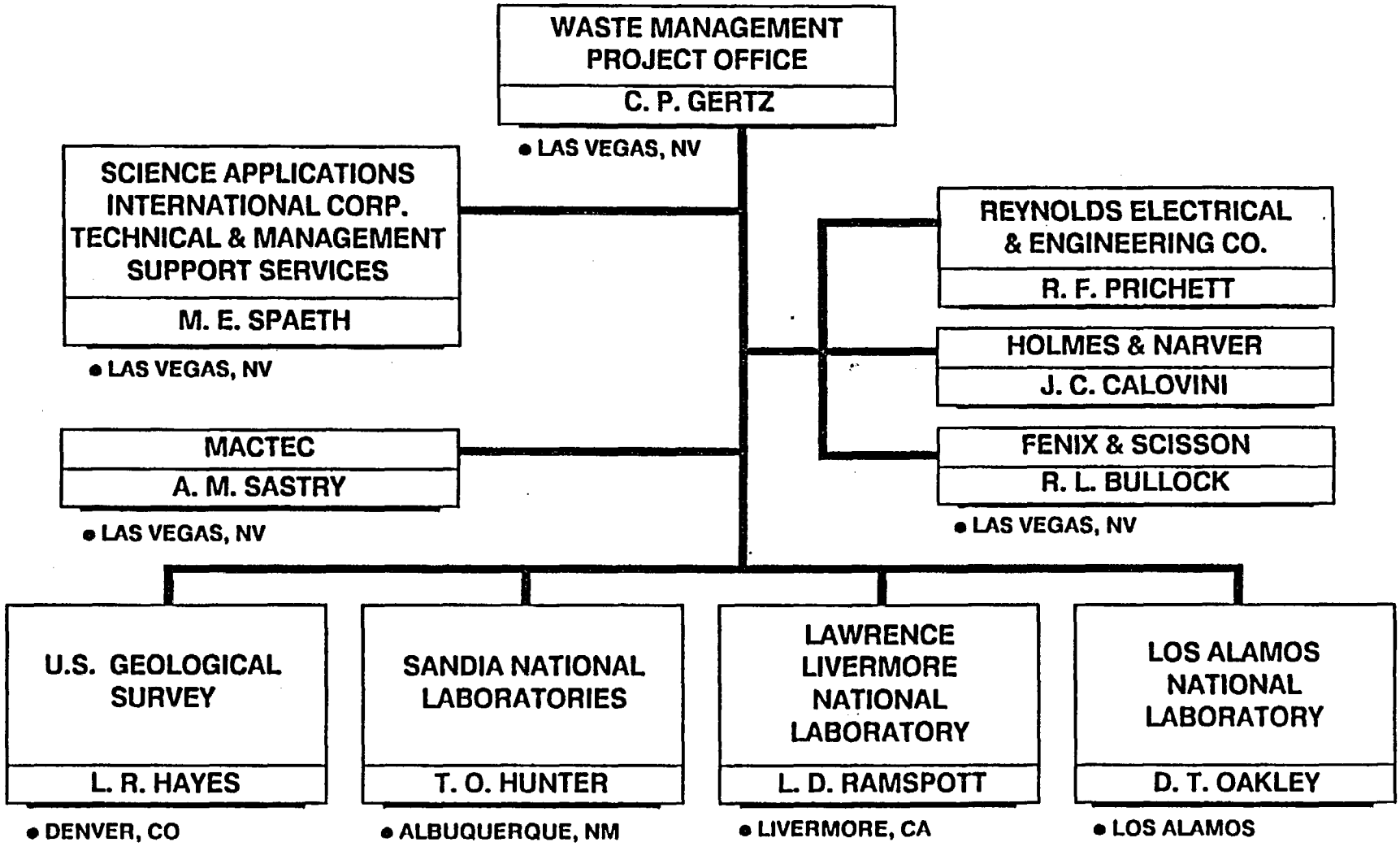
Carl Gertz
PROJECT MANAGER

JULY 27, 1988

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/WASTE MANAGEMENT PROJECT OFFICE

WORK ON YUCCA MOUNTAIN PROJECT CONTINUES

DOE/NV ORGANIZATION



DOE PROJECT OFFICE ISSUED THE USGS A STOP WORK ORDER (SWO) ON JULY 26, 1988, TO DISCONTINUE THE ANALYSIS, INTERPRETATION, AND PUBLICATION OF RESULTS IN FIVE TECHNICAL AREAS

- SITE WATER TABLE LEVEL EVALUATION
- CURRENT SEISMICITY MEASUREMENTS
- SURFACE WATER RUNOFF MONITORING
- TRANSPORT OF DEBRIS BY SEVERE RUNOFF
- STUDIES OF CALCITE AND OPALINE SILICA VEIN DEPOSITS

- 20 DEFICIENCIES WERE IDENTIFIED DEALING WITH PROCEDURAL INCONSISTENCIES

- DATA COLLECTION ASSOCIATED WITH ALL AREAS EXCEPT CALCITE AND OPALINE SILICA STUDIES WILL CONTINUE

SWOs DIRECTLY AFFECT APPROXIMATELY 10 PERCENT OF THE WORK BEING DONE ON THE PROJECT BY THE USGS

- FINDINGS BY DOE AUDIT TEAM AT THIS TIME INDICATE THAT DEFICIENCIES HAVE NO MAJOR IMPACT ON DATA COLLECTED BY USGS

- USGS WILL SUBMIT A PLAN TO DOE IN FOUR WEEKS TO ASSESS THE IMPACT OF THE DEFICIENCIES ON THE OTHER SCIENTIFIC ACTIVITIES CONDUCTED BY THE USGS ON THE PROJECT

- AFTER USGS PLAN IS REVIEWED, FURTHER EVALUATIONS OF IMPACTS MAY BE MADE

NNWSI PROJECT
QA AUDIT SCHEDULE FOR FY 1988

COMPLETED AUDITS

FENIX & SCISSON (TULSA)	2/28 - 3/02
HOLMES & NARVER	3/23 - 4/01
U.S. GEOLOGICAL SURVEY (MENLO PARK)	4/26 - 4/29
U.S. GEOLOGICAL SURVEY (DENVER)	6/09 - 6/24

SCHEDULED AUDITS

LAWRENCE LIVERMORE NATIONAL LABORATORY	10/24 - 10/28
SANDIA NATIONAL LABORATORIES	7/25 - 7/29
REYNOLDS ELECTRICAL & ENGINEERING CO.	8/22 - 8/26
LOS ALAMOS NATIONAL LABORATORY	10/03 - 10/07
FENIX & SCISSON (LAS VEGAS)	9/07 - 9/09

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

JUL 26 1988

Larry R. Hayes
Technical Project Officer
for NNWSI
U.S. Geological Survey
Mail Stop 421
P.O. Box 25406
Denver, CO 80225

WASTE MANAGEMENT PROJECT OFFICE (WMPO) STOP WORK ORDER FOR THE U.S. GEOLOGICAL SURVEY (USGS) NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS (NNWSI) PROJECT SUPPORT

During the course of WMPO Quality Assurance (QA) Audit 88-04 of USGS, the audit team reviewed sufficient objective evidence and generated numerous Standard Deficiency Reports to conclude the following based on the sample taken:

1. The QA program currently in place is not being properly implemented in all areas.

2. In specific areas the effectiveness of the QA program is questionable.

As a result of these findings, the following actions are ordered:

1. A stop work order is hereby placed on the analysis, interpretation, publication, and dissemination of data and information generated from the following activities:

   a. 8.3.1.2.3.1.2, Site Potentiometric Level Evaluation

   b. 8.3.1.5.2.1.5, Studies of Calcite and Opaline Silica Vein Deposits

   c. 8.3.1.17.4.1.2, Current Seismicity

   d. 8.3.1.2.1.2.1, Surface Water Runoff Monitoring

   e. 8.3.1.2.1.2.2, Transport of Debris by Severe Runoff

   All other tasks, including data collected for the preceding monitoring activities, will continue. The sole exception to this provision is the Calcite and Opaline Silica Vein Deposits study, for which sample collection is not authorized.

   This stop work order will remain in effect until a readiness review, in which the U.S. Department of Energy is a direct participant, determines that the affected activities have been brought into full compliance with the provisions of the USGS NNWSI Project QA program.

JUL 26 1988

2. Further, an in-depth investigation shall be undertaken to determine the extent to which the identified deficiencies in the QA program noted above apply to the balances of the QA Level I and II monitoring activities being conducted by the USGS. This investigation shall commence by the submittal of a course of action plan(s) to the NNWSI Project Manager no later than 20 working days from the stop work notification letter date. This plan shall include the timetables, milestones, manpower requirements, and criteria necessary to both detail the extent of the deficiencies and outline the measures necessary to correct them.

Effective immediately, this stop work order is placed on the preceding USGS activities and subject to the conditions outlined above.

The activities affected by this stop work order are crucial to the successful completion of the site characterization at Yucca Mountain. WMPO is confident that USGS can and will develop the required course of action plan(s) and implement corrective actions expeditiously.

If you have any questions regarding this matter, please call me at FTS 544-7920 or James Blaylock at FTS 544-7913.

for

Carl P. Gertz, Project Manager
Waste Management Project Office

WMPO:JB-3061

cc:
M. E. Spaeth, SAIC, Las Vegas, NV
S. H. Klein, SAIC, Las Vegas, NV
Stephen Metta, SAIC, Las Vegas, NV
H. H. Caldwell, SAIC, Las Vegas, NV
James Blaylock, WMPO, NV
E. L. Wilmot, WMPO, NV

SUMMARY OF 20 USGS STANDARD DEFICIENCY REPORTS (SDRs)

142	o	Certifications for certain USGS QA receiving inspectors were incomplete (Note: Receiving inspectors examine items before used in a study)
143	o	Indoctrination and training needs not assessed annually as required
144	o	No documented evidence of trend analysis performed to support statements in 1987 management assessment/no procedure for trending exists (Note: Trending is mechanism to determine if there are repeated QA deficiencies in a certain area)
145	o	Position descriptions for QA staff do not exist
146, 147 & 148	o	Computer software does not identify quality levels, software not properly certified as being verified and validated, i.e. software not properly documented and controlled
149	o	Technical reviewers of scientific reports not properly certified
150	o	No criteria letter available to specify the scope of REECo's responsibilities for calibration services at NTS
151	o	Scientific Investigations Plans (SIP) did not reference all appropriate technical procedures
152	o	Comments of technical review not maintained in QA files as required
153	o	Entries into Scientific Notebooks are inadequate
154	o	Procurement documents do not include required information
155	o	Notebook entries for computer programs inadequate
156	o	Procedures have not been updated to describe quality activities
157	o	Procedure not properly controlled
158	o	USGS QA office not notified of equipment calibration
160	o	USGS internal deficiency documents not evaluated for unusual occurrence
161	o	QA records not processed in accordance with procedure requirements
162	o	USGS not performing external audits of its contractors as required

Title	No. QMP-01-02 Rev. 0
STOP WORK	Effective Date 1/11/88
	Page 1 of 7

1.0 PURPOSE AND SCOPE

This procedure establishes the Waste Management Project Office (WMPO) methodology and responsibilities for suspending a WMPO, Nevada Test Site (NTS) Support Contractor, Participating Organization, or WMPO supplier's activity that has been identified as a significant condition adverse to quality requiring correction prior to resumption of the affected activity.

2.0 APPLICABILITY

This procedure applies to WMPO staff personnel who observe or are made cognizant of a significant condition adverse to quality regarding a Quality Assurance (QA) Level I or II activity performed by WMPO, NTS Support Contractor, Participating Organization, or a WMPO supplier.

3.0 DEFINITIONS

3.1 STOP WORK ORDER (SWO)

A letter issued by authorized WMPO personnel to cause the suspension of an activity that is not being conducted in compliance with the applicable Nevada Nuclear Waste Storage Investigations (NNWSI) Project, WMPO, or QA Program requirement, plan, procedure, instruction, drawing, or procurement document, and requires correction prior to resumption of the affected activity.

3.2 CONDITION ADVERSE TO QUALITY

An all-inclusive term used in reference to any of the following: failures, malfunctions, deficiencies, defective items, and nonconformances.

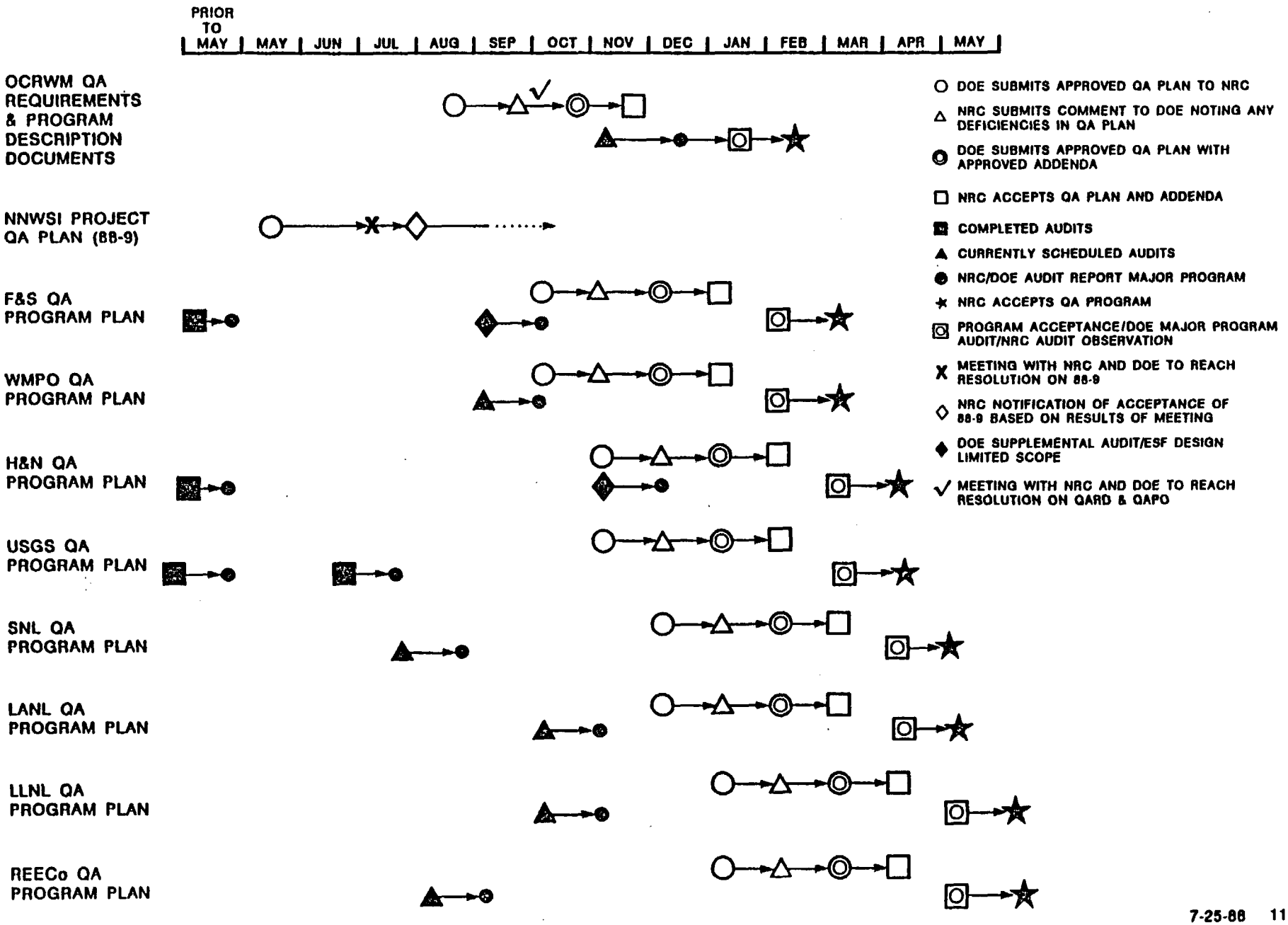
3.3 SIGNIFICANT CONDITION ADVERSE TO QUALITY

A condition adverse to quality which, if not corrected, could have a serious affect on safety or operability.

APPROVED BY

Project Manager, T&MSS	WMPO Project Quality Manager	WMPO Project Manager
Date March 7, 1988	Date 3/21/88	Date 3/21/88

SCHEDULE FOR NRC ACCEPTANCE OF DOE QA PROGRAM



NNWSI QA STRATEGY IS A THREE-PART PROCESS TO ENSURE FULL IMPLEMENTATION OF ALL APPLICABLE QA PROCEDURES ON PROJECT-RELATED WORK

- NRC APPROVAL OF NNWSI QA PLAN
- SEQUENTIAL APPROVAL OF PROJECT PARTICIPANTS QUALITY ASSURANCE PLANS
- IMPLEMENTATION AUDITS OBSERVED BY NRC

PRESIDENT SIGNED FY 1989 ENERGY AND WATER APPROPRIATIONS BILL INTO LAW JULY 19, 1988

- FUNDING AMOUNTS INCLUDE:
  - TOTAL E&W APPROPRIATION $17.0 B
  - TOTAL DOE (13.16 B)
  - DOE NUCLEAR ACTIVITIES (8.1 B)
  - NUCLEAR WASTE FUND (369.8 M)

- APPROPRIATION FOR NUCLEAR WASTE CONTAINS THE FOLLOWING DIRECTIONS:
  - $11 M TO STATE OF NEVADA FOR OVERSIGHT ACTIVITIES
    * $1.5 FOR SOCIOECONOMIC STUDIES
    * $1.5 FOR TRANSPORTATION STUDIES
  - $5 M TO AFFECTED LOCAL GOVERNMENTS
  - NO FUNDS TO BE USED TO INFLUENCE LEGISLATIVE ACTION ON ANY MATTER PENDING BEFORE CONGRESS OR STATE LEGISLATURE OR FOR ANY LOBBYING ACTIVITY

OTHER CONGRESSIONAL ACTIVITIES

- A BILL RECENTLY PASSED A HOUSE COMMITTEE THAT REQUIRES THE WIPP SITE TO COMPLY WITH EPA STANDARDS BEFORE RECEIPT OF TRU (HR 2504 - WIPP LAND WITHDRAWAL ACT)
  - REQUIRES "DETERMINATION OF COMPLIANCE" BY EPA AND THE ENVIRONMENTAL EVALUATION GROUP
  - REQUIRES EPA TO PROMULGATE PROPOSED STANDARDS FOR SPENT FUEL, HLW AND TRU WITHIN 12 MONTHS OF ENACTMENT; AND FINAL STANDARDS WITHIN 2 YEARS OF ENACTMENT
- CONGRESS IS STILL ATTEMPTING TO FINALIZE PRICE-ANDERSON RENEWAL LEGISLATION (NUCLEAR INSURANCE). FINAL LEGISLATION COULD BE APPROVED BY CONGRESS BEFORE AUGUST RECESS
  - PROVIDES INDEMNIFICATION TO DOE CONTRACTORS AND NUCLEAR WASTE ACTIVITIES
- EFFORTS TO REORGANIZE NRC UNDER A SINGLE ADMINISTRATOR ARE NOT EXPECTED TO RESULT IN ANY LEGISLATION BEFORE THE END OF THIS SESSION

APPROXIMATELY 200 PEOPLE ATTENDED THE SAMPLE MANAGEMENT FACILITY OPEN HOUSE AT THE NTS ON JULY 20, 1988

- ATTENDEES INCLUDED 100 MEMBERS OF THE GENERAL PUBLIC, LAS VEGAS MEDIA, DOE/NV MANAGER AND OTHER DOE AND CONTRACTOR STAFF

- AGENDA INCLUDED MEDIA TOUR, RIBBON-CUTTING CEREMONY, AND GENERAL PUBLIC TOURS OF THE FACILITY

CURRENT STAFF INVOLVEMENT WITH THE ARCHETYPE STUDY PLANS

WMPO

DAVE DOBSON
BILL HUGHES
BOB KAISER
WENDELL MANSEL
VINCE IORII

DOE/HQ

JEFF KIMBALL
INA ALTERMAN
GLEN FAULKNER

SAIC

ED MCCANN
MARTY MITCHELL
MARTHA PENDLETON

WESTON

MIKE CLINE
KEN CZYSCINSKI

USGS

JOE ROUSSEAU (PI)
KEN FOX (PI)
BILL LANGER
DAVE SCHLEICHER
RALPH SHROBA
TOM CHANEY

SANDIA

LES SHEPPARD (PI)
FRAN NIMICK (PI)
TOM BLEJWAS
AL STEVENS
BARRY SCHWARTZ

REECO

J.C. MCDANIEL

F&S

BILL GARMS

MACTEC

JIM MADSEN

STATUS CHECK

STUDY PLAN SUBMISSION DATES

8.3.1.2.2.3	UZ PERCOLATION - SURFACE BASED (ROUSSEAU)	8/15/88
8.3.1.15.1.1	LAB THERMAL PROPERTIES (NIMICK)	AT HQ REVIEW
8.3.1.17.4.2	FAULTING NEAR SURFACE FACILITIES (SHEPHARD)	8/15/88
8.3.1.17.4.6	QUATERNARY FAULTING IN THE SITE AREA	8/15/88

TASK FORCE PLANS

NEAR TERM ACTIVITIES

- DEVELOP A PLAN TO OBTAIN NRC INVOLVEMENT/APPROVAL OF WORK INITIATION FOR ARCHETYPE ACTIVITIES

- COMPLETE THE ACTIVITY NETWORKS AND CIRCULATE FOR REVIEW

TASK FORCE PLANS (CONT.)

ACTIONS INITIATED ON RECEIPT OF STUDY PLANS

TECHNICAL ACTIVITIES

- INITIATE PO AND HQ REVIEWS ON EXPEDITED SCHEDULE
- INITIATE TRACKING/APPROVAL OF TECHNICAL PROCEDURES REQUIRED FOR WORK START

QA ACTIVITIES

- UTILIZE STUDY PLANS TO ESTABLISH WHAT QA REQUIREMENTS APPLY AND ATTEMPT TO EXPEDITE IMPLEMENTATION
  - IDENTIFY RELEVANT GLOBAL AND SPECIFIC REQUIREMENTS
  - REVIEW AND APPROVE QALAS

ENVIRONMENTAL ACTIVITIES

- INITIATE ALL ACTIVITIES NECESSARY TO OBTAIN PERMITS
  - IDENTIFY REQUIREMENTS FOR LAND ACCESS, WATER AND AIR QUALITY PERMITS
  - CONDUCT SURVEYS (ARCHEOLOGICAL, BIOLOGICAL)

WORK IMPLEMENTATION ACTIVITIES

- DEVELOP CRITERIA LETTERS, WORK PLANS
- INITIATE SCHEDULING REQUIREMENTS FOR EQUIPMENT, PERSONNEL
- ARRANGE PROCUREMENT
- ARRANGE FUNDING

OTHER INTEGRATION ACTIVITIES

- IDENTIFY AND IMPLEMENT ADDITIONAL REQUIREMENTS , SUCH AS
  - IDAS IMPLEMENTATION
  - DATABASE REQUIREMENTS (SEPDB, RIB)
  - SAMPLE MANAGEMENT FACILITY REQUIREMENTS

THE LONG RANGE PLANNING PROCESS

PURPOSE OF THIS PRESENTATION:

- PRESENT THE PLAN FOR LONG RANGE PLANNING (LRP)
- AGREE TO THE LRP PROCESS AND FINAL PRODUCTS
- AGREE TO THE LRP SCHEDULE
- AGREE ON STAFF ASSIGNMENTS
- AGREE ON PRIORITY OF LRP EFFORT AND DEDICATION OF STAFF

SCOPE OF LONG RANGE PLANNING

THE OBJECTIVE OF THE LONG RANGE PLANNING (LRP) EFFORT IS TO DEVELOP A SCHEDULE AND ACTIVITY AND MILESTONE BASE TO AID IN THE MANAGEMENT, INTEGRATION, AND CONTROL OF THE NNWSI PROJECT ACTIVITIES UP TO AND INCLUDING THE INITIATION OF LICENSE APPLICATION

THE INTENT OF THE LRP EFFORT IS TO HAVE USEFUL NETWORKS AND DATA BASE IN PLACE BY JANUARY 1, 1989

THE LRP TASK IS DIVIDED INTO SEVERAL DISTINCT TASKS:

- COMPLETE THE REVIEW AND REVISIONS OF THE SCP NETWORKS
- REVIEW, MODIFY, AND APPROVE THE WORK BREAKDOWN STRUCTURE (PHASE 1)
- PREPARE NETWORK LOGIC SEQUENCING AND INTEGRATE WITH SITE CHARACTERIZATION PLAN (SCP) NETWORKS, ESF CONSTRUCTION AND TESTING NETWORKS, LICENSING SUPPORT DOCUMENTATION NETWORKS, QUALITY ASSURANCE PREREQUISITES, AND OTHER NETWORKS NECESSARY FOR PROJECT MANAGEMENT (PHASE 2)
- RESOURCE-LOAD THE NETWORKS (PHASE 3)
- REVIEW, REVISE, APPROVE, AND IMPLEMENT THE NETWORKS (PHASE 4)
- REVIEW, UPDATE, AND MAINTAIN NETWORKS AND COST DATA AS REQUIRED (PHASE 5)

ASSUMPTIONS FOR LONG RANGE PLANNING

- NETWORK DEVELOPMENT FOR ALL ACTIVITIES WILL BE PERFORMED ON AN UNCONSTRAINED BASIS (EXCEPT FOR POSSIBLE FUNDING CONSTRAINTS FOR FY89)
- INFORMATION USED TO DEVELOP THE NETWORKS WILL BE AT THE P&S ACCOUNT LEVEL OF THE WBS (LEVEL 5 - 6)
- ALL NETWORKS WILL BE REVIEWED AND OPTIMIZED UTILIZING CRITICAL PATH ANALYSES PRIOR TO RESOURCE LOADING
- THE END PRODUCTS FROM THIS EFFORT (NETWORKS AND ANNUAL COSTS PER ACTIVITY) WILL BE CONTROLLED AND MAINTAINED FOR THE LIFE OF THE PROJECT
- PLANNING WILL BE PERFORMED FOR THE CURRENT SCOPE OF WORK FOR THE PROJECT (ASSUMES NO MANAGEMENT AND OPERATIONS CONTRACTOR)
- THE PRODUCT RESULTING FROM THE LRP EFFORT IN DECEMBER, 1988, WILL NEED TO UNDERGO FURTHER REVISION THROUGH AT LEAST THE FIRST HALF OF FY89. THE PRODUCT IN DECEMBER WILL BE USED TO DEVELOP THE NETWORKS AT HIGHER LEVELS OF THE WBS, AND AS THE FRAMEWORK FOR THE FY91 WAS

PROPOSED LRP ORGANIZATION

THE WORK OF THE LRP TASK WILL BE CONDUCTED BY AN OVERVIEW/MANAGEMENT GROUP, AND THREE WORKING GROUPS ORGANIZED BY WBS

THE MANAGEMENT OVERVIEW TEAM (MOT) WILL:

- COORDINATE THE LONG RANGE PLANNING PROCESS
- DEVELOP NETWORK GUIDANCE AND INTEGRATE THE EFFORTS OF THE COST AND SCHEDULING GROUP IN THE DEVELOPMENT OF THE LRP
- DEVELOP WBS CHANGE GUIDANCE AND INTERFACE WITH THE CONFIGURATION MANAGEMENT GROUP TO IMPLEMENT THESE CHANGES
- INTEGRATE AND DIRECT THE EFFORTS REQUIRED FOR COST DEVELOPMENT OF THE LRP

THE PARTICIPANT REPRESENTATIVES ON THE MOT WILL:

- BRIEF TPO'S ON A REGULAR BASIS AND RELAY TPO INPUT TO MOT
- SUPPORT THE CHAIRMAN/DEPUTY CHAIRMAN AS THE TPO'S REPRESENTATIVES, AND PROVIDE SUPPORT TO THE WITS REPRESENTATIVES

PROPOSED MANAGEMENT OVERVIEW TEAM (MOT):

VINCE IORII	WMPO	CHAIRMAN
DAVE JORGENSON	T&MSS	DEPUTY CHAIRMAN
REX REUST	T&MSS	
CRAIG GARVIN	T&MSS	
SUSAN JONES	T&MSS	
JEAN YOUNKER	T&MSS	
GARY YEAGER	SNL	
RICHARD HERBST	LOS ALAMOS	
DAVE SHORT	LLNL	
DANIEL GILLIES	USGS	
RAYE RITCHEY	USGS	

THE WORKING INTEGRATION TEAMS (WITs) ARE BASED ON THE WBS, GROUPED LOGICALLY INTO 3 TEAMS:

(1) 1.2.1 - SYSTEMS, 1.2.2 - WASTE PACKAGE, 1.2.4 - REPOSITORY;

(2) 1.2.3 - SITE, 1.2.6 - ESF, 1.2.7 - TEST FACILITIES, 1.2.10 - FINANCIAL AND TECHNICAL ASSISTANCE;

(3) 1.2.5 - REGULATORY AND INSTITUTIONAL, 1.2.8 - LAND ACQUISITION, 1.2.9 - PROJECT MANAGEMENT

THE WORKING INTEGRATION TEAMS WILL:

- SUPPORT THE PARTICIPANTS WITH DEVELOPMENT OF THE REQUIRED INPUT
- COORDINATE THE DEVELOPMENT OF THE NETWORK AND COST DATA TO ENSURE PROPER INTERFACING WITH ALL OTHER ELEMENTS OF THE LRP
- DEVELOP THE NETWORKS

THE PARTICIPANT REPRESENTATIVES ON THE WITs WILL:

- BE RESPONSIBLE FOR DEVELOPMENT AND DELIVERY OF THE INFORMATION REQUIRED FOR THE LRP (ACTIVITY DESCRIPTIONS, FTE LOADS, COSTS, ETC.)
- BRIEF TPO'S AND MOT COUNTERPART ON A REGULAR BASIS AND RELAY INPUT TO WIT

PROPOSED WORKING INTEGRATION TEAMS (WITS):

WIT-1: WBS 1.2.1, 1.2.2, 1.2.4

TIM ZVADA	WMPO	CHAIRMAN
JOHN WADDELL	T&MSS	DEPUTY CHAIRMAN
DICK MORISSETTE	T&MSS	
HALIT DOKUZOGUZ	T&MSS	
ALBERT DENNIS	SNL	
ROGER ZIMMERMAN	SNL	
MIKE REVELLI	LLNL	
SCOTT SINNOCK	SNL	

T&MSS SUPPORT: GEORGE DEWEY
GEORGE MORRISON
COLLIN STEWART

WIT-2: WBS 1.2.3, 1.2.6, 1.2.7, 1.2.10

UEL CLANTON	WMPO	CHAIRMAN
IVAN COTTLE	T&MSS	DEPUTY CHAIRMAN
NATHAN MORLEY	WMPO	
DEAN EPPLER	T&MSS	
WILLIAM LANGER	USGS	
BOB KNECHT	USGS	
KAREN WEST	LOS ALAMOS	
DAN KOSS	REECO	
TOM TEMPLER	F&S	
CHARLES WARD	H&N	

T&MSS SUPPORT: ANNE CAVAZOS
JAMES TAYLOR
DIANE RAINEY
GARY ROBERSON
TERRY GRANT
HARRY PERRY

WIT-3: WBS 1.2.5, 1.2.8, 1.2.9

WINN WILSON	WMPO	CHAIRMAN
DAVE DAWSON	T&MSS	DEPUTY CHAIRMAN
ROBERT BARTON	WMPO	
SANDRA DAVIS	WMPO	
BOB SWEENEY	T&MSS	
BILL JACOBS	T&MSS	

T&MSS SUPPORT: ED MCCANN
DAVE WAYMAN
CANDIE BIDDISON

PLAN BASIS AND SCHEDULE

PHASE 1: REVISION OF THE PROJECT WORK BREAKDOWN STRUCTURE 8/3/88 - 8/15/88

- MOT DEVELOPS GUIDANCE FOR WBS REVIEW AND REVISION, AND PREPARES STRAWMAN VERSION OF WBS OUTLINE
- WITs REVIEW PROPOSED WBS REVISIONS, SUGGEST CHANGES, PROPOSE ACTIVITY DESCRIPTIONS FOR DICTIONARY WHERE NEEDED TO SUPPORT THE LONG RANGE PLANNING EFFORT
- MOT REVIEWS WIT CHANGES PRIOR TO SUBMITTAL TO CCB
- DOE/HQ WILL BE UPDATED ON WBS REVISIONS BY MOT CHAIRMAN
- END PRODUCT (8/15): WBS STRUCTURE AND ENOUGH DESCRIPTIVE TEXT TO BEGIN NETWORK DEVELOPMENT

(MOT PREPARES GUIDANCE FOR PHASES 2 AND 3 DURING THIS PERIOD)

PLAN BASIS AND SCHEDULE (CONT)

PHASE 2: DEVELOPMENT OF PROJECT NETWORKS 8/15/88 - 11/9/88

- GUIDANCE FROM MOT WILL INCLUDE AN ACTIVITY DESCRIPTION FORM WHICH WILL BE USED TO DEVELOP THE NETWORKING DATA BASE
- PARTICIPANT REPRESENTATIVES ON WITs WILL DEVELOP ACTIVITY INPUT FROM THEIR ORGANIZATIONS, COMPLETING ACTIVITY DESCRIPTION FORMS FOR EACH P&S ACCOUNT
- EACH WIT WILL DEVELOP THE NETWORK LOGIC AND SEQUENCING, AND THE NETWORKS FOR THEIR WBS ELEMENTS
- WIT NETWORKS WILL BE REVIEWED AS A GROUP BY THE MOT FOR LOGIC, COMPLETENESS, ETC
- MOT AND WITs WILL WORK TOGETHER TO INTEGRATE THESE NETWORKS WITH OTHER PROJECT NETWORKS, SUCH AS THE SCP, ESF, QA, LICENSING, ETC
- MOT AND WITs WILL WORK TOGETHER TO OPTIMIZE THE COMPLETED NETWORKS BY IDENTIFYING THE CRITICAL PATH ITEMS, AND ADJUSTING SCHEDULES WHERE POSSIBLE
- DOE/HQ WILL BE REGULARLY BRIEFED BY THE MOT CHAIRMAN ON THE NETWORKS THROUGHOUT THIS PHASE AND WHEN THE NETWORKS ARE COMPLETED
- END PRODUCT (11/9): COMPLETED INTEGRATED NETWORKS AT THE P&S ACCOUNT LEVEL

(MOT WILL COMPLETE GUIDANCE FOR PHASE 3 DURING THIS PERIOD)

PLAN BASIS AND SCHEDULE (CONT)

PHASE 3: RESOURCE LOADING OF NETWORKS 11/9/88 - 12/15/88 +

- PARTICIPANT REPRESENTATIVES WILL ACQUIRE FTE AND COST INPUT ON THE NETWORK ACTIVITIES FROM THEIR ORGANIZATIONS (P&S ACCOUNT LEVEL)
- NETWORKS WILL BE RESOURCE-LOADED BY FTE AND DOLLARS, AND ANNUAL COSTS WILL BE DEVELOPED FOR THE PROJECT THROUGH LICENSE APPLICATION
- LRP NETWORKS AND COSTS WILL BE REVIEWED BY MOT AND PREPARED FOR WMPO AND TPO REVIEW
- END PRODUCT (12/15): RESOURCE LOADED DATA BASE AND NETWORKS

PLAN BASIS AND SCHEDULE (CONT)

PHASE 4: PROJECT MANAGEMENT REVIEW AND APPROVAL 12/15/88 - 1/5/89 +

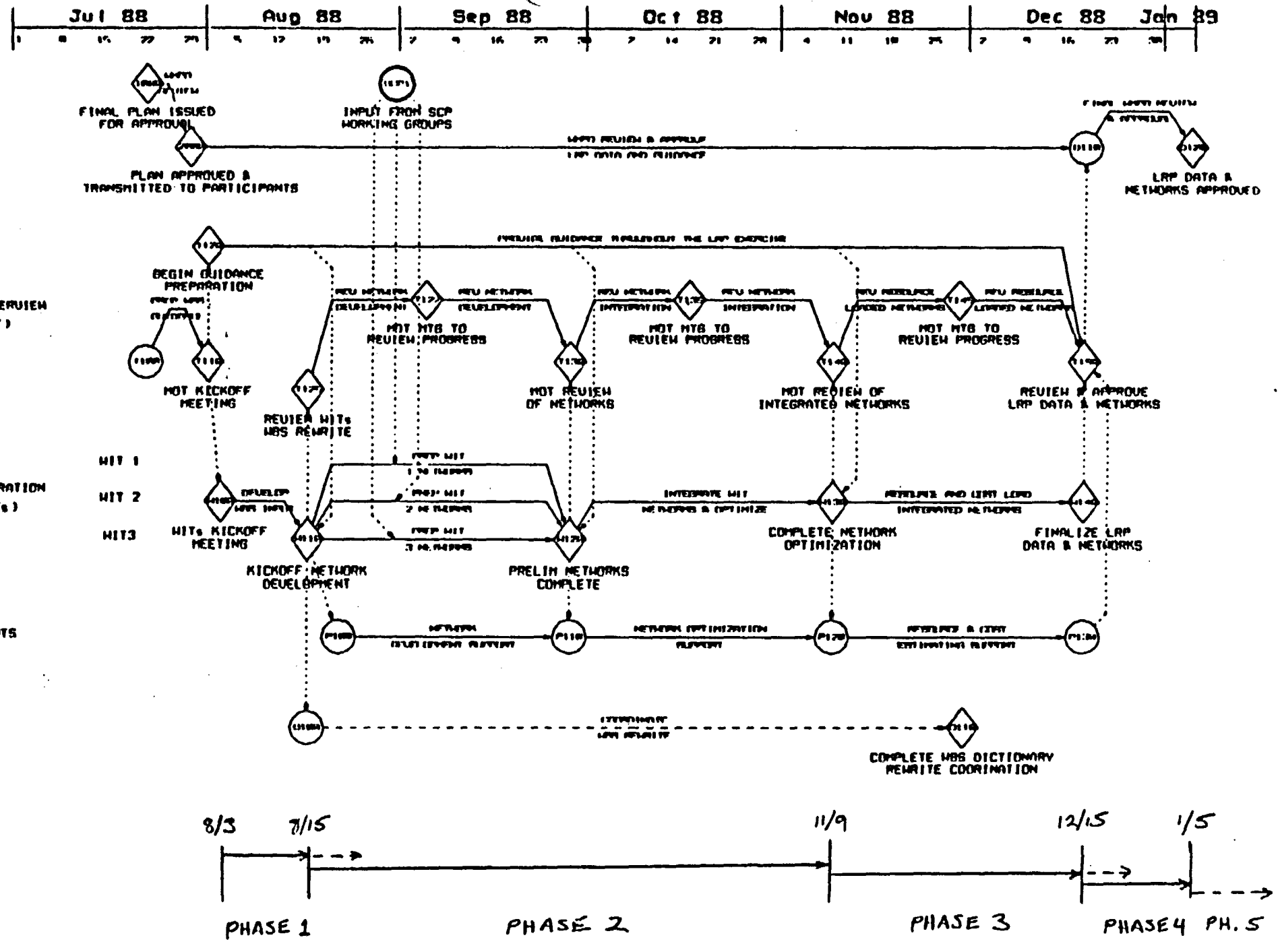
- COMPLETED NETWORKS WILL BE REVIEWED BY PROJECT MANAGEMENT (WMPO AND TPOs)
- MOT WILL TRACK NETWORK REVIEW, AND ASSURE THAT COMMENTS ARE INCORPORATED
- COMPLETED AND APPROVED NETWORKS WILL BE IMPLEMENTED FOR PROJECT USE
- FINAL PRODUCT (1/5): PROJECT-APPROVED INTEGRATED NETWORKS, RESOURCE LOADED, AT THE P&S ACCOUNT AND HIGHER LEVELS OF THE WBS

PLAN BASIS AND SCHEDULE (CONT)

PHASE 5: REGULAR REVIEW AND EVALUATION 1/5/88 -

- MOT AND WITs WILL RECOMMEND A PROCEDURE FOR CONTROL AND MAINTENANCE OF THE NETWORKS AND DATA BASE
- THE PROJECT WILL IMPLEMENT THIS PROCEDURE TO REGULARLY REVIEW AND EVALUATE THE DATA BASE, COSTS, AND SCHEDULES TO KEEP THE PLANNING INFORMATION UP TO DATE

SCHEDUOLE FOR LONG RANGE PLANNING

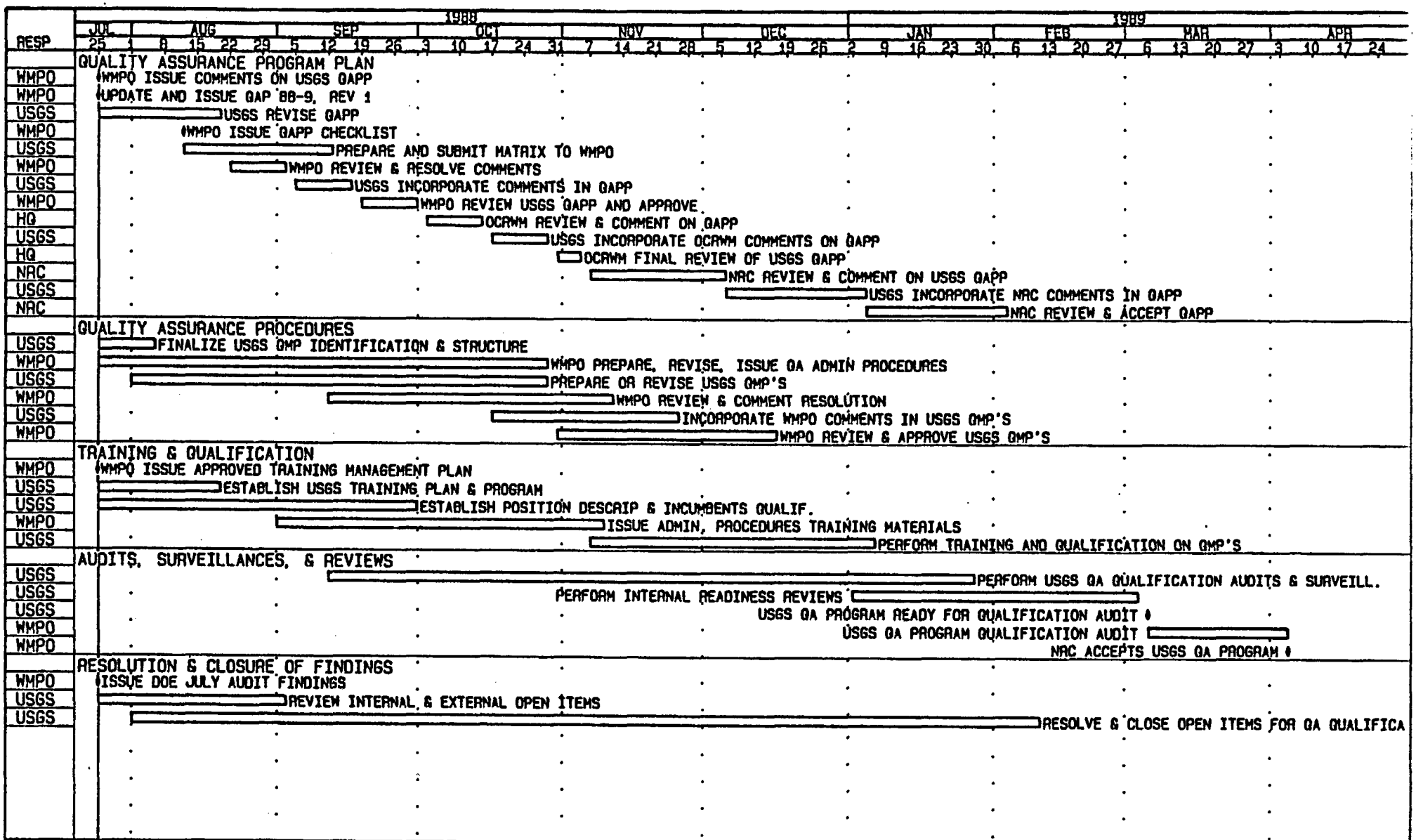


8/3 7/15 11/9 12/15 1/5

PHASE 1 PHASE 2 PHASE 3 PHASE4 PH. 5

LONG RANGE PLANNING MILESTONES

1. LRP plan finalized and issued to the WMPO for approval	July 22, 1988
2. LRP plan approved and transmitted to participants	July 29, 1988
3. Kick-off meeting of MOT	August 1, 1988
4. Kick-off meeting of WITs	August 3, 1988
5. MOT meeting to review WBS revisions	August 15, 1988
6. WITs Kick-off meeting for network development	August 15, 1988
8. MOT meeting to review preliminary networks	October 3, 1988
9. MOT review of final networks	October 31, 1988
10. Final networks approved for resource loading	November 9, 1988
11. WITs Kick-off meeting for resource loading of networks	November 9, 1988
12. MOT review of final networks and resource loading data	December 5, 1988
13. Networks and resource loading data complete	December 15, 1988
14. Final approval of LRP data and networks	January 5, 1989



Activity Bar/Early Dates
Critical Activity
Progress Bar

Primavera Systems, Inc. 1984, 1985, 1986, 1987

UNITED STATES GEOLOGICAL SURVEY
NNWSI
QA PROGRAM QUALIFICATION SCHEDULE

Project Start : 1JUL88
Project Finish: 7APR89

Sheet 1 of 1

Data Date: 25JUL88
Plot Date: 28JUL88

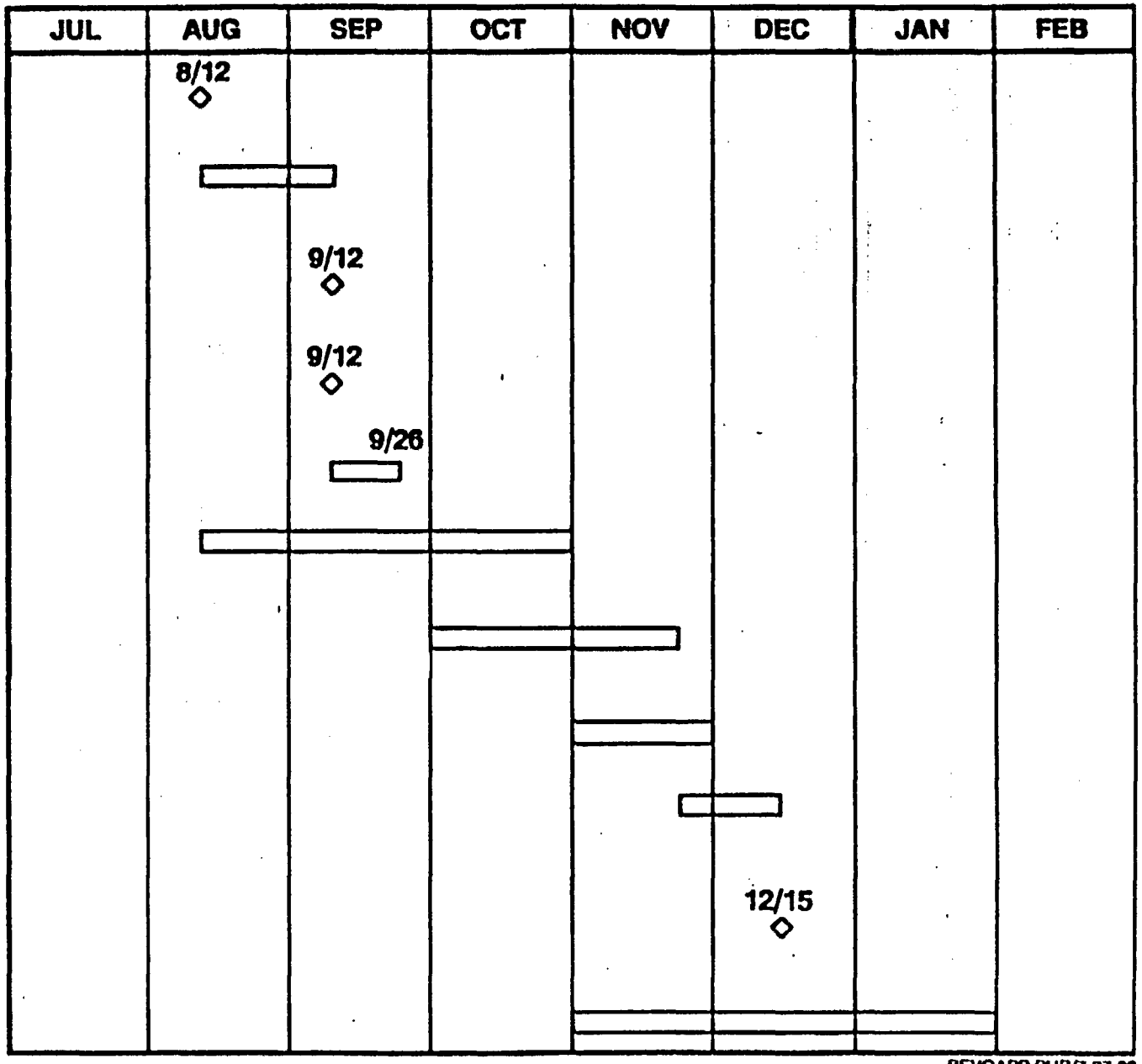
USGS QUALITY ASSURANCE PROGRAM

Date	Revision	Checked	Approved

MAJOR CHANGES IN 88-9, REV. 1

- Commitments to meet
  - NUREG-1318 (Q-List) - Appendix I
  - NUREG-1297 (Peer Review) - Appendix J
  - NUREG-1298 (Qualification of Data) - Appendix G
- QA Level I definition changes for consistency with NUREG-1318
- Interpretation/analysis of scientific investigation (planned, performed, and documented)
- Content of technical procedures utilized in scientific investigations
- Verification planning for SIs
- Addition of QA requirements for computer software control

REVISION OF PARTICIPANT QA ADMINISTRATIVE PROCEDURES



REVQAPP.PUB/7-27-88

REVISION OF PARTICIPANTS QAPPs

TRANSMIT 88-9 REV. 1 TO PARTICIPANTS

COMMENT RESOLUTION MEETING ON 88-9 R0 AND DISCUSSION ON 88-9 R1

PARTICIPANT REVISION OF QAPPs

TRANSMIT CHECKLIST TO PARTICIPANTS

TRANSMIT DRAFT QAPP TO WMPO FOR REVIEW ALONG WITH COMPLETED CHECKLIST

WMPO REVIEW COMPLETE BY 8/26

COMMENT RESOLUTION MEETINGS COMPLETE BY 9/2

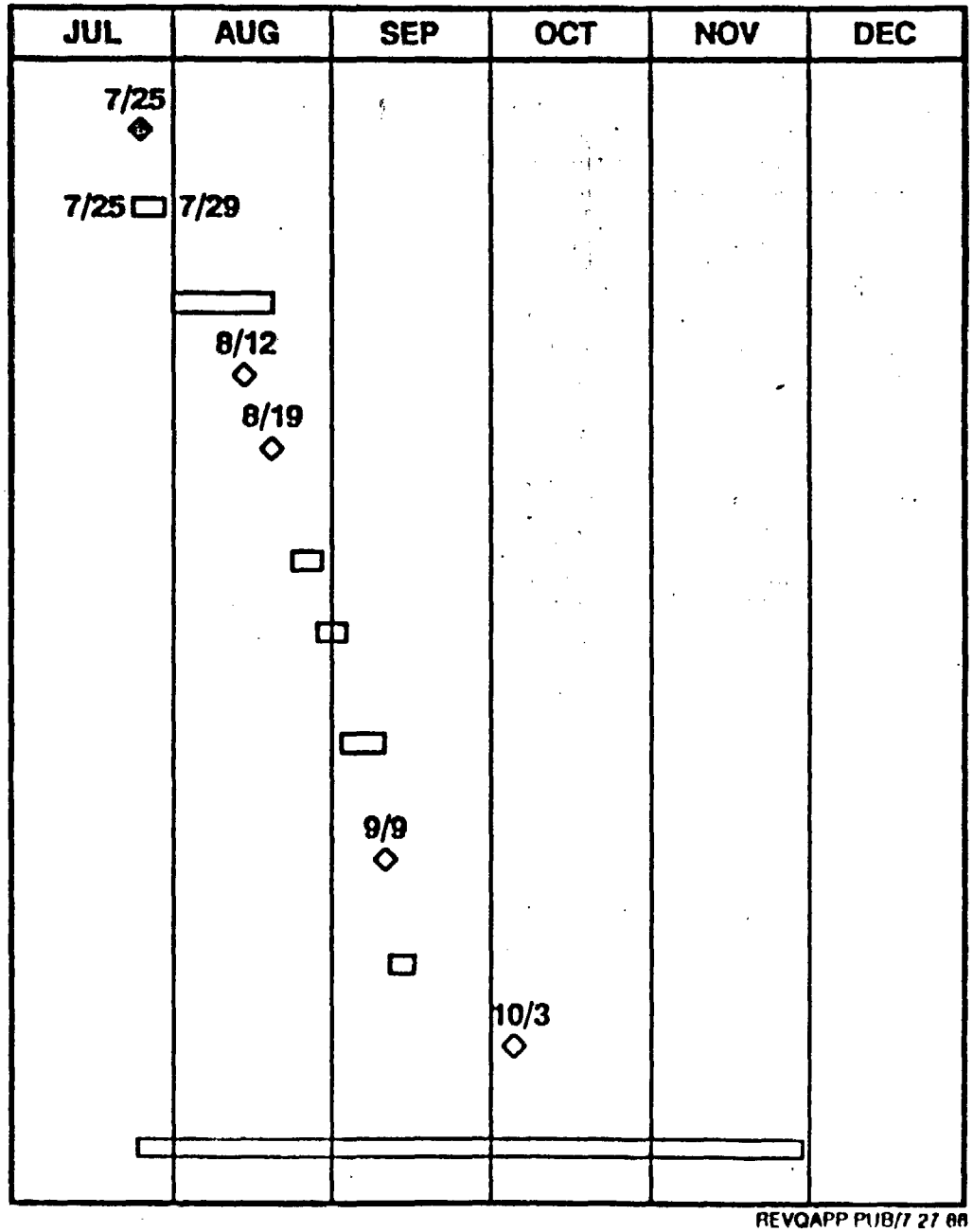
INCORPORATION OF COMMENTS BY PARTICIPANTS BY 9/9

TRANSMIT REVISED QAPP AND VERIFIED CHECK-LIST TO WMPO

FINAL REVIEW BY WMPO COMPLETED BY 9/10

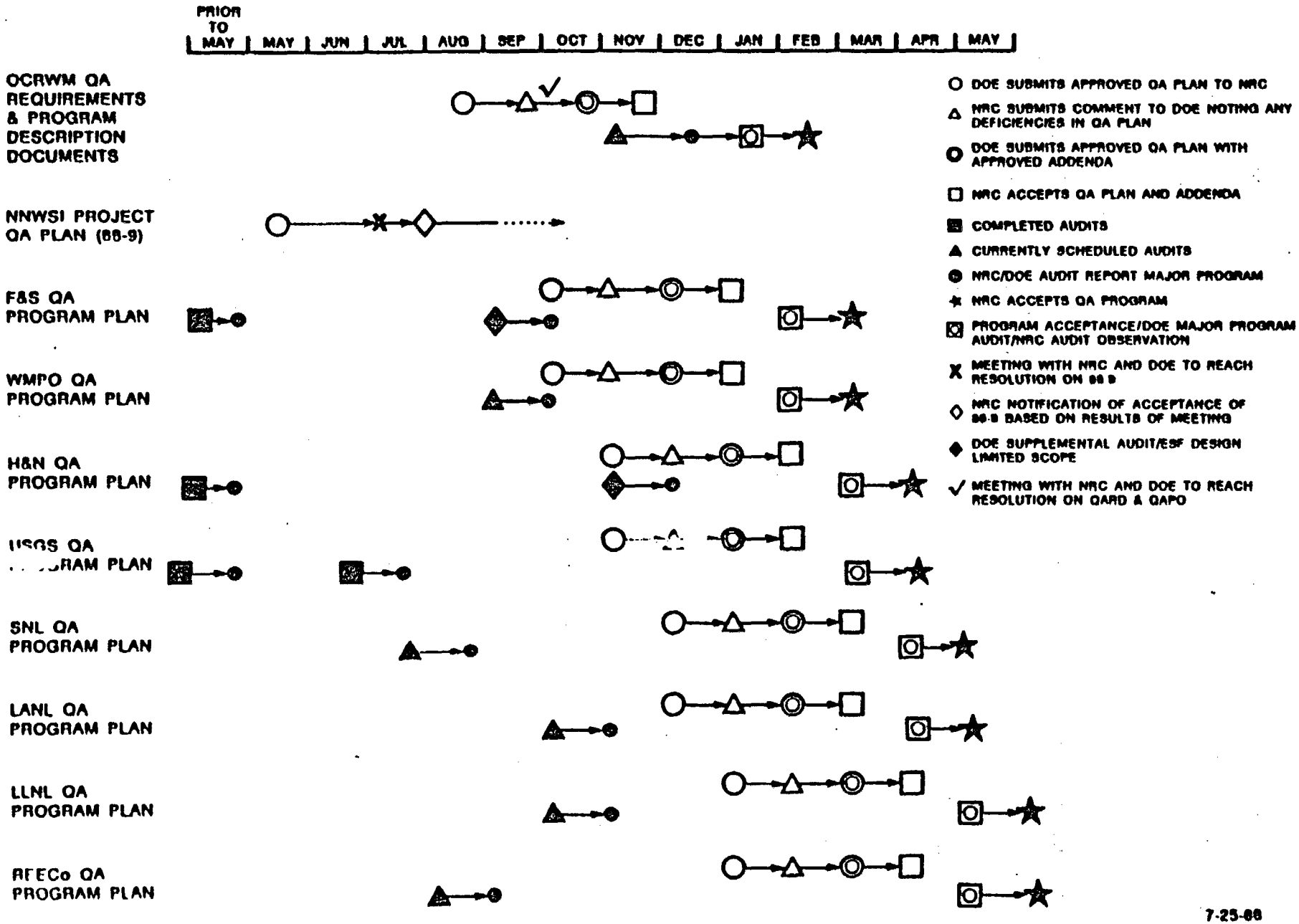
TRANSMIT QAPPs TO OCRWM FOR REVIEW/ APPROVAL

TRAINING TO REVISED QAPP



REVQAPP PUB/7 27 88

SCHEDULE FOR NRC ACCEPTANCE OF DOE QA PROGRAM



7-25-88

"INFORMAL INPUT"

Larry Hayes, USGS
Don Oakley, LANL
Tom Hunter, SNL
Larry Ramspott, LLNL
Mike Spaeth, SAIC
Dan Gillies, USGS
Bob Raup, USGS
Dick Herbst, LANL
Tom Blejwas, SNL
Jesse Yow, LLNL

Attached are two pages consolidating and evaluating the potential areas of interest for cooperative interactions between the NNWSI project and AECL (Canada). The two lists are a working draft and in no manner represent final conclusions. The lists are based on your formal/informal input and your efforts are greatly appreciated. Input was also received informally from interested individuals who are part of the participant organizations as well as WMPO and SAIC staff. We have consolidated and integrated the input into several major areas. We will appreciate clarifications and comments on any items on the lists.

Please examine the lists and identify a lead person for each area in which your organization has been identified. This person will be the key NNWSI contact in that area for interaction with AECL personnel.

I need immediate feedback on contact names and their availibility during the next two weeks (August 1st thru 12th) for meetings with AECL technical leads either in Las Vegas or at the Participant location. The feedback should be sent to me by fax (as informal input) or by phone. The information is needed in Las Vegas by noon (Las Vegas time) on Friday, July 29th. Please phone me at FTS 544-7946 or Tom Ricketts of SAIC at FTS 544-7602.

Bob Levich
DOE-WMPO

"INFORMAL INPUT"

Nevada Nuclear Waste Storage Investigations Project evaluations of potential areas for cooperative interactions with Atomic Energy Canada, Limited

Areas where detailed information is needed to extablish whether NNWSI interest exists

**(Note: In general, the following areas have a lower priority)

1.Drift wall radar	USGS
2.Application of MOTIFF model	USGS
3.Fracture characterization data base for validation of fracture network model	USGS
4.Instrumentation of the unsaturated zone above the cone of depression at URL to determine the level of saturation within a fracture network that fracture flow occurs	USGS
5.Fracture mapping methodology	USGS
6.Potentiometric monitoring using transducers (reliability for use in deep boreholes)	USGS
7.Borehole fracture logging	USGS
8.Performance assessment	WMPO/SNL
-Total system evaluation strategy	
-Scenarios & disruptive events	
-Validation	
-Geostatistics	
-Codes Transfer	
-Biosphere Modeling & Methodology	
9.Large block tracer test methodology	
-near field flow & transport	LLNL
-experimental validation of retardation modeling	LANL
10.Permeability/conductivity measurements & analysis methods for fractures	LLNL
11.Cigar Lake natural analogue studies	LANL
12.Geomechanical experiments	SNL
-Validation of Geomechanical codes	
-Planning & Design (for Information)	
13.Instrumentation for in situ water chemistry measurements	WMPO/USGS LANL/LLNL

"INFORMAL INPUT"

"INFORMAL INPUT"

Nevada Nuclear Waste Storage Investigations Project evaluations of potential areas for cooperative interactions with Atomic Energy Canada, Limited

Areas where greatest potential interest exists

1.Shaft and Facility Construction/Testing Management	WMPO/LANL
-Excavation & mapping integration	
-Instrumentation installation integration	
-Generic quality procedure development	
-Construction Contractor/Testing Controls	
2.Tracer Test Methodology	LANL/USGS
-Procedures	
-Selection of tracers	
-Instrument configuration	
3.Instrumentation Development	
-USBM borehole probe	USGS
-CSIR cell for overcoring	USGS
-Dilatometer development & emplacement	USGS
-Displacement & Stress measurements at high temperatures	SNL
-Data acquisition & recording	LANL
-Near field hydrologic & geomechanical (monitoring & active measurements)	LLNL
-Specifications for instruments requiring high reliability	WMPO/NNWSI
4.Sealing Technology	
-Concepts	SNL
-Materials	
-Grouts & Grout Injection	SNL
-Materials Interactions & Seal Performance in Hydrothermal & Geochemical sense	LLNL
5.Waste Package Research	LLNL
-Cu container fabrication, closure & inspection	
-Uranium oxide electrochemistry	
-Model development for oxidative dissolution of spent fuel & uranium oxide ##	
-Model validation for spent fuel & near field transport	
6.Topical International Exchanges	WMPO/NNWSI
-Workshops/Symposia	
7.Review of specific NNWSI Study Plans, test procedures, etc.	WMPO

##Suggest a cooperative agreement where NNWSI (LLNL) would concentrate on equilibrium geochemistry & AECL would work on kinetics & radiochemistry

"INFORMAL INPUT"

"INFORMAL INPUT"

ATOMIC ENERGY CANADA, LIMITED (AECL)

Following the Denver presentations by AECL in coordination with the ESTC meeting, input was received both formally and informally from all technical participants evaluating potential technical areas for cooperative interactions between NNWSI and AECL. These inputs were integrated and evaluated and two lists were forwarded to the Technical Project Officers and their previously appointed leads on Wednesday for comment. Each was also asked to identify (by Noon on Friday) a technical lead for each potential area of cooperation in which they might be involved. A request was also made to provide an availibility schedule for each technical lead to interact with a Canadian counterpart during the period August 1st thru August 12th. It has not been determined whether these interactions will take place in Las Vegas or at the TPO location or some combination of the two.

Each list is a seperate grouping of potential areas for cooperative interactions. The first list indicates the areas that NNWSI believes have the greatest potential for future technical cooperation. The second list groups those areas where detailed information is required before we can establish whether their are firm grounds for a cooperative program.

NAGRA (Switzerland)

A Meeting of the Technical Committee of the DOE/NAGRA Cooperative (NDC) Project is planned for Las Vegas for the week of October 3rd through 6th. It will be an opportunity for NNWSI participants to learn about the technical work being conducted in Switzerland for the Cooperative Project. Attending the meeting will be representatives of NAGRA, LBL investigators and DOE HQ and RTP staff who have been involved in the program. At present the the Technical sessions are expected to run Monday and Tuesday (October 3rd and 4th), and will be followed by a Technical Committee meeting (late Tuesday thru Wednesday) and a NAGRA visit to Yucca Mountain, G-Tunnel and Climax (Thursday). It is the goal of NNWSI to place representatives on the NAGRA Technical Committee in the near future.

"INFORMAL INPUT"

7/

INTEGRATION GROUP MEMBERS ASSIGNED OVERVIEW RESPONSIBILITY FOR THE TEXT BEING REVIEWED ARE EXPECTED TO BE AVAILABLE TO SUPPORT WORKING GROUP CO-CHAIRMEN IN WORKSHOPS AS NECESSARY

CURRENT INTEGRATION GROUP MEMBERSHIP

L. BALLOU, LLNL
J. CANEPA, LANL
R. RAUP, USGS
M. WILSON, USGS
A. STEVENS, SNL
S. SINNOCK, SNL
J. YOUNKER, SAIC
T. ZVADA, NNPO
D. DOBSON, NNPO
J. RIMBALL, HQ
R. CADY, HQ
R. GAMBLE, WESTON

7/28/88
rev. 2

AUGUST 1988 HQ COMMENT RESOLUTION WORKSHOP SCHEDULE

Month.....AUGUST.....

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Date ____	Date 1	Date 2	Date 3	Date 4	Date 5	Date 6
	BEGIN DISTRIBUTION OF TEXT MARKUPS----------					
Date 7	Date 8	Date 9 Chapt. 7 Waste Package	Date 10 Sect. 8.3.4 8.3.5.9 8.3.5.10	Date 11 Chapt. 6 Repository	Date 12 Sect. 8.3.2 8.3.5.1-8 8.3.3 8.3.5.11	Date 13 3.5.5
Date 14	Date 15 Chapt. 1 Geology Chapt. 4 Geochemistry	Date 16 Sect. 8.3.1.8 8.3.1.13 8.3.1.17 Sect. 8.3.1.3 8.3.1.7 8.3.1.9	Date 17 Chapt. 3 Hydrology	Date 18 Sect. 8.3.1.6 8.3.1.12 8.3.1.16 Chapt. 2 Geoengineering Sect. 8.3.1.15	Date 19 Chapt. 5 Climate Sect. 8.3.1.5 Sect. 8.6 - QA	Date 20
Date 21 Sect. 8.3.5.6 8.3.5.7 8.3.5.18	Date 22 Sect. 8.1 8.2 8.3.1 Sect. 8.3.5.19 8.3.5.20	Date 23 Sect. 8.3.5.8 8.3.5.13 8.3.5.14 8.3.5.15 8.3.5.17	Date 24 Sect. 8.3.5.12	Date 25 Sect. 8.5 8.3.5.16 Sect. 8.3.1.2	Date 26 Sect. 8.3.1.4	Date 27
Date 28	Date 29 Sect. 8.4 8.7	Date 30 Sect. 8.4	Date 31 Sect. 8.4	Date ____	Date ____	Date ____

July 28, 1988
rev. 1

SUGGESTED ATTENDEES FOR DOE/HQ COMMENT RESOLUTION WORKSHOPS

SECTION/CHAPTER	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
CHAPTER 1-GEOLOGY	AUGUST 15	WG 4 Co-Chairmen: T. Grant, SAIC R. Levich, WMPO R. Fox, USGS
CHAPTER 2-GEOENGINEERING	AUGUST 18	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WMPO T. Blejwas, SNL M. Perry, SAIC
CHAPTER 3-HYDROLOGY	AUGUST 17	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO W. Langer, USGS D. Roxie, USGS
CHAPTER 4-GEOCHEMISTRY	AUGUST 15	WG 2 Co-Chairmen: A. Matthusen, SAIC D. Livingston, WMPO D. Vaniman, LANL
CHAPTER 5-CLIMATE	AUGUST 19	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO D. Moore, USGS
CHAPTER 6-REPOSITORY	AUGUST 11	WG 5 Co-Chairmen: J. Waddell, SAIC J. Robson, WMPO A. Dennis, SNL
CHAPTER 7-WASTE PACKAGE	AUGUST 9	WG 5 Co-Chairmen: J. Waddell, SAIC J. Robson, WMPO D. Emerson, LLNL R. Morissette, SAIC

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SECTION/CHAPTER	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
CHAPTER 8		
8.1	AUGUST 22	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WMPO
8.2	AUGUST 22	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WMPO
8.3.1	AUGUST 22	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WMPO J. King, SAIC (WG 8 Co-Chairman) S. Sinnock, SNL (WG 8 Co-Chairman)
8.3.1.2-GEOHYDROLOGY	AUGUST 25	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO D. Roxie, USGS W. Langer, USGS
8.3.1.3-GEOCHEMISTRY	AUGUST 16	WG 2 Co-Chairmen: A. Matthusen, SAIC D. Livingston, WMPO D. Vaniman, LANL
8.3.1.4-ROCK CHAR.	AUGUST 26	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WMPO M. Perry, SAIC E. Hardin, SAIC C. Throckmorten, USGS
8.3.1.5-CLIMATE	AUGUST 19	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO D. Moore, USGS

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SECTION/CHAPTER	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
8.3.1.6-EROSION	AUGUST 18	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO
8.3.1.7-DISSOLUTION	AUGUST 16	WG 2 Co-Chairmen: A. Matthusen, SAIC D. Livingston, WMPO
8.3.1.8-POSTCLOS. TECT.	AUGUST 16	WG 4 Co-Chairmen: T. Grant, SAIC R. Levich, WMPO R. Fox, USGS
8.3.1.9-HUMAN INTERF.	AUGUST 16	WG 2 Co-Chairmen: A. Matthusen, SAIC D. Livingston, WMPO S. Mattson, SAIC
8.3.1.10-POP. DENSITY	TBD	MINOR REVISIONS TBD
8.3.1.11-SITE OWNERSHIP	TBD	MINOR REVISIONS TBD
8.3.1.12-METEOROLOGY	AUGUST 18	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO M. Jablonski, SAIC
8.3.1.13-OFFSITE INSTALL.	AUGUST 16	WG 4 Co-Chairmen: T. Grant, SAIC R. Levich, WMPO S. Woolfolk, SAIC
8.3.1.14-SURF. CHARACT.	AUGUST 19	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WMPO M. Sublette, SAIC

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SECTION/CHAPTER	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
8.3.1.15-THERMAL/MECH. PROPERTIES	AUGUST 19	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WMPO R. Zimmerman, SNL
8.3.1.16-HYDROLOGY	AUGUST 18	WG 1 Co-Chairmen: D. Goings, SAIC U. Clanton, WMPO
8.3.1.17-PRECLOS. TECT.	AUGUST 16	WG 4 Co-Chairmen: T. Grant, SAIC R. Levich, WMPO R. Fox, USGS J. King, SAIC
8.3.2-REPOSITORY	AUGUST 12	WG 5 Co-Chairmen: J. Waddell, SAIC J. Robson, WMPO A. Dennis, SNL
8.3.3 & 8.3.5.11 SEALS	AUGUST 12	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WMPO J. Fernandez, SNL M. Ahagen, WMPO
8.3.4-WASTE PACKAGE	AUGUST 10	WG 5 Co-Chairmen: J. Waddell, SAIC J. Robson, WMPO W. Glassley, LLNL R. Morissette/D. Stahl, SAIC

SECTION/CH	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
8.3.5.1 - 8.3.5.5 RAD. SAFETY & RETRIEVABILITY	AUGUST 12	WG 5 Co-Chairmen: J. Waddell, SAIC J. Robson, WHPO A. Stevens, SNL W. Andrews, SAIC
8.3.5.6, 8.3.5.7 HLP	AUGUST 22	Integration Group: R. Gamble, Weston J. Danna, Weston
8.3.5.8-POSTCL. PA OVERVIEW	AUGUST 23	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO J. Yeager, SNL S. Adams, SAIC
8.3.5.9 & 8.3.5.10 CONTAINMENT & ESS	AUGUST 10	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO S. Adams, SAIC W. O'Connell, LLNL D. Stahl, SAIC
8.3.5.12 GWTT	AUGUST 24	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO S. Adams, SAIC E. Klavetter, SNL
8.3.5.13-8.3.5.15 TOTAL SYSTEM, GW PROTECTION, DOSE TO MAN	AUGUST 23	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO U. Park, SAIC M. Tierney, SNL D. Livingston, WHPO
8.3.5.16-PERF. CONF.	AUGUST 12	Integration Group: R. Gamble, Weston T. Zvoda, SAIC R. Cruscinski, Weston

SECTION/CHAPTER	WORKSHOP DATE	SUGGESTED PROJECT ATTENDEES
8.3.5.17-NRC SITING CRIT.	AUGUST 23	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO
8.3.5.18-HLP	AUGUST 22	Integration Group: R. Gamble, Weston J. Danna, Weston
8.3.5.19-8.3.5.20 ANALY. TECHNIQUES/ VALIDATION	AUGUST 22	WG 6 Co-Chairmen: M. Pendleton, SAIC D. Dobson, WHPO D. Livingston, WHPO D. Noxie, USGS
8.4-SITE PREPARATION	AUGUST 29-31	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WHPO M. Voegele, SAIC (WG 7 Co-Chairman) J. Tillerson, SNL (WG 7 Co-Chairman) E. Hardin, SAIC E. Klavetter, SNL D. Irby, WHPO
8.5-SCHEDULES	AUGUST 25	Integration Group: J. Younker, SAIC C. Biddison, SAIC V. Iorii, WHPO C. Garvin, SAIC
8.6-QA	AUGUST 19	Workshop Co-Chairmen: S. Metta, SAIC J. Blaylock, WHPO
8.7-DECONT. & DECOMM.	AUGUST 29	WG 3 Co-Chairmen: C. Stewart, SAIC W. Hughes, WHPO

① Future meeting about NRC's list of ESF open items

② July 18,19 briefing did not alleviate NRC's concern about inadequacy of DOE ESF design process

③ NRC's wants an identifiable entity (not design team) responsible for ensuring & verifying 10CFR60 reqmts are incorp'd into design. Called a Significant Weakness.

④ GRD, Ap E is not adequate to demonstrate that the ESF design incorp's 10CFR60 implicit & explicit reqmts.

⑤ NRC's wants final design details 2-3 mos (Oct/Nov) before SCP, if DOE expects to receive their comments in March '89 for an ESF start of Jun '89

⑥ A decision about penetration by ES-1 into Calico Hills has been deferred until evaluation of benefits vs risks has been completed & consultation with NRC has occurred

⑦ 8.4 will provide justification for separation distance between ES-1 & ES-2

⑧ NRC questions adequacy of DOE approach for evaluating interference between tests caused by construction. If we want their comments by March '88, they need this info before SCP release

⑨ NRC's states analyses underway by DOE are too limited & do not include the complete range of scenarios affecting the site for 10,000 yrs

⑩ NRC questions the QALAS for ESF.

NRC does not have confidence that the DOE design process is adequate for QA level I

1

(12) NRC expects to review revisions to DOE's/GRD before reaching closure over ESF design process

NRC wants to review DETAILS of Title II design & spec's before commenting about ESF design.

(14) DOE agreed to put Title II design details in SCP

(15) NRC needs other details of design (see 1983 letter NRC/Coplan to DOE/Vieth) 2 mos before SCP is released in order to give DOE Comments in March '88

(16) DOE agreed to provide a current version of SDRD & all outstanding ECR's

(17) NRC emphasizes need to collect data about Calico Hills

(18) NRC feels that the approach DOE has taken about test-to-test interference is satisfactory.

(19) NRC feels that the approach DOE has taken about Construction-to-test interference is not satisfactory. Get construction personnel and P.I.'s involved.

(20) NRC wants latest draft of analysis of shaft location

(21) NRC feels DOE approach is too limited for analysis of impact of ESF on repository perform Consider a complete range of scenarios affecting repos over 10,000 yrs. Consider SCENARIOS in S.3.E.13 as a starting point.

(22) NRC's wants proof that the prelim perf assess is BOUNDING or parameters are not SENSITIVE for the ESF impact on repos perf.

(23) NRC's concerned with DOE using .5mm/yr flux

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SUMMARY OF DOE/NRC MEETING
ON EXPLORATORY SHAFT FACILITY
July 18-19, 1988
Rockville, Maryland

Agenda: See Attachment 1

List of Attendees: See Attachment 2

Summary:

The objectives of the meeting were: 1) for DOE to explain how their Exploratory Shaft Facility (ESF) design process considers and implements the requirements of 10 CFR Part 60, and 2) for DOE to respond, to the extent practicable at this time, to NRC concerns related to the ESF, in particular objections 2, 3, and 4 to the Consultation Draft Site Characterization Plan (CDSCP). Also, as a result of the July 7, 1988 NRC/DOE meeting on Quality Assurance (QA) open items, where it was agreed that QA level assignments for ESF design and construction would be discussed at this meeting, the DOE made a presentation concerning the assignment of QA levels for ESF design and construction. All NRC and DOE presentation materials are included as part of this meeting summary as Attachments 3-13. The ultimate purpose of these presentations was to provide a basis for NRC and DOE to discuss and reach agreement on approaches to and schedules for resolution of the NRC concerns with respect to the ESF.

In opening the NRC presentations, the NRC provided a list of ESF open items (Attachment 3) which have resulted from meetings with the DOE since 1983. Both parties agreed that some of the items on Attachment 3 had been closed. The NRC suggested that a meeting be held to discuss closure of the remaining items. The DOE agreed to meet on the topic and suggested that discussion of these open items be held in conjunction with the meeting on DOE's plans to revise the Site Characterization Plan (SCP) in response to NRC's objections, comments, and questions made on the CDSCP. (1)

NRC presented their major concerns regarding consideration of 10 CFR Part 60 requirements in design, that is, that it did not appear that the DOE had systematically reviewed, considered, and incorporated 10 CFR Part 60 in the design process for the ESF. See Attachment 4. The DOE presented the organization and structure of its design efforts, including use of the Interface Control Work Group (ICWG) to control design interfaces, and use of the ICWG and engineering change requests to control design changes. The NRC indicated that the DOE presentation did not alleviate the NRC concerns about the DOE ESF design process. In particular, NRC noted that there is not one specific and identifiable entity responsible for ensuring and verifying that 10 CFR Part 60 requirements are considered and incorporated into the ESF design. The DOE also presented a matrix from the Generic Requirements Document, Appendix E, which related design requirements to 10 CFR Part 60 (Attachments 5 and 6). The NRC noted that the matrix should be more accurate and complete in spelling out the 10 CFR Part 60 requirements that apply to various portions of the ESF and expressed interest in further review and discussion of such an expanded matrix. (2) (3) (4)

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In a separate matter related to the design process, DOE presented a schedule showing final ESF design due to be completed in March 1989. NRC pointed out that if DOE hopes to obtain NRC comments on the ESF in March 1989 and begin construction in June 1989, NRC must have final design details relevant to safety or waste isolation for review two to three months prior to release of the SCP (currently scheduled for December 1988). (5)

Regarding Objections 2, 3, and 4, the NRC summarized their concerns, as indicated in the NRC point papers. See Attachment 4. Concerning Objection 2, the DOE stated their position is to construct both shafts to a depth of approximately 1100 feet. The ES-1 will not penetrate the Calico Hills unit; however, the design of the facility will remain flexible enough to support drilling and testing in the Calico Hills, if necessary. Alternate methods of characterizing the Calico Hills were discussed. A decision about penetration by ES-1 into the Calico Hills has been deferred until evaluation of benefits vs. potential risks has been completed and consultation with the NRC has occurred. (6)

DOE's presentation concerning potential interferences of testing in the ESF with each other or of ESF construction operations with testing in the shafts (NRC Objection 3) indicated that work to resolve this objection is in process and will be provided in full in Section 8.4 of the SCP. The process to respond to the objection, including formation of a working group to revise Section 8.4 of the SCP, was discussed. Both the NRC and the DOE agreed that the process for selecting the separation distance between the shafts was important. DOE will provide justification that the configuration presented in Section 8.4 will not result in significant interference effects. The NRC continued to be concerned about the adequacy of the proposed approach for evaluating test interferences from construction operations. The NRC expressed the need to review the ESF portions of the SCP prior to reviewing the final SCP if ESF-related comments are to be provided to DOE three months after release of the SCP. The DOE indicated that a mechanism for informal review prior to releasing the SCP will be examined. (7) (8)

The DOE's presentation on Objection 4, the shaft location and the potential for flooding and erosion at that location (see Attachment 12), included a status report of analyses underway to respond to this objection. The analyses underway include an evaluation of infiltration around the shaft, sealing concepts, and performance considerations. The methodology employed to select the shaft locations, the calculation of the probable maximum flood, and the bounding cases for surface and subsurface inflow to the ESF were discussed at length. The NRC expressed concern that these analyses currently underway are too limited in that they do not take into account the complete range of scenarios that can affect the site over the 10,000 year life of the repository. Conclusions from these analyses will be documented in the SCP (Section 8.4) and in the Exploratory Shaft Performance Analysis Report (SAND85-0598). The NRC requested an update copy of this report in draft. (9)

The NRC summarized its concern over the process by which DOE assigns QA levels for ESF design and construction activities. See Attachment 5. The DOE gave a presentation on the QA level assignments for the design and construction of the ESF (Attachment 13). This included some background on how QA levels are assigned, current status of QA level assignments, justification for QA level assignments with examples, and plans for incorporating Q-List requirements. NRC and the state raised several questions regarding the process used to assign (10)

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quality levels to particular items, activities, and documents. Specifically, NRC indicated it still did not have confidence that there is in place a design process that assures items or activities related to safety or waste isolation are quality level I. (NRC Closing Statements/Observations) (11)

ESF Design Process

The ESF design process as presented by DOE does not ensure that 10 CFR Part 60 requirements are considered and incorporated into the ESF design. In particular, the lack of a specific and identifiable entity responsible for assuring that 10 CFR Part 60 requirements are considered in the development of the design and then for verifying that those requirements have in fact been incorporated into the design is a significant weakness in the overall ESF design process. (2) (3)

The guidance with respect to 10 CFR Part 60 requirements in Appendix E of DOE's Generic Requirements document is inadequate. The guidance needs to spell out more accurately and completely what parts of 10 CFR Part 60 apply to the various aspects of the ESF. DOE mentioned during the discussion that it has improvements in Appendix E being developed. NRC would expect to review those revisions as part of reaching closure on the NRC concern regarding the DOE ESF design process. (4) (12)

The current DOE schedule for the ESF calls for completion of the Title II (final) design in March 1988. The SCP is scheduled to be released in late December 1988. In recognition of the fact that NRC will need to review all details of the Title II design and specifications relevant to radiological health and safety and to waste isolation prior to issuing its comments on the ESF, DOE committed to including those details in the SCP. However, NRC will need those details, as well as other key materials supporting the ESF design, at least two months prior to release of the SCP if NRC is to be able to provide comments on the ESF to DOE three months after release of the SCP. The agreement for such an expedited review of the ESF has been clearly predicated on early receipt by NRC of such information. (13) (15)

10 CFR PART II in SCP

The NRC needs to receive a copy of the Subsystem Design Requirements Document (SDRD) and the Engineering Change Requests (ECR.) modifying that document. DOE has committed to supplying those materials to NRC. (16)

COSCP Point Paper Objection 2—Penetration of the Calico Hills Unit

DOE's approach to the NRC objection relating to penetration of the Calico Hills unit appears satisfactory. It is NRC's understanding that DOE does not currently plan to penetrate the Calico Hills unit with the exploratory shaft, and that if DOE does later decide it does wish to penetrate the Calico Hills unit, it will do an impact analysis of that activity upon the waste isolation capability of the site. NRC would expect to review that analysis prior to DOE's going ahead with the penetration of the Calico Hills unit. NRC wishes to emphasize that data on the Calico Hills unit are needed, and that its concerns regarding penetration of the Calico Hills unit should not be construed to mean that DOE does not need to gather information on that unit. When DOE formally transmits their position on penetration of the Calico Hills unit to NRC, closure can be reached on this objection. (6) (17) (6)

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CDSCP Point Paper Objection 3--Potential Test Interferences

The approach and analyses proposed to treat the NRC concern regarding potential interference of one test with another appear satisfactory. On the other hand, an adequate approach to the concern about potential interference of construction operations with testing seems lacking. In developing such an approach, NRC recommends that the input of construction operations personnel and test principal investigators be specifically solicited. (18) (19)

Performance confirmation testing to be started during site characterization needs to be described in the SCP in sufficient detail that potential interferences involving that testing can be evaluated. Part 60 also requires seal testing to begin during site characterization. That testing must also be described in the SCP so that potential interferences can be evaluated. DOE mentioned that it will address both of these topics during the CDSCP point paper response meeting tentatively scheduled for August 1988.

CDSCP Point Paper Objection 4--Shaft Location

The NRC did not have the draft performance analysis that formed the basis for the DOE presentation on analysis of shaft locations. The most current draft available of that analysis should be provided to NRC. (20)

Based on DOE's presentation, NRC is concerned that DOE is taking too limited an approach to the analysis of the impact of the ESF on repository performance. In doing the bounding analyses for the impact on waste isolation of locating the exploratory shafts at their proposed sites, DOE needs to consider the complete range of scenarios that may affect the repository site over the next 10,000 years, evaluate how those scenarios may effect the ESF, and analyze, in turn, whether the site would be significantly affected by the ESF. DOE should consider the list of scenarios presented in Section 8.3.5.13 of the CDSCP as a starting point for the analysis, and further develop that list keeping in mind the NRC comments on that section of the CDSCP. (21) (21)

As presented, the DOE treatment of preliminary performance assessments during the ESF design stage recognized the need to provide assurance either that the analyses are really bounding analyses or that for particular parameters where that is not the case the analyses are not sufficiently sensitive to those parameters for that to be a problem. However, NRC is concerned about DOE's implementation of this approach. For example, DOE has used 0.5 mm/year as an upper bound estimate of average flux for the performance assessments even though this value has been questioned by both the NRC staff and the State of Nevada for some time. (22) (23)

Quality Level Assignments for the ESF

The concern was expressed by NRC at the beginning of the meeting that there is not an adequate design process in place to assure that appropriate quality levels are being assigned to ESF design and construction activities. The DOE presentation on the process currently in place to assign quality levels to those activities did not alleviate the NRC concern. Specifically, the staff still does not have confidence that there is in place a design process that assures items or activities related to safety or waste isolation are quality level I. Further meetings or discussions will be needed to reach agreement on an approach and schedule for resolution of this concern. (2) (2) (11)

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ESF Open Items

The NRC has proposed that a meeting be scheduled in the near future to discuss an approach to closure of each ESF open item and a schedule for closure. DOE proposed to have such a meeting in conjunction with the CDSCP point paper response meeting tentatively scheduled for August 1988. The NRC agrees that August is acceptable for scheduling the meeting. However, if the CDSCP point paper meeting is delayed, the NRC feels that the meeting on ESF open items still needs to be held in August. (1)

List of DOE Documents Requested

A list of DOE documents that NRC needs to receive from DOE is attached to this meeting summary. See Attachment 14.

DOE Closing Statements/Observations:

Statements by M. Frei, DOE

The objective of the meeting was for DOE to describe the ESF design process, discuss NRC point paper Objections 2, 3, and 4, and to describe the approach for QA level assignments for the ESF. The material presented was of a preliminary nature and has not been reviewed or completed. DOE believes it has an adequate design process in place through the Engineering Change Request process, the ICRB and Working Group 7. DOE recognizes the deficiencies in Appendix E of the Generic Requirements Document and will be checking that process to ensure proper implementation of 10 CFR Part 60 requirements.

With respect to NRC Objection 2, there is agreement on the approach not to penetrate the Calico Hills unit with the exploratory shaft and therefore this objection is ready to be brought to closure. However, DOE recognizes the need to get information on the Calico Hills unit, and will assess the risks and benefits associated with penetrating the unit with the exploratory shaft. Regarding Objections 3 and 4, DOE feels it is on the right track, but will go back and look at other scenarios. DOE will address the objections as the design progresses.

DOE believes that the DOE list of ESF open items should be the same as the NRC list distributed at the meeting. Open items discussions could be correlated with point papers response meetings, and most open items could be dealt with before SCP issuance.

On QA level assignments, NRC comments have been noted and concerns are being seriously considered. DOE will come forward with a QA program to give both NRC and DOE confidence in the program.

State of Nevada Closing Statements/Observations:

The State of Nevada participated in the discussions throughout the meeting. No closing statements were received from the State, or other interested parties.

Attachment 14

DOE DOCUMENTS REQUESTED BY NRC IN CONJUNCTION WITH THE JULY 18-19, 1988 NRC/DOE ESF MEETING

- Subsystem Design Requirements Document (SDRD) and all updates
- Current draft of SAND85-0598, "Analyses to Evaluate the Effect of the Exploratory Shaft on Repository Performance of Yucca Mountain"
- Impact Analysis (cited as to be completed August 15, 1988 on page 16 of T. Hunter package)
- Test Requirements for ESF Experiments (cited as complete on page 7 of J. Tillerson package concerning NRC CDSCP Objection 3)
- Layout Constraints to Working Group 7 (cited as complete on page 7 of J. Tillerson package concerning NRC CDSCP Objection 3)
- ESF Fluids and Materials Study (cited as in press on page 5 of J. Tillerson package concerning NRC CDSCP Objection 4)
- Evaluation Supporting SCP Section 8.4 (cited as in progress on page 5 of J. Tillerson package concerning NRC CDSCP Objection 4)
- ESF Title I Design Report (when complete)
- Report on Effects of Ventilation on Drying of Rock (referenced in presentation by T. Hunter)

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RT Pritchett	REECO	702-295-6678
Dick Coppage	F&S	794-7986
Don Clark	Sandvik RockTools	703-669-8223

LANG EXPLORATORY DRILLING
A DIVISION OF Longyear
2286 WEST 1500 SOUTH • SALT LAKE CITY, UTAH 84104

STANDARD EQUIPMENT
DEEP HOLE REVERSE CIRCULATION
3,000 FOOT CAPACITY*

DRILTECH DH-1 TOP HEAD ROTARY DRILL

Compressor		-	900 cfm @ 300 psi	
Rotational torque		-	up to 100,000 in lbs.	(1130 Nm)
Feed Length		-	34 ft. 0 in.	(10.35 m)
Pulldown		-	30,000 lbs.	(13,620 Kg)
Pullback		-	90,000 lbs.	(40,910 Kg)
Dimensions	Length	-	49 ft. 9 in.	(15.17 m)
	Width	-	8 ft. 0 in.	(2.44 m)
	Height	-	14 ft. 0 in.	(4.27 m)
Weight		-	76,000 lbs.	(34,500 Kg)

CRANE - WINCH TRUCK

Tandem axle flat bed

Hydraulic crane	-	18,000 lbs. capacity 50 ft. reach
Winch	-	80,000 lbs.

This truck is used for moving drill rod, compressors,and miscellaneous equipment. It could be used for hauling water if needed.

AUXILIARY COMPRESSOR

Sullair screw type - 900 cfm @ 350 psi
Skid mounted

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STANDARD EQUIPMENT
DEEP HOLE REVERSE CIRCULATION
3,000 FOOT CAPACITY*

BOOSTER UNIT

Joy WB 12 - Up to 1,400 psi
Skid mounted

PARTS VAN

Single axle truck equipped with 20' box container. This equipped with welder, oxygen - acetylene torch, workbench, grinder, assorted power tools, and various hydraulics, and spare equipment parts.

CREW TRANSPORT

4 Wheel Drive - 1 Ton Pickup
250 gallon fuel transport tank

* Hole depths are dependent on ground conditions and drilling tools used.

Gilt Edge Project
Lead, S.D.

Geology

Upper formation

1. Sediments - Quartz, Hornfelds
   Thermally Metamorphosed

Lower formation

1. Precam. schistose
2. Tertiary intrusive porphory

Hole depth avg. 1500 ft.

Vertically extensive fractures (varied loc.)

Water flows at depth 90 - 130 gpm

Operating pressure at depth 600 - 800psi

Penatration Rates Avg. 32 ft./hour

Goldstrike Project
Carlin Trend
Carlin, NV

Geology

Upper formation
1. Siltstone
2. argillites

Lower formation
1. Limestone
2. Diorites (intrusive)

all of above thermally altered

Hole depth 1700 - 2600 ft

Water flows 130 to 170 gpm

Operating Pressurs 900 - 1100 PSI

Penetration Rates 14 ft per hour avg.

Advantages

1. " self casing hole"
2. Lost circulation control
3. wireline core thru inner tube
4. Large sample chip size w/ rotary
5. Speed
6. Low cost per foot

Disadvantages

1. set up cost high
2. dust control could be problem

Aamodt/Newsom
1-15-88
SUBJECT: UPDATE OF INFORMATION FOR A DEEP ODEX EXPLORATORY HOLE

OVERVIEW

A dry drilled hole can be successfully drilled to 1500' depth using the telescoping ODEX method.

It would take approximately 12 weeks after plans, permits, and approvals to procure, prepare site, mobilize, and drill the hole.

The cost would be approximately $800,000 for primary materials and drilling.

ROUGH DRAFT

To: Paul L. Aamodt
Chairman, ESTP Committee
Los Alamos National Laboratory

From: Jon Newsom
Newsom Industries/Los Alamos

January 14, 1988

SUBJECT: UPDATE OF INFORMATION FOR A DEEP ODEX EXPLORATORY HOLE

This document is in response to your request for information regarding a deep exploratory ODEX hole drilled vertically on Yucca Mtn.. It briefly addresses ODEX system parameters and system air requirements, previous ODEX experience on Yucca Mtn., the potential problems that may be encountered and possible solutions, anticipated range for hole deviation, likelihood for successfully completing the hole, other concerns and comments, estimated time and costs, and two scenarios for the technical drilling approach.

My first look into this matter was in June of 1984. Dale Hammermeister (USGS) wanted to ODEX approximately 1500' vertically. Upon learning that the ODEX 215 was being built, the idea of telescoping succeedingly smaller casing sizes to achieve his desired depth was developed. He proposed to telescope UZ-6A and UZ-8.

ODEX SYSTEMS

Atlas Copco currently has at least 11 different sizes for use with down-the-hole hammers. Mr. Kjell-Ove L. Jansson, an engineer and product designer from Sandvik in Sweden, has discussed with me their willingness to develop a system as large as 32" or 36" for the very large Ingersoll Rand DHD 124 or DHD 130 hammers.

For down-the-hole hammers, there are 6 commercial on-the-shelf ODEX sizes and one very large semi-commercial size that could be used on Yucca Mtn. We can use several combinations of these depending on the minimum hole or core size needed at total depth.

Below in Table I is a list of commonly available sizes and how they might telescope together.

TABLE I

ODEX Model	Casing Size (inches) O.D.	I.D.	Shoe ID (inches)	Pilot Bit (inches)	Diameter of Reamed Hole(inches)	COST($)	AVAILABLE
90	4 1/2	4	3 1/2	3 11/32	4 13/16	* 6,500	(On shelf)
115	5 1/2	5 1/16	4 9/16	*4 1/2	6	9,000	At NTS
140	6 5/8	6 1/8	5 9/16	5	7 3/8	11,000	(On shelf)
165	7 5/8	7 1/8	6 9/16	6	8 11/32	13,000	At NTS
190	8 5/8	8	7 9/16	6 1/2	*9 3/8	15,000	(On shelf)
215	10	9 1/2	8 9/16	8 1/4	10 15/16	17,000	At NTS
240	10 3/4	N/A	*9 9/16	*9 3/8	N/A	13,247+ plus dth	(2-3 Months)
310	14	N/A	12 3/16	*12	N/A	35,435+ plus dth	(2-3 Months)
365	16	15 1/4	*14 3/4	*14 3/8	N/A	70,000	(On shelf)
610	26	N/A	*24	*23	N/A	106,000+ plus dth	(2-3 Months)
700	30	N/A	27 9/16	*27	N/A	*139,700+ plus dth	(2-3 Months)
Poss-ible	32	N/A	N/A	N/A	N/A	N/A	(Several Months)
Poss-ible	36	N/A	N/A	N/A	N/A	N/A	(Several Months)

* Approximate + dth = down-the-hole hammer

NOTE: N/A in Table I indicates measurements that are unavailable due to systems so new that engineering specifications have not yet been released.

If the inside lip of the casing shoe is milled out, we double the possible number of telescoping sizes.

TABLE II

EXAMPLE WEIGHTS OF CASING STRINGS:

Length	O.D.	Weight Per Foot	Total Weight
500'	10"	27# CASING	13,500#
1000'	7 5/8"	21# CASING	21,000#
1500'	5 1/2"	13# CASING	19,500#

- -

1000' of 4 1/2" OD DRILL ROD = approximately 17,500#

Rig would need to be able to handle at least 38,500#

- -

AIR VOLUME REQUIREMENTS

Air requirements depend on the diameter of the drill rods used, but REECo has sufficient compressors on the site. The minimum air velocity for effective cuttings removal is about 3000 feet per minute, and 7,000 feet per minute is ideal.

However, the extremely fractured formations of Yucca Mtn. use up much of this air. For example, UZ-6s seemed to have taken about half the injected air into the fractures.

The doubling of air volume cleaned the hole when necessary. The use of larger drill rod would have given us more efficient use of compressors, and also would have streamlined the air flow path.

NEEDED CFM TO ACHIEVE 7,000' PER MINUTE

			Normal	Double
ODEX 215	9 1/2" ID w/ 5 1/2" OD Drill Rod	=	2,100 CFM	4,200 CFM
	9 1/2" ID w/ 6 1/4" OD Drill Rod	=	1,900 CFM	3,800 CFM
ODEX 165	7" ID w/ 3 1/2" OD Drill Rod	=	1,400 CFM	2,800 CFM
	7" ID w/ 4 1/2" OD Drill Rod	=	1,100 CFM	2,200 CFM
	7" ID w/ 5 1/2" OD Drill Rod	=	600 CFM	1,200 CFM
ODEX 115	5" ID w/ 3 1/2" OD Drill Rod	=	490 CFM	980 CFM
ODEX 365	15" ID w/ 12 3/4 " OD Drill Rod	=	2400 CFM	

(I am not sure if this pipe exists at NTS.)

With the use of the larger sizes of drill rods, 2400 CFM will do the job adequately for the ODEX 115, 165, and 215 systems. In addition to compressed air, the vacuum system used on UZ-6 can be used as an assist on this hole and would help greatly.

TABLE III

DRILL RODS RECOMMENDED FOR EACH SYSTEM AND THE CORE BBLS AND RODS

System	Drill Rods	Suggested Core bbl
ODEX 90	3" +	NQ
ODEX 115	3", 3 1/4"	NQ or HQ
ODEX 140	4 1/2"	HQ
ODEX 165	4 1/2", 5 1/2"	HQ or larger
ODEX 190	4 1/2", 5 1/2"	HQ or larger
ODEX 215	4 1/2", 5 1/2", 6 5/8"	HQ or larger
ODEX 365	12 3/4" if available	HQ or larger

DRY DRILLING ODEX EXPERIENCE ON YUCCA MTN.

UZ-6s, 4/23/85

The largest diameter ODEX hole drilled on Yucca Mtn. is USW UZ-6s. The hole was started 4/23/85 using an ODEX 165 and intermittently cored with an oversized HQ core bit.

The hole (8 11/32" diameter) was drilled and cased with 7 5/8" O.D. casing to 494.5' and a 3.990" hole was then drilled on to 519'.

Total main-hole construction time was 18.34 days, however, several problems were encountered. Equipment modifications have greatly increased reliability and they should not be a problem on future drilling programs.

The average time to ODEX 20' was about 20 minutes and the average time to core was about 20' per day. Core was not continous from the top to the bottom-of-hole.

It was apparent that this hole could not have been dry drilled without advancing casing or some dual wall system. Both UZ-6 and UZ-6s are very highly fractured and normal circulation could not be maintained without large losses of fluid.

USW UZ13, 1/24/85

A 6" diameter hole (410') deep was ODEXed using the ODEX 115 system. 5 1/2" O.D. casing was run to 410' and 3.937" core was cut to 430'. Total main-hole construction time = 13.19 days. There were numerous problems with bits and casings. Several types and sizes of core bits were tried. Most of the problems encountered have been either eliminated by equipment modification or by changes in drilling programs.

POTENTIAL PROBLEMS

The ODEX systems are marketed to drill 350' to 400' each. The limitations of the system come about by accumulated friction on the casing as the hole is lengthened. The effective high-impact percussion energy needed to drill the hole and drive the casing is progressively reduced. This combination of high impact energy and drag on the casing can increase failure rates.

Other problems that have been encountered with ODEX drilling are the unscrewing of the pilot bit, wear and fatigue on bits, and the destruction of the internal driving lip of the casing shoe. Redesign of the pilot bit and guide device on the ODEX 115, ODEX 140, and ODEX 165 have remedied these problems and demonstrated that it is possible to successfully drill 400' to 500' holes on a routine basis.

The biggest problem currently facing deep ODEXing is casing breakage. This normally occurs either at the shoe joint or on a joint somewhere below a tight spot in the hole.

There are two methods of adding casings:

1) To weld each joint on to the next one, or

2) To use flush inside and outside left hand threaded joints.

On most small and medium ODEX systems the approach generally taken is to use threaded casings because it goes together easily, comes apart easily, and allows the casing to be used on other jobs, if desired. If a crooked hole is encountered the long straight-sided thread area does not hold up well where it is stressed as the casing rotates. Fatigue starts and this decreases its strength considerably. Threaded joints must also be pre-torqued properly to hold up to predicted stresses. A weld would have to be done to very high quality standards, and if the casing were removed it would have to be cut and reworked to get a straight edge for the next job. The yield strength of a 6 5/8" threaded joint grade is 73,000# while the welded joint has a yield of 195,000#.

Because of the ease of using threaded casing vs. welded casing, sometimes more chances are taken than necessary.

As an example, please see the drilling reports on UZ-6s, and UZ-13. For this reason I recommend that a deep hole at Yucca Mtn. use welded casings on all strings.

HOLE DEVIATION

Anticipated deviation of a deep ODEX hole is not expected to be significant and should be within 12' of the starting center-line of the hole. This would be <1° of deviation. However, if the hole alignment starts to vary too much, it can be realigned by directional drilling of the diamond core holes. This would be done with a gradual curve of adjustment to prevent stress or binding on the casing. Periodic surveys can be run to determine hole-direction.

A decision will need to be made regarding how much of the total depth needs to be cored. Continuous ODEX drilling of the hole would be much quicker than alternating the ODEX and coring operations. However, since the objective is to get as much information as possible, it may be best to try to core a full 20 feet or 40 feet ahead of the casing in areas of low fractures. This long core could, in itself, present a problem of hole deviation.

LIKELIHOOD OF SUCCESS

The probability of successfully completing this hole increases with the number of telescoping systems used in succession. By taking the position that each system has limitations, that a shoe joint or casing joint might break near the bottom, or that one size might bind up prematurely, the availability of several sizes to fall back on should get us to T.D.

CONCERNS

There are other concerns of project participants which merit study and attention.

1. That hole cleaning problems may result in failure to reach T. D.
2. That a failed attempt at drilling this hole might jeopardize this immediate area of the ESF Site.
3. That the final hole size may be too small for practical use or for stemming.
4. That bridging could occur when casings are removed.

ANSWER TO CONCERNS

1. Cleaning hole can be very difficult, but the use of air injector subs spaced in the drill string could assist up-hole velocity. The addition of a vacuum drilling system would help greatly. This was used to drill USW UZ-6 and should be used as an assist on deep ODEX.
2. The hole would be drilled dry and sealed as needed.
3. No stemming will be needed. Start with the largest hole possible and determine what, if any, stemming needs to be placed.
4. Although casing removal from this hole is not anticipated, bridging could be eliminated by stemming while removing casing.

SPACE REQUIREMENT

Drill pad size, rig, compressors, and pipe storage space could best be determined when the ODEX sizes are decided on.

ESTIMATED TIME AND COST

Hole Sizes and Primary Materials Costs for Two Possible Drilling Scenarios

Using the larger size scenario #2 provides greater size redundancy (i.e. safeguards) however, this would double the cost of materials. An estimated cost of $8,000 per shift for the rig, some rig support, and compressors was previously given during an ESF meeting when deep ODEX drilling was discussed.

Scenario #1			Scenario #2		
10" - ODEX 215	APX. $ 17,000		16" - ODEX 365	$ 70,000	
7 5/8" - ODEX 165	15,000				
5 1/2" - ODEX 115	9,000				
	41,000	41,000	Plus 3 other sizes	41,000	
				111,000	111,000

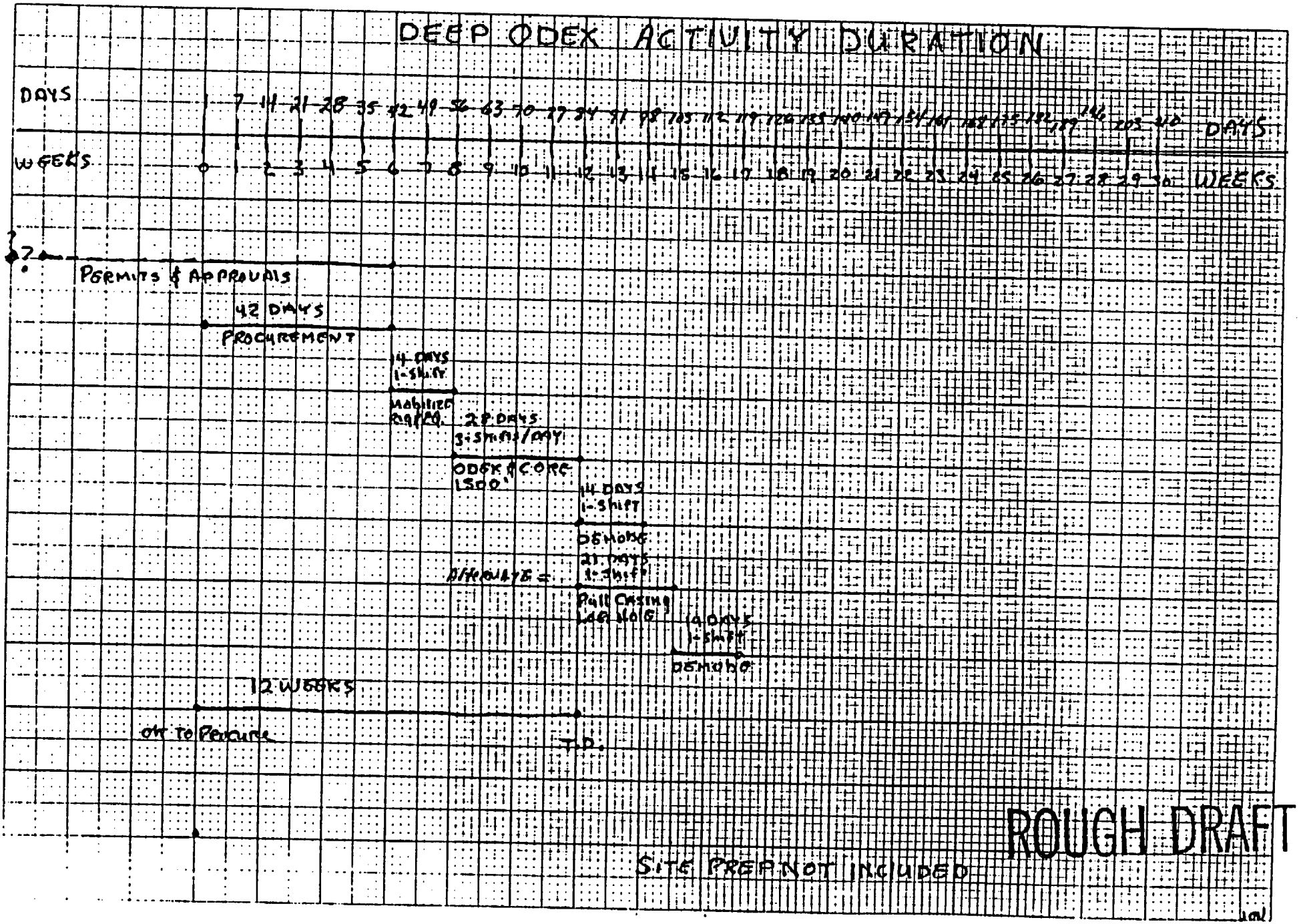
Casing for above sizes:

500' of 10"	= 5,500		16" Casing	= 10,000	
1000' of 7 5/8"	= 9,000				
1500' of 5 1/2"	= 5,500				
	20,000	20,000	Plus Smaller Casing	20,000	
				30,000	30,000

Scenario #1 Subtotal for ODEX systems with casing	61,000	Scenario #2 Subtotal for ODEX systems with casing	141,000
Time to alternate ODEX and Core 1500' is 90 shifts @ $ 8,000 ea	720,000		720,000
30 Core bits @ $ 450 ea	13,500		13,500
1 Core bbl. and accessories	3,000		3,000

Scenario #1		Scenario #2	
Approximate hole cost. Total	$ 797,500	Approximate hole cost. Total	$ 877,000

Scenario #1 is recommended.



CLASS XIII RIG SPECIFICATIONS

RIG: JOY 1 REECO NO. 85172

PRIMARY USE: DRILLING SMALL DIAMETER EXPLORATORY HOLES

DATE ACQUIRED: FEBRUARY, 1980 New ____ Used X

A. MAST:

1. Mast JOY, 58' HEIGHT
2. Height from Derrick Floor to Pipe Racking Platform 27'
3. Crown Block JOY 4 SHEAVE - 1 LARGE FOR SINGLE LINE
4. API Static Hook Load, lbs. 45,000 MAST / 33,900 REECo Safe Load Rating, lbs. 39,700 4-PART LINE / 26,000 2-PART LINE
5. REECo Safe Load Rating Limited by 2-PART, WIRELINE / 4-PART, 80% STATIC HOOK LOAD

B. DRAW WORKS AND ROTARY TABLE:

1. Draw Works JOY MODEL 225 AS
2. Traveling Block & Hook JOY 4 SHEAVE - 1 LARGE FOR SINGLE LINE
3. Hoisting Power CUMMINS MODEL 855 R, 235 HP
4. Type & Size Drilling Line 5/8", 6 X 19 SEALE, IWRC
5. Rotary Table HYDRAULIC CHUCK
6. Rotary Table Power CUMMINS MODEL 855 R, 235 HP

C. SUBBASE:

1. Maximum Hole Size that can be Drilled, in. 6-1/4"

CLASS XIII RIG SPECIFICATIONS

RIG: JOY 2 REECO NO. 85173

PRIMARY USE: DRILLING SMALL DIAMETER EXPLORATORY HOLES

DATE ACQUIRED: FEBRUARY, 1980 New ____ Used X

A. MAST:

1. Mast JOY, 38' HEIGHT
2. Height from Derrick Floor to Pipe Racking Platform 27'
3. Crown Block JOY 4 SHEAVE - 1 LARGE FOR SINGLE LINE
4. API Static Hook Load, lbs. 50,800 MAST 38,200 REECo Safe Load Rating, lbs. 43,800 4-PART LINE 26,000 2-PART LINE
5. REECo Safe Load Rating Limited by 2-PART, WIRELINE 4-PART, 80% STATIC HOOK LOAD

B. DRAW WORKS AND ROTARY TABLE:

1. Draw Works JOY 225 AT
2. Traveling Block & Hook FAILING 25 TON 4 - SHEAVE
3. Hoisting Power MACK TRUCK R-600
4. Type & Size Drilling Line 5/8", 6 X 19 SEALE, IWRC
5. Rotary Table HYDRAULIC CHUCK
6. Rotary Table Power MACK TRUCK R-600

C. SUBBASE:

1. Maximum Hole Size that can be Drilled, in. 6-1/4"

AUXILIARY RIG SPECIFICATIONS

RIG: CME-550 REECO NO. 85136

PRIMARY USE: DRILLING AND CORING SMALL DIAMETER EXPLORATORY HOLES

DATE ACQUIRED: APRIL, 1983 New ____ Used X

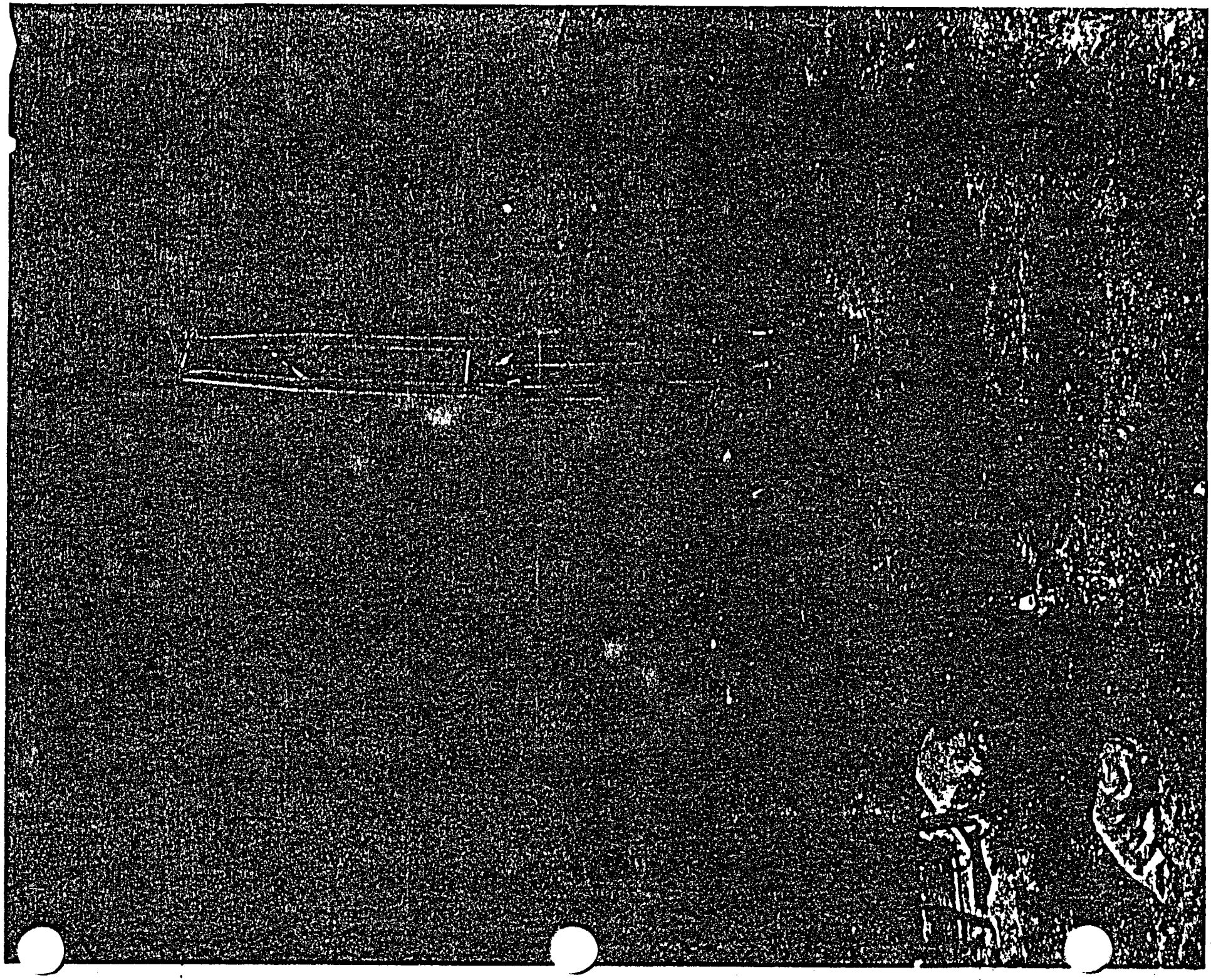
A. MAST:

1. Mast CME-550, 23' HEIGHT
2. Crown Block 1 - SHEAVE
3. API Static Hook Load, lbs. 6000 LBS REECo Safe Load Rating, lbs. ____
4. REECo Safe Load Rating Limited by ____

B. DRAW WORKS AND ROTARY TABLE:

1. Draw Works N/A
2. Hoisting Power FORD 192 CU.IN., 4-CYLINDER, 78 HP, 6000 LBS.
3. Type & Size Drilling Line 5/8", 6 X 19 SEALE, IWRC
4. Rotary Table HYDRAULIC CHUCK
5. Rotary Table Power FORD 192 CU.IN., 4-CYLINDER, 78 HP, 5-SPEED TRANSMISSION, 650 RPM

Maximum Hole Size that can be Drilled, in. 14"



CLASS III RIG SPECIFICATIONS

RIG: IDECO 37 REECO NO. 85116

PRIMARY USE: DRILLING SMALL DIAMETER EXPLORATORY HOLES

DATE ACQUIRED: JUNE, 1965 New X Used ____

A. MAST:

1. Mast IDECO GUYED TELESCOPING, 103' (MODEL NO. KM103-212G)
2. Height from Derrick Floor to Pipe Racking Platform 54'
3. Crown Block IDECO 5 SHEAVE
4. API Static Hook Load, lbs. 212K# WITH 8 LINES REECo Safe Load Rating, lbs. 170K#
5. REECo Safe Load Rating Limited by 80% STATIC HOOK LOAD

B. DRAW WORKS AND ROTARY TABLE:

1. Draw Works IDECO H-37ED, 400 HP
2. Brake NOT APPLICABLE
3. Traveling Block & Hook McKISSICK, 150 TON - 4 SHEAVE
4. Hoisting Power 2 GM 6-71, 350 HP
5. Type & Size Drilling Line 1", 6 x 19 SEALE, IWRC
6. Rotary Table IDECO 275, 27-1/2"
7. Rotary Table Power 2 GM 6-71, 350 HP

C. SUBBASE:

1. Subbase IDECO, SPLIT TRAILER MOUNT Elev. G.L. 11.30'
2. Outside Dimensions (LXW) ft. 16.8' x 20' Between Boxes, ft. 7.95' x 7.54'
3. Vertical Distance from G.L. to Bottom of Rotary Beams, ft. 8.65'
4. Maximum Hole Size that can be Drilled, in. 20"

Sub Base 45,000 #

Rig 110,000

12 x 60. 15' high

CLASS V RIG SPECIFICATIONS

RIG: HYCALOG II REECO NO. 85119

PRIMARY USE: DRILLING ANGLE POST SHOT HOLES

DATE ACQUIRED: SEPTEMBER, 1965 New X Used ____

A. MAST:

1. Mast HYCALOG TILTING 0 - 30°
2. Crown Block HYCALOG 4 SHEAVE
3. API Static Hook Load, lbs. 180,000 REECo Safe Load Rating, lbs. 144,000
4. REECo Safe Load Rating Limited by 80% STATIC HOOK LOAD

B. DRAW WORKS AND ROTARY TABLE:

1. Draw Works HYCALOG HH 6000
2. Traveling Block & Hook HYCALOG 3 SHEAVE
3. Hoisting Power CUMMINS NT 380 DIESEL, 380 HP @ 2300 RPM
4. Type & Size Drilling Line 1", 6 X 19 SEALE, IWRC
5. Rotary Table POWER SWIVEL, 10-3/4"
6. Rotary Table Power POWER SWIVEL
7. Brake ____

C. SUBBASE:

1. Subbase HYCALOG Elev. G.L. 4'
2. Maximum Hole Size that can be Drilled, in. 17-1/2"

DRY DRILLING AND CORING TECHNOLOGY WORKSHOP

AGENDA: Tuesday, July 26, 1988

Activity	Time
Introduction	
Welcome - W. Hughes, WMPO	8:00-8:05
Scope and Objectives - R. Long, SAIC	8:05-8:10
Introductions	8:10-8:20
Agenda - H. Perry, SAIC	8:20-8:30
Scientific Needs	
Unsaturated Zone Hydrology - J. Rousseau, USGS	8:30-9:00
Saturated Zone Hydrology - J. Czarnecki, USGS	9:00-9:30
Geology - R. Spengler, USGS, or representative	9:30-10:00
Geochemistry - A. Norris, LANL	10:00-10:30
Performance Assessment - C. Rautman, SNL/ E. Hardin, SAIC	10:30-11:00
Discussion	11:00-11:30
Lunch	11:30-12:30
NTS Experience and Capabilities	
Description of NTS Drilling Equipment - J. C. McDaniel, REECo	12:30-1:00
Overview of Drilling Systems Used at NTS - B. Garms, F&S	1:00-1:30
Reverse Vacuum Drilling Experience - M. Whitfield, USGS	1:30-2:00
ODEX Drilling Experience - J. Newsome, LANL, Consultant	2:00-2:30
G-Tunnel Prototype Drilling and Coring - J. Newsome, LANL, Consultant	2:30-3:00
Panel Discussion	3:00-4:30

DRY DRILLING AND CORING TECHNOLOGY WORKSHOP

AGENDA: Wednesday, July 27, 1988

Activity	Time
Industry Experience and Capabilities	
Dual-Wall Reverse Circulation Drilling - T. Boa, Drill Systems Inc.	8:00-9:00
Downhole Hammer (DHH)	8:00-8:30
Rotary Cone Coring w/Wireline Core Barrel	8:30-9:00
DHH Reverse Circulation Case History - R. Mayer, Lang Exploratory Drilling	9:00-9:30
ODEX Systems Case History - F. Zelinka, Atlas Copco	9:30-10:00
Panel Discussion	10:00-11:30
Lunch	11:30-12:30
NNWSI Project Closed Session	
Management Review and Recommendation for Prototype Drilling System	12:30-4:30
Develop a list of Drilling System Selection Criteria	12:30-1:30
Prioritize Drilling System Selection Criteria	1:30-2:30
Evaluate Each System Using the Priortized Criteria	2:30-3:30
Recommend a Drilling System for the Prototype Hole	3:30-4:30

Note: Each half hour presentation is intended to consist of a 20-min. talk followed by a 10-min. question and answer period.

VACUUM DRILLING OF UNSATURATED TUFFS AT A POTENTIAL RADIOACTIVE-WASTE REPOSITORY, YUCCA MOUNTAIN, NEVADA

Merrick S. Whitfield

U.S. Geological Survey
Denver, Colorado

Abstract

A vacuum reverse-air circulation drilling method was used to drill two 17½-inch (44.5-centimeter) diameter test holes to depths of 1,269 feet (387 meters) and 1,887 feet (575 meters) at Yucca Mountain near the Nevada Test Site. The site is being considered by the U.S. Department of Energy for construction of a high-level radioactive-waste repository. One of these two test holes (USW UZ-1) has been equipped with instrumentation to obtain a long-term record of pressure and moisture potential data; the other test hole (USW UZ-6) will be similarly instrumented in the near future. These investigations are being conducted as part of the Nevada Nuclear Waste Storage Investigations Project of the U.S. Department of Energy.

The test holes were drilled using a 5½-inch (14-centimeter) by 8 5/8-inch (22-centimeter) dual-string reverse-vacuum assembly. A vacuum, induced at the land surface, removed the drill cuttings through the inner string. Compressed air was injected into the dual-string annulus to cool the bit and to keep the bit and inner string clean. A tracer gas, sulfur hexafluoride (SF_6), was added to the compressed air for a later determination of atmospheric contamination that might have occurred during the drilling. After reaching the surface, the drill cuttings were routed to a dry separator for sample collection. Then return air and dust from the cuttings were routed to a wet separator where the dust was removed by a water spray, and the remaining air was exhausted through the vacuum unit (blower) to the atmosphere.

Advantages of using vacuum reverse-air circulation for drilling are: (1) Capability of obtaining continuous uncontaminated and representative rock samples, thus permitting a moisture profile to be made of the unsaturated volcanic rocks drilled, and (2) positive

identification of any perched-water zones. Disadvantages of using this drilling method are: (1) Need for more equipment and a larger drill site than for other drilling methods, (2) vacuuming action creates unstable hole conditions and causes frequent caving, and (3) methods need to be developed to obtain satisfactory cores.

Introduction

Vacuum drilling, or more specifically, vacuum reverse-air circulation, was first used in 1967 at the Nevada Test Site to drill an emplacement hole for underground nuclear testing. Since then, 10 emplacement holes and 2 test holes have been drilled using this method. Two years ago, the U.S. Geological Survey started using vacuum drilling in their hydrologic studies of unsaturated tuff at Yucca Mountain near the Nevada Test Site, one of the potential sites being considered as a repository for storage of high-level radioactive wastes. This investigation is part of the Nevada Nuclear Waste Storage Investigations (NNWSI) Project and is conducted in cooperation with the U.S. Department of Energy, Nevada Operations Office, under Interagency Agreement DE-AI08-78ET44802.

The primary objectives in drilling these large diameter test holes were to: (1) Obtain a vertical moisture-content profile of the rocks drilled, (2) check for the presence of perched-water zones, and (3) emplace hydrologic instruments at selected depths so that a long-term record of pressure and moisture-potential data could be collected. The unsaturated section in the Yucca Mountain area consists of nonwelded to densely welded tuff ranging in thickness from 1,500 to 2,500 feet (460 to 760 meters). The two test holes drilled in these unsaturated rocks are the major topic of this paper; location of these test holes is shown in Figure 1.

This unique method of drilling unsaturated rocks permits the detection of perched water or moist zones as soon as they are penetrated and prevents contamination of the unsaturated rocks with drilling liquids. In waste storage, knowledge of the chemistry of native pore water is important in designing canisters to contain radioactive wastes for long periods. Another essential reason for collecting hydrologic data from boreholes drilled in unsaturated rocks is determining whether in situ borehole conditions still exist after completion of a test hole. One way of doing this is to determine the presence or absence of atmospheric gas in the rocks adjacent to the borehole. Any atmospheric gas induced during the drilling process can later be detected if a tracer gas, such as sulfur hexafluoride (SF_6), is injected into the borehole during drilling. In order to obtain an accurate age determination of water from rocks, it is essential that they not be contaminated by present-day atmospheric gases such as carbon dioxide. Prior to instrumenting, the air in the test hole is vacuumed until all the tracer gas has been removed, assuring that only in situ gases are filling the rock pores.

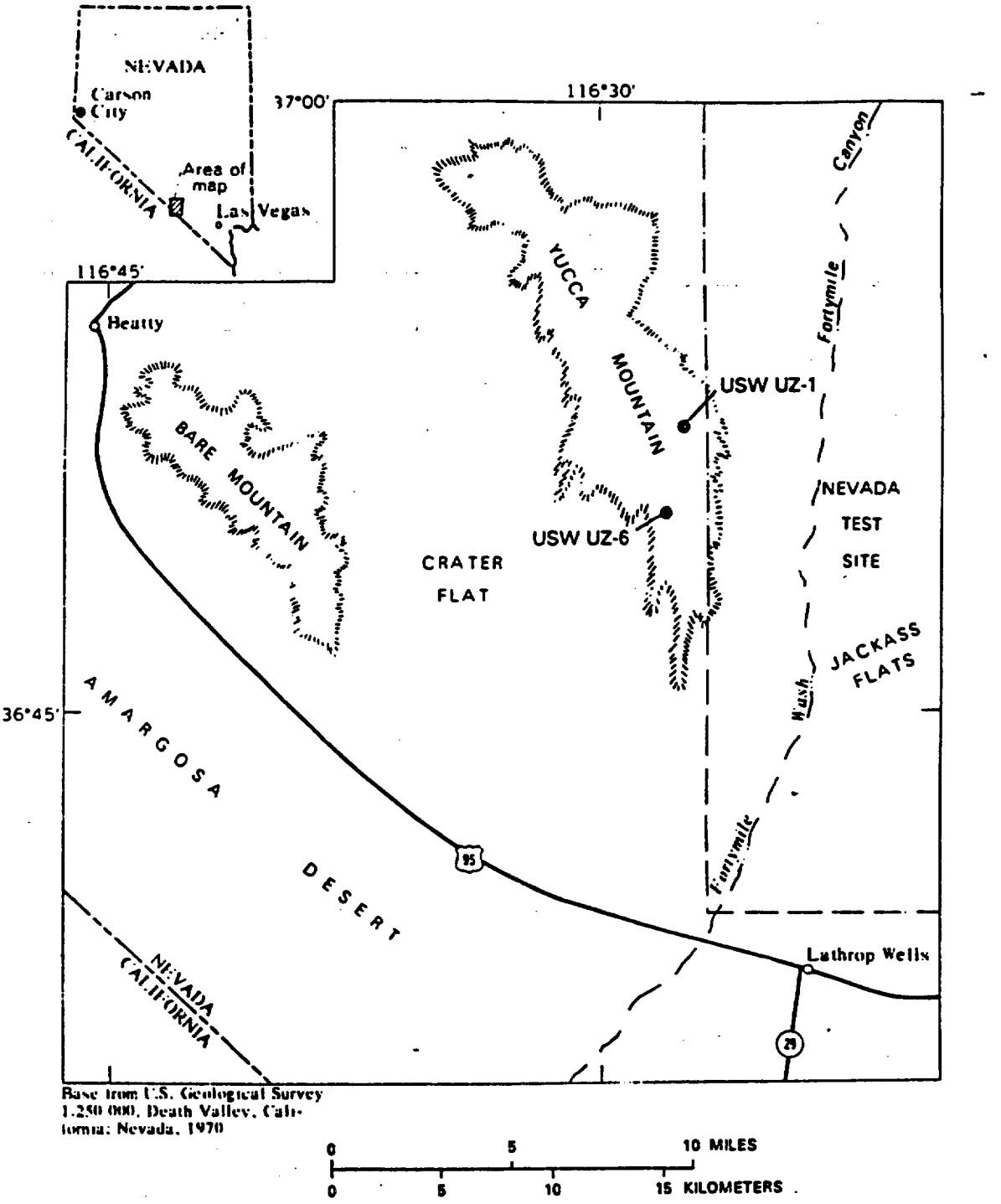


Figure 1. Location of test holes USW UZ-1 and USW UZ-6.

Drilling Procedures

The two test holes completed at Yucca Mountain for hydrologic studies of unsaturated tuff were drilled using a dual-string pipe with a 17½-inch (44.5-centimeter) modified rock bit. The inner string was 5½ inches (14 centimeters), and the outer string was 8 5/8 inches (22 centimeters) in diameter. A vacuum unit or blower located on the land surface created a suction in the inner string of the drill pipe that moved the drill cuttings from the bottom of the drill hole to the surface. From the inner string, the drill cuttings were routed via the kelly hose to a dry separator for sample collection. The dry separator contains two chambers that could be separated by a hydraulic slide gate, which prevents vacuum loss in the system. Drilling and sample collection can then be done simultaneously. When closed, the slide gate allows drill cuttings to accumulate in the upper compartment of the dry separator while drill cuttings are being collected from the lower compartment of the dry separator. A schematic diagram showing the arrangement of the separators and vacuum unit is given in Figure 2. After collecting samples for lithologic and hydrologic analysis, the remaining drill cuttings were vibrated out of the lower chamber of the dry separator and removed from this collecting point by a conveyor belt.

The dust particles that did not settle out in the dry separator were vacuumed to a wet separator where the dust was removed by a water spray, and the remaining clean vacuumed air was exhausted to the atmosphere through the vacuum unit and exhaust muffler. The water spray removed almost all the dust before it passed through the vacuum unit and exhaust muffler to the atmosphere.

One of the major advantages of using this method in drilling unsaturated rocks is that moist zones can be determined immediately from the returned drill cuttings during drilling. Another advantage of using vacuum drilling is that it requires no drilling liquids, so the natural state of rock liquids is minimally disturbed. In addition, natural hydrologic properties of the rock are not altered significantly by invasion of drilling liquids and can be determined more accurately in the laboratory.

Vacuum drilling has proven to be effective when used with 13 3/8-inch (34-centimeter) diameter drill pipe for drilling boreholes varying in diameter from 17½ to 104 inches (44.5 to 366 centimeters). Coring was attempted in the first test hole (USW UZ-1) but was unsuccessful because of the use of an inappropriate coring bit. In addition, the cores were heated to a high temperature by the dry coring; therefore, the moisture contents determined by laboratory analysis were considered erroneous. One problem in vacuum drilling is the slower drilling rate when rock moisture is greater than 5 percent by weight. In moist zones, plugging of the drill bit and encrustation of the inner string and kelly hose with a mud cake eventually restricts the flow of drill cuttings to the surface. When plugging occurs, drilling needs to stop or the drill bit will be buried in drill cuttings, and eventually it will become stuck. Drilling can be resumed only after the bit, inner string, and kelly hose are cleaned and dried by blowing dry compressed air through them.

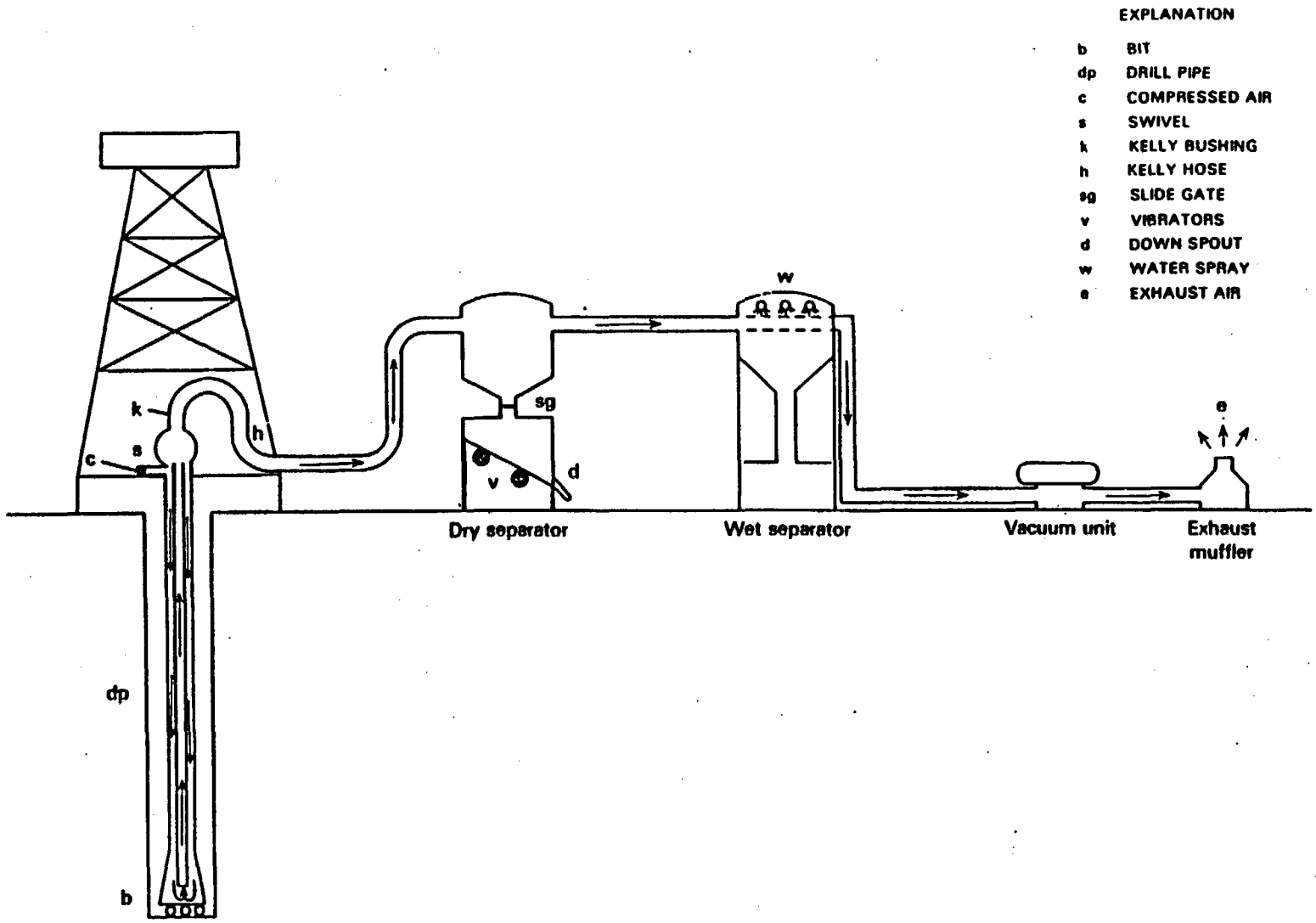


Figure 2. Schematic diagram of separators, vacuum unit, and exhaust muffler.

One solution to the plugging problem can be made if maintaining drilling rate is more important than collecting representative moisture samples. In this case, a measured quantity, less than 2 gallons (7.6 liters) per minute, of clean water can be injected through the outer string of drill pipe while drilling. A tracer of known concentration, such as lithium bromide or lithium chloride, when added to this drilling water will help determine approximately how much formation water has been encountered by periodically checking the concentration of this drilling water as it returns from the borehole. However, by using even this small quantity of drilling water, the ability to detect moist and perched-water zones will be limited. Two critical factors when adding water while drilling are: (1) Water needs to be shut off when drilling is not actually being done, and (2) quantity of water being added needs to be decreased when rock is very hard and the penetration rate is slow. If a head of water occurs above the drill bit, the bit will become submerged, and drill cuttings cannot be removed from the borehole by the vacuum. When this occurs, water in the borehole needs to be pumped out before drilling can be resumed.

Drilling of Test Hole USW UZ-1

The first large diameter test hole using vacuum drilling to collect hydrologic data from the unsaturated zone in the Yucca Mountain area was USW UZ-1. This test hole was drilled to a total depth of 1,269 feet (387 meters). Drilling was discontinued at this depth, because a large volume of water was encountered, and the water level could not be lowered significantly. Thus, the entire unsaturated section, which is about 1,540 feet (470 meters) thick at this location, was not penetrated. There are two possible explanations for the presence of this water:

1. All of this water may be contamination from a geologic test hole (USW G-1) located 1,000 feet (305 meters) to the southeast of test hole USW UZ-1. Approximately 2,300,000 gallons (8,700,000 liters) of polymer drilling fluid were lost in the drilling and coring of USW G-1. A chemical analysis of the water from USW UZ-1 indicated that the polymer was identical to that found in USW G-1. A major fracture zone probably exists between these two test holes that may have provided hydrologic connection between the two holes;

2. A naturally occurring perched-water zone also may have been encountered at this depth; this zone definitely is contaminated with drilling polymer that was used to drill USW G-1.

With the possible exception of perched water in the bottom of this test hole, no perched-water zones were encountered in the upper part. A profile of the geologic units penetrated and the moisture content (by weight) of these rocks are shown in Figure 3. The moisture-content profile of this test hole ranged from 1 to 22 percent by weight. The first 58 feet (17.7 meters) of this hole was drilled in the alluvium using 1,208 gallons (4,573 liters) of water tagged with a lithium bromide tracer, added at the rate of 1.5 to 2 gallons (5.7 to 7.6 liters)

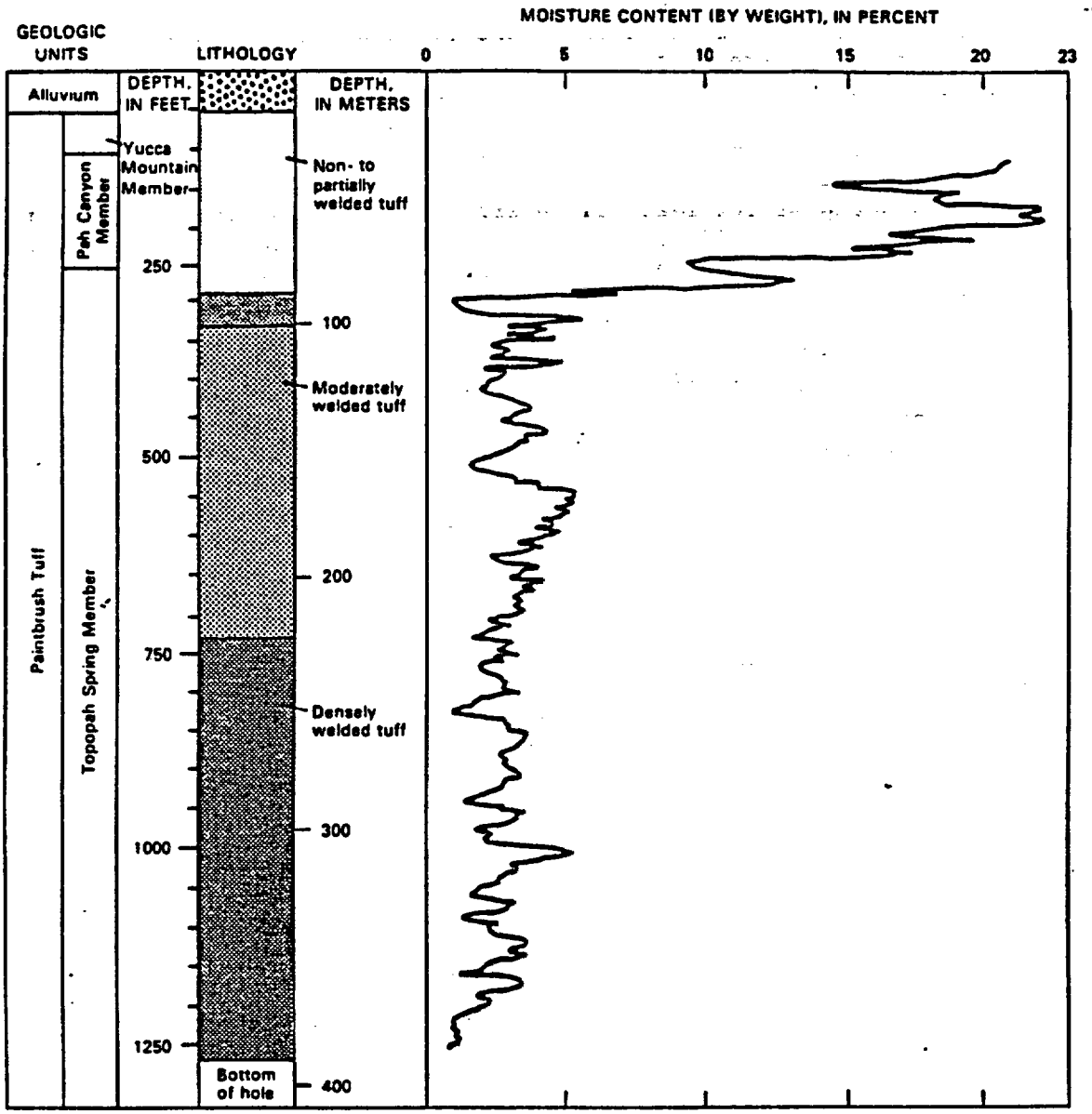


Figure 3. Geologic units, lithology, and moisture content of rocks penetrated in test hole USW UZ-1.

per minute. The addition of water was discontinued below this depth, because a balance could not be maintained between rate of penetration and minimum quantity of water needed to cool the bit. Four hundred gallons (1,514 liters) of water were pumped out of the hole by a diaphragm pump that was lowered downhole; thus, 808 gallons (3,059 liters) of water were left in the borehole. Drill-cutting and instrumentation data indicate that this drilling water probably did not seep below 250 feet (76 meters). Drill cuttings from selected depths were submitted to the laboratory for lithium leaching. Laboratory results indicate that the lithium concentration was 13 micrograms per gram to a depth of 101 feet (31 meters) but showed a background level of lithium less than 10 micrograms per gram below 250 feet (76 meters). Hydrologic-instrumentation data obtained after drilling USW UZ-1 show a relatively low matric potential below a depth of 83 feet (25.3 meters) (Montazer et al. 1985, this proceedings). Below this depth, the rock-moisture content is considered to be representative of rocks underlying a wash that probably receives periodic recharge from surface-water runoff and flooding. This test hole has been instrumented with pressure transducers, psychrometers, and heat-dissipation probes so that a long-term record of atmospheric-pressure and moisture-potential changes can be monitored for selected depths (Montazer et al. 1985, this proceedings; Thamir and McBride, 1985, this proceedings).

Drilling of Test Hole USW UZ-6

The second test hole for collecting hydrologic data from the unsaturated zone was drilled without any drilling water to a total depth of 1,887 feet (575 meters); it will be instrumented next year with pressure transducers, psychrometers, and heat-dissipation probes. The initial plan was to drill through the entire unsaturated section, which is about 2,550 feet (777 meters) thick at this location. However, drilling was stopped because of an overrun of drilling time caused by numerous hole cavings and excessive breakage of the drill-pipe inner string. Continual caving occurred to a depth of 1,000 feet (305 meters) because of the numerous fractures in the densely welded tuffs in the lower part of the Tiva Canyon Member and in the upper one-half of the Topopah Spring Member of the Miocene Paintbrush Tuff. In the drilling of USW UZ-6, the deepest unsaturated-zone test hole, no free water was encountered; however, the kelly hose became plugged and required cleaning several times while drilling through a 60-foot (18-meter) moist, nonwelded to partially welded tuffaceous zone at the geologic contact between the Tiva Canyon Member and the Topopah Spring Member of the Miocene Paintbrush Tuff. Laboratory analysis indicated that this zone had a moisture content ranging from 5 to 18 percent by weight. Similar drilling problems occurred near the bottom of this test hole from 1,400 feet (427 meters) to total depth in nonwelded to partially welded tuff of the tuffaceous beds of Calico Hills and the Prow Pass Member of the Crater Flat Tuff, both of Miocene age. The moisture content in these discontinuous zones generally was less than 5 percent by weight. The geologic units penetrated and the moisture content of these rocks are shown in Figure 4.

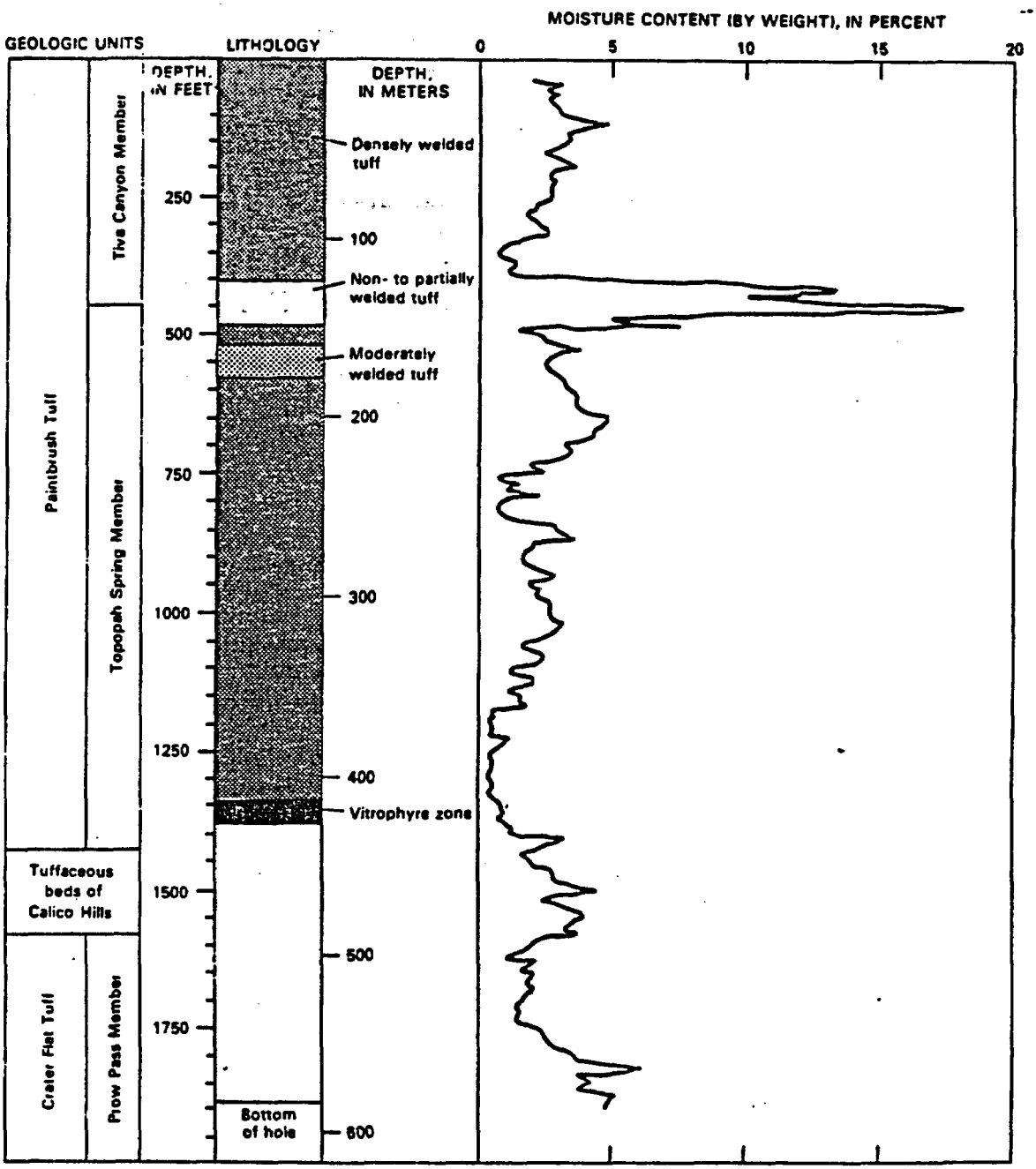


Figure 4. Geologic units, lithology, and moisture content of rocks penetrated in test hole USW UZ-6.

Conclusions

The reverse-vacuum drilling method is well suited for collecting hydrologic data from unsaturated rocks because it permits the drilling of rocks without appreciably changing their moisture content; the rock pores are not contaminated with any drilling fluids, and laboratory determinations of moisture content and hydrologic properties can be more accurately determined. In addition, this drilling method permits the immediate detection of moist or perched-water zones.

Major disadvantages of using the vacuum-reverse-air drilling method are that it requires more equipment and space than conventional rotary-drilling rigs. Drilling problems, such as caving of the borehole, also are quite common because no liquids are in the borehole to exert hydrostatic pressure on the walls of the hole, and the vacuuming action creates an inward suction of loose rocks. Extensively fractured zones create the largest drilling problems, and considerable time is required to remove caved material from the borehole.

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Thamir, Falah and C.M. McBride. 1985. Measurements of matric and water potentials in unsaturated tuff at Yucca Mountain, Nevada: *in* Proceedings, National Water Well Association Conference on Characterization and Monitoring of the Vadose (Unsaturated) Zone, Denver, Colorado, November 19-21, 1985.

OVERVIEW OF DRY DRILLING SYSTEMS USED AT NTS

- REVERSE VACUUM ROTARY DRILLING
  - Used to drill USW UZ-1 17-1/2 inch hole to 1270'
  - Used to drill USW UZ-6 17-1/2 inch hole to 1887'

o USW UZ-1	Total Cost-To-Date	Cost/Foot
	$1,852,950	$1,459
o USW UZ-6	Total Cost-To-Date	Cost/Foot
	$1,972, 009	$1,021

- ODEX DRILLING/DRY AIR CORING
  - UE-25 UZ #4 — 6 inch hole to 367 feet
    $131,342 Total Cost — $358/foot
  - UE-25 UZ #5 — 6 inch hole to 365 feet
    $114,931 — $325/foot
  - USW UZ-6s — 8-11/32 inch hole to 494.5 feet
    3.990 inch hole to 519 feet
    $293,854 — $566/foot
  - USW UZ-7 — 6 inch hole to 207 feet
    $71,869 — $347/foot

- o USW UZ-8 — 6 inch hole to 55 feet
  4.25 inch hole to 57 feet
  $106,163 — $1863/foot
  Hole not completed due to work stoppage

- o USW UZ-13 — 6 inch hole to 417 feet
  3.937 inch hole to 430 feet
  $172,219 — $400/foot

- o Neutron Access Holes - 76 Total Drilled
  6 inch hole to 43 feet (average depth)
  $619,203 Total Cost — $189/foot

COMMENTS:

- Reverse vacuum rotary drilling not a good method for cutting cores.

- 15 spot cores were attempted in UZ-1 using a Globe basket. One core was attempted using a Kore-King barrel and conventional air circulation. Globe basket core recovery was 67% and core was extremely hot when recovered.

- UZ-1 hole was terminated when Globe basket became stuck in a cement plug spotted to isolate drilling fluid from the G-1 hole.

- On UZ-6 hole extreme vibration caused drill pipe failures and plugging of the inner string. No cores were attempted.

- ODEX-drilled holes, casing failure and other problems occurred on the following holes:

- UZ #4 5-1/2 in. O.D. 7.3 ft. fish left in the hole at 231 feet.

- UZ #5 5-1/2 in. O.D. casing parted at 99 feet. Recovered fish and drilled to 365 feet. Left 2 feet of parted casing shoe in the hole.

- UZ-6s Bit backed off at 336 feet. Recovered bit. Drill pipe parted at 294 feet. Recovered fish. Lost fish in hole at 490 feet. Recovered fish. 7-5/8 in. casing parted at 253 feet. Recovered fish after fishing for 14 days.

- UZ-7 Hole completed at 207 feet. Hole bridged at 37 feet after pulling casing. Cleaned out bridge and completed hole at 201 feet. Hole bridged at 22 feet now.

- UZ-13 Casing parted at 147 feet. Casing stuck. Recovered casing. Lost bit in hole at 275 feet. Destroyed bit with explosive. Resumed drilling. Drill pipe parted at 276 feet. Recovered fish. Hole completed to 407 feet.

- Neutron Access Holes, 76 holes, average depth 43 feet.

  - These holes were drilled and cored at about one day per hole.
    No serious drilling problems occurred.

For DTH hammers

ODEX 90 W/T	COP 32 A 30–15	W: max. O.D. 115 min. I.D. 102 min. wall thickness 5 mm T: 114.3 × 101.6 L.H. thread	4 1/2 4 4 1/2 × 4	76	(3)	123	(4 13/16)
ODEX 115 W/T	COP 42 DHD 24 DHD 340 A A 34–15	W: max. O.D. 142 min. I.D. 128 min. wall thickness 5 mm T: 140 × 128 L.H. thread	5 10/16 5 1/16 5 1/2 × 5 1/16	76 or 89	(3) (3 1/2)	152	(6)
ODEX 140 W	DHD 15 DHD 350 A 43–15	max. O.D. 171 min. I.D. 157 min. wall thickness 5 mm	6 5/8 6 1/8	89 or 114	(3 1/2) (4 1/2)	187	(7 3/8)
ODEX 165 W	COP 62 DHD 16 DHD 360 A 53–15	max. O.D. 196 min. I.D. 183 min. wall thickness 5.5 mm	7 5/8 7 1/8	114	(4 1/2)	212	(8 11/32)
ODEX 215 W	DHD 380 A 63–15	max. O.D. 257 min. I.D. 241 min. wall thickness 6 mm	10 9 1/2	114 or 140	(4 1/2) (5 1/2)	278	(10 15/16)

*T = threaded casing tubes
W = welded casing tubes

SATURATED ZONE STUDIES

John B. Czarnecki
U.S. Geological Survey

Dry-hole drilling required for:

1) Potentiometric-levels study (WT Holes)

2) Fortymile Wash Infiltration Study
(FM and FMN holes)

WATER-TABLE (WT) HOLES

Dry hole drilling required "... to eliminate contamination of gas and water samples to be sampled near the water table ..."

Re: dry coring and drilling -- usgs saturated-zone studies.
john czarnecki fts 776-5176
bill steinkampf fts 776-4939

---

well number	estimated well depth (m)	approx. length of core (m) uz	sz
<activity 8.3.1.2.3.2.2; WBS 1.2.3.3.3.G; steinkampf>			
USW WT-8	640	25	10
USW WT-9	670	--	5
USW WT-19	335	25	10
USW WT-20	305	25	10
USW WT-21	550	25	10
USW WT-22	395	--	5
USW WT-23	670	~75 *	10
USW WT-24	670	--	5
<activity 8.3.1.2.1.3.3; WBS 1.2.3.3.4.G; czarnecki>			
UE-25 FM#1	350-370	3/15 **	30
UE-25 FM#2	300-320	3/15 **	30
UE-25 FM#3	260-275	3/15 **	30

---

* uncertain length of uz core from WT-23 derives from uncertainty as to water-table elevation.

** approximately 20 percent of unsaturated interval.

WATER-TABLE HOLES TO BE DRILLED (DRY?)

HOLE	APPROX. DEPTH (m)
USW WT-8	640
USW WT-9	670
UE-25 WT-19	335
UE-25 WT-20	305
UE-25 WT-21	550
USW WT-22	395
USW WT-23	670
USW WT-24	670

About 25 m of core will be collected at the UZ/SZ interface for gas and water sample extraction. It may be difficult to predict this interface within 10 m accuracy.

FORTYMILE WASH DRILLHOLES

FM SERIES

Three deep holes to water table

* Depths: 275, 320, and 370 m
* Core: 3 m/ 15 m (10 ft/ 50 ft)
* Diameter: 12.7 cm (6 in.)

FMN SERIES

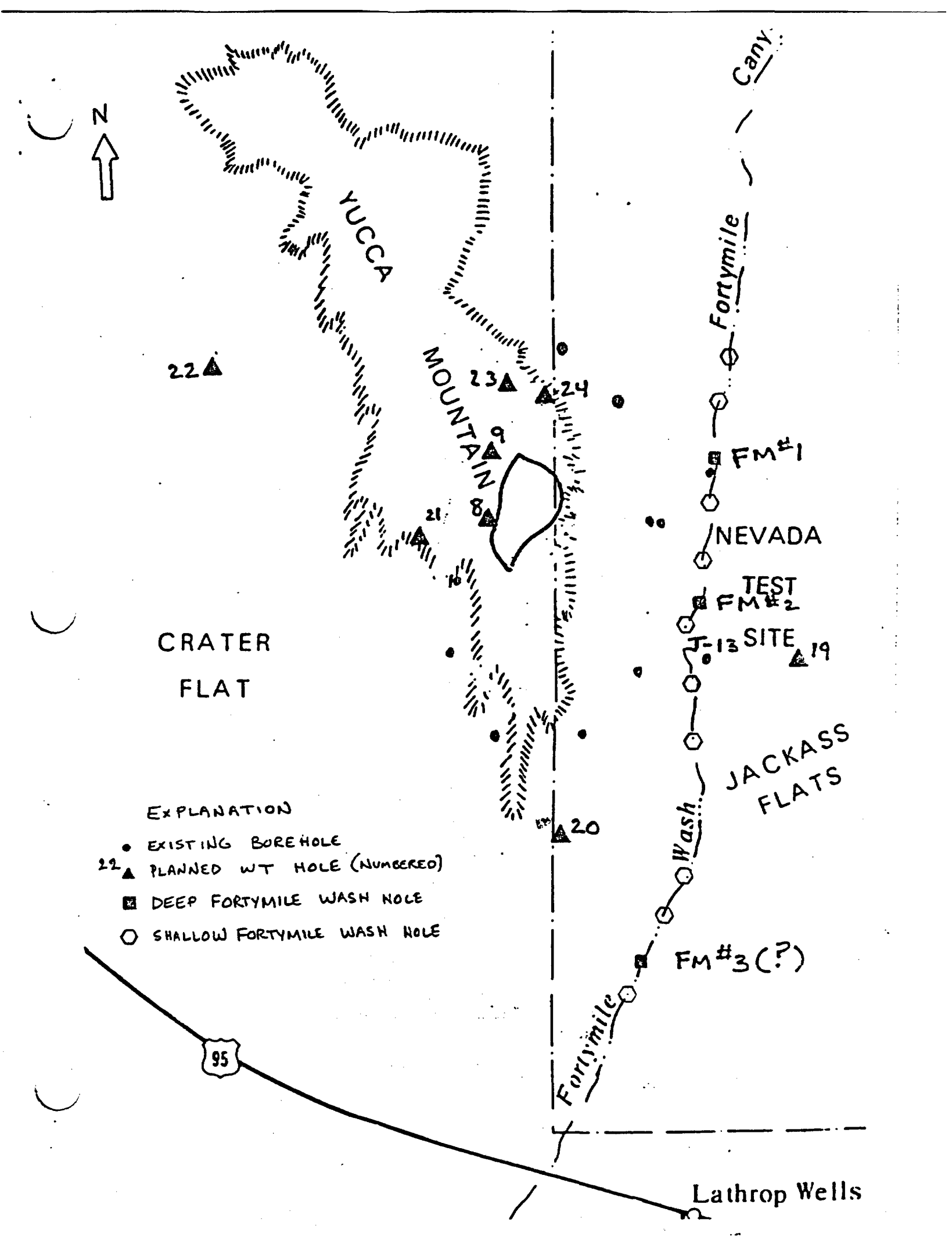
Neutron-access holes

* Ten holes up to 50 m deep
* Continuous core for bulk soil properties and hydrochemical samples

INFILTRATION TESTS

Flooding with LiBr tagged water from well J-13

Ponding/Infiltration tests at each FM hole and selected FMN holes


N
YUCCA
MOUNTAIN
CRATER
FLAT
22
23
24
9
8
21
20
19
J-13
Fortymile Canyon
FM#1
NEVADA
TEST
SITE
FM#2
JACKASS
FLATS
Wash
FM#3(?)
Fortymile
95
Lathrop Wells
EXPLANATION
EXISTING BOREHOLE
PLANNED WT HOLE (NUMBERED)
DEEP FORTYMILE WASH HOLE
SHALLOW FORTYMILE WASH HOLE

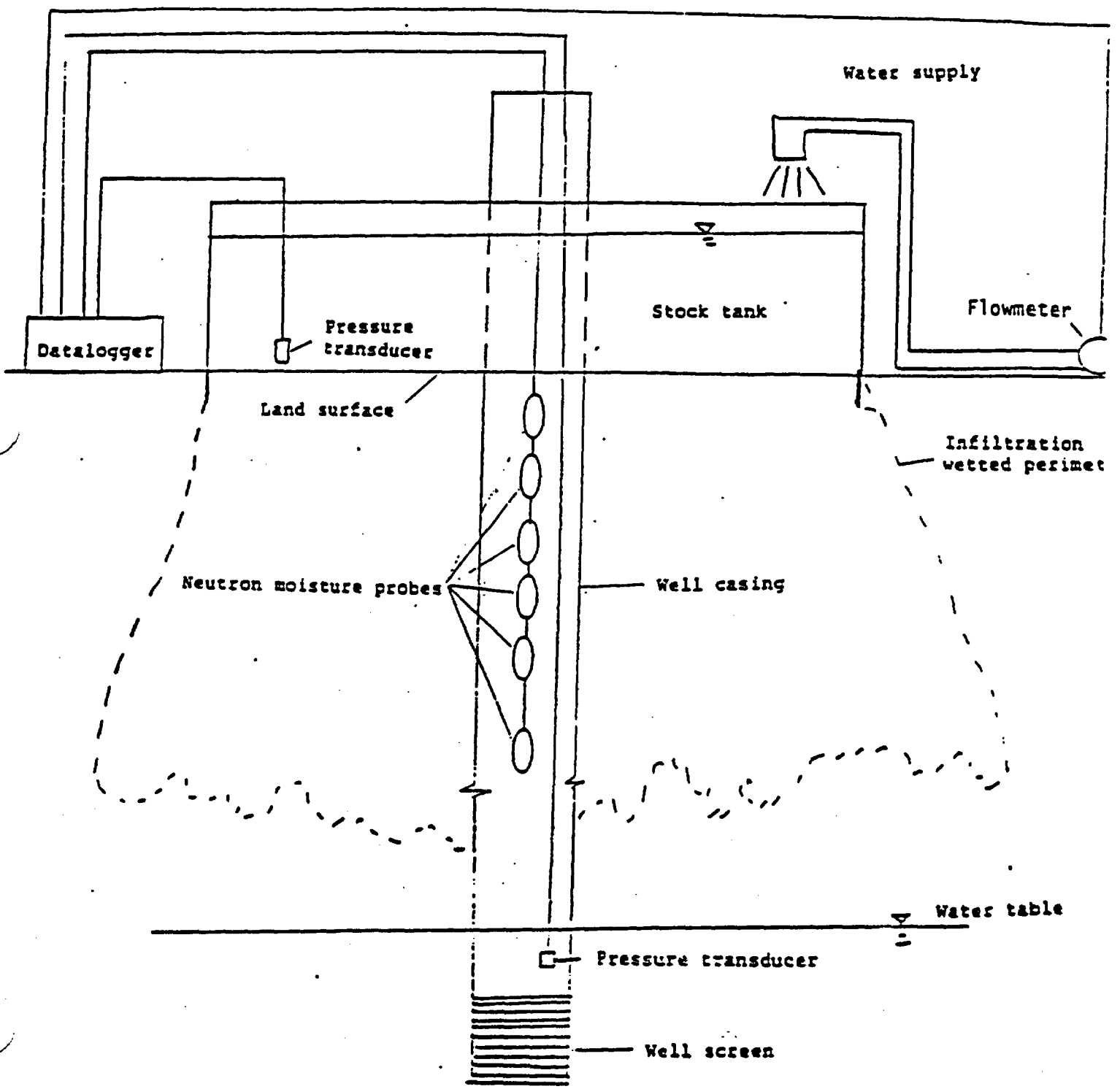


Figure 3-4 Ponding and infiltration experimental setup.

Los Alamos/NNWSI

Prototype Testing

Prototype Air Coring and Evaluation of Potential Dust-Related Hazards

Principal Investigators

J. M. Ray - ESS-1
J. Newsom - Drilling Consultant
B. Skaggs - HSE-5

PREVIOUS EXPERIENCE

FRAN RIDGE AIR CORING (1982-83)

Goals:

1) Air core two parallel horizontal holes 400 ft into Topopah Spring welded tuff at Fran Ridge

2) Conduct radionuclide transport tests between the two holes

Accomplishments:

1) Air cored 165 ft of hole before problems required air-mist and, finally, air, soap and water to be used to reach a final depth of 400 ft

Problems:

1) High bit wear

2) Drill string vibration

3) Core retrieval problems

4) Loss of circulation air

5) Sloughing of hole

6) Low core recovery rate (73%) and mechanical breakage

7) Occasionally stuck in hole

G-TUNNEL AIR CORING TEST OBJECTIVES

1. Validate air coring technology in fractured welded tuff.

2. Select, modify, and test dust collection system.

3. Evaluate health hazard potential from fugitive dust emissions.

4. Develop procedures for underground air coring.

5. Develop procedures for fugitive dust control underground.

6. Train drilling personnel in air coring/dust control operations.

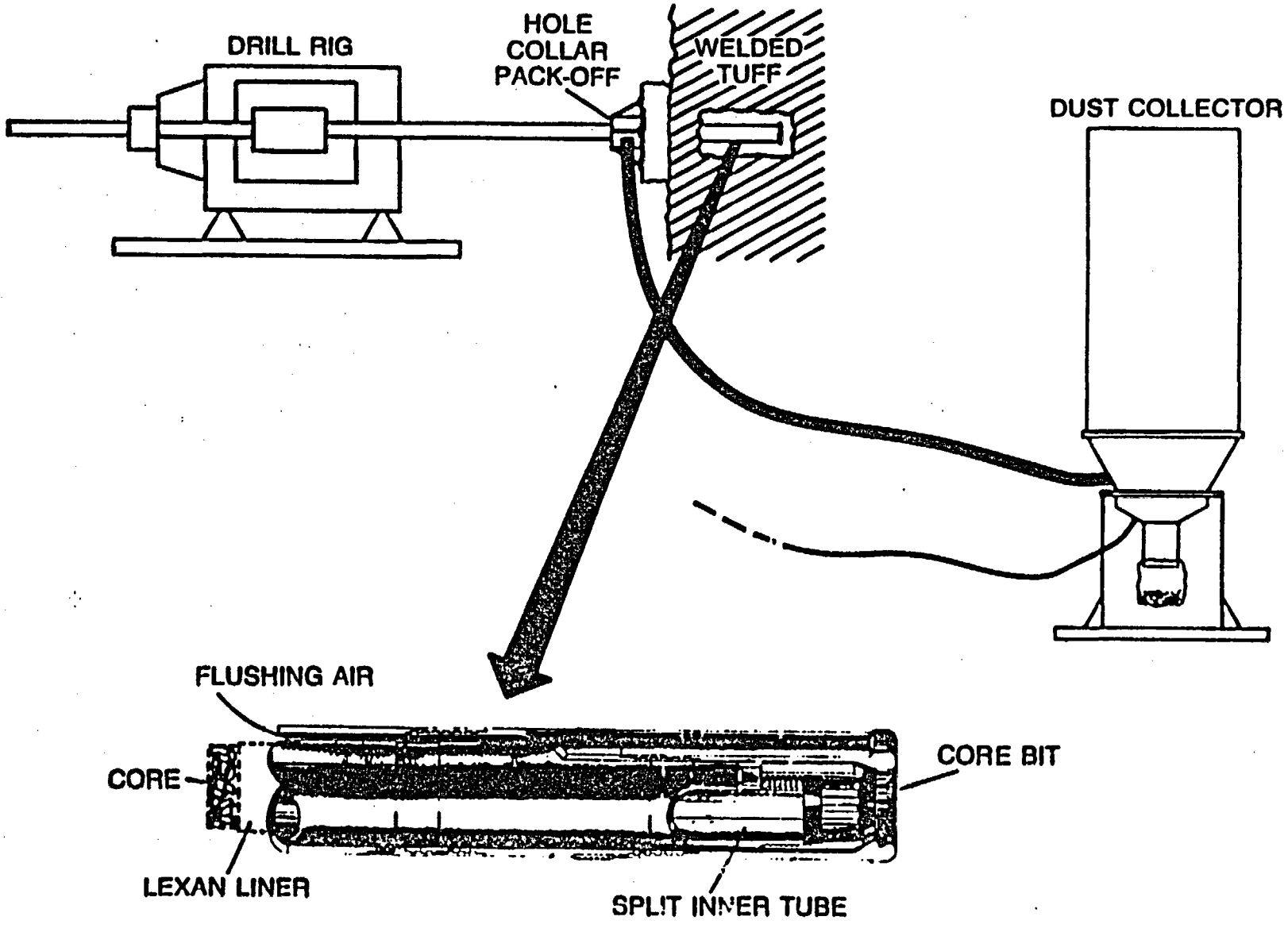
7. Provide air cored holes for others to use.

APPROACH

1. Air core 50 ft horizontal hole to check out dust collection equipment and procedures and measure fugitive dust emissions.

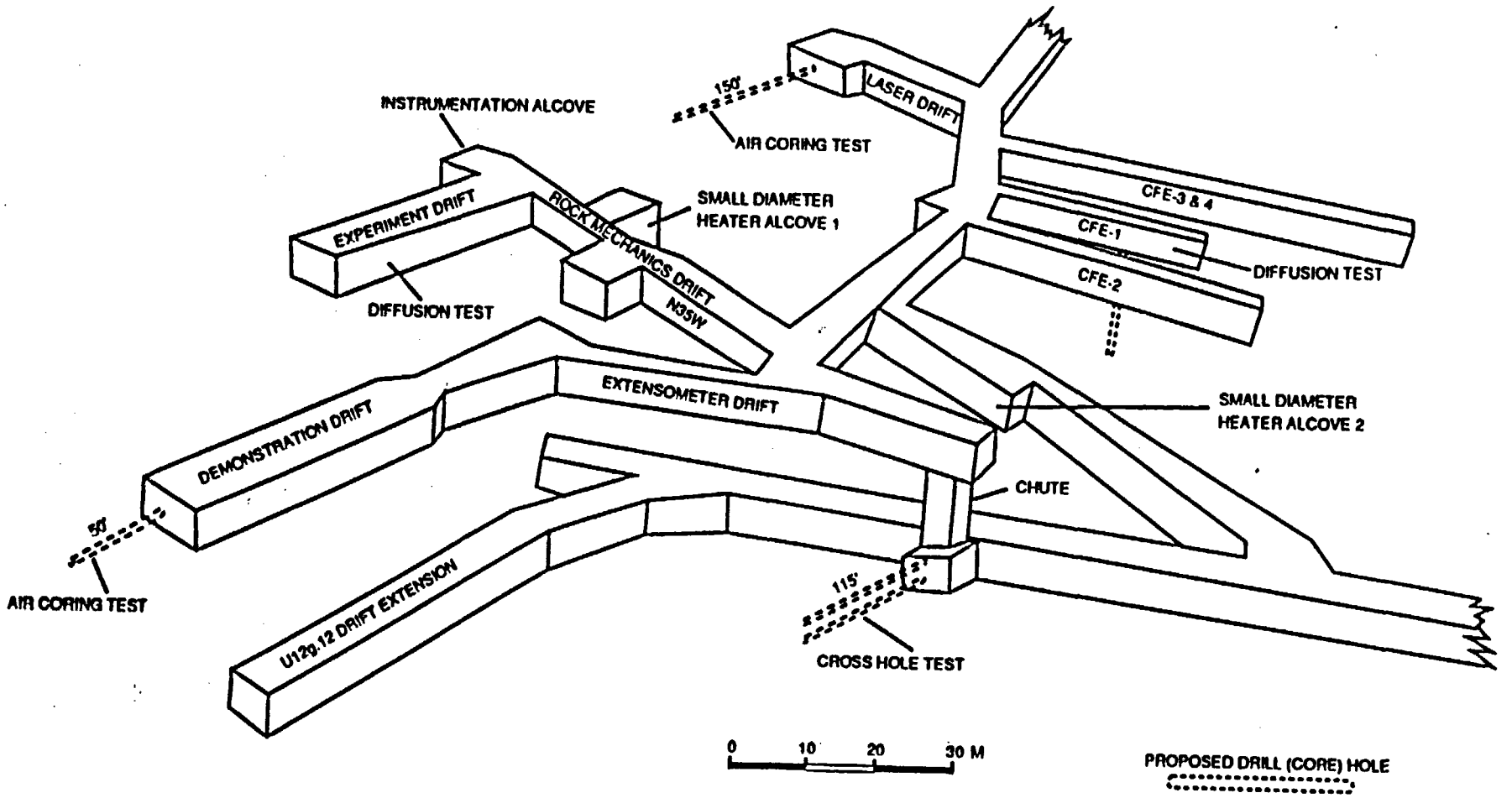
2. Air core 150 ft horizontal hole with express purpose of technology validation, methodology refinement, and procedures development.

EQUIPMENT CONFIGURATION



EQUIPMENT/OPERATING SPECIFICATIONS

- Longyear 38-electric over hydraulic power system
- Triple tube retrievable wireline coring method
- RPM - 60-120
- Air Pressure - 60-120 psi
- Air volume - 150-400 cfm
- Drill airflow monitoring system
- Bits - diamond impregnated bits with matrix and face design for optimum air circulation
- Optimally positioned stabilizers
- Lexan liners for core encapsulation
- Special design dust-tight collar pack-off and diverter



GTUF LOCATION OF AIR-CORED
HOLES EVALUATED IN THIS REPORT

PRELIMINARY TEST RESULTS

Rig

- Penetration rates (depending on fractures, bit condition, and formation encountered) - averaged 5 ft/hr
- Core recovery - ~97%
- Lexan liner - successfully used with minor field modification
- Bit life - ~~~50-90~~ ~100-160 AS NOW PREDICTED ft/bit
- Reaming shells - ~1 per each 3 bits used
- Air requirements in ESF - for normal dry air coring low pressure (120 psi) mine air is adequate

Dust Control Technique (DCT)

- Provides safe drilling environment
- Removal of 99.8% of all dust and cuttings
- Vacuum assists long hole drilling

ANTICIPATED FUTURE PROBLEMS AND POSSIBLE SOLUTIONS

Depth limitations due to cumulative air loss to fractures

Use optimal DCT/drilling system

Use ODEX-type system with casing advance

Possible hole instability at Yucca Mountain

Use dry air coring with ODEX-type system

Drill rod vibrations

Proper size and placement of stabilizers

Moisture in hole

Solution is dependent on amount of moisture

Failure of DCT filters

Seal DCT exhaust to mine exhaust ventilation

Bit failure

Use appropriate bit design

Hole deviation

Periodic surveys and proper selection of in-hole tools/drilling techniques

UPCOMING PROTOTYPE TESTS
THAT REQUIRE AIR CORED HOLES

1) Cross-Hole Prototype Test Core Holes

2) Diffusion Test Core Holes

3) Wet versus Dry Prototype Test Holes

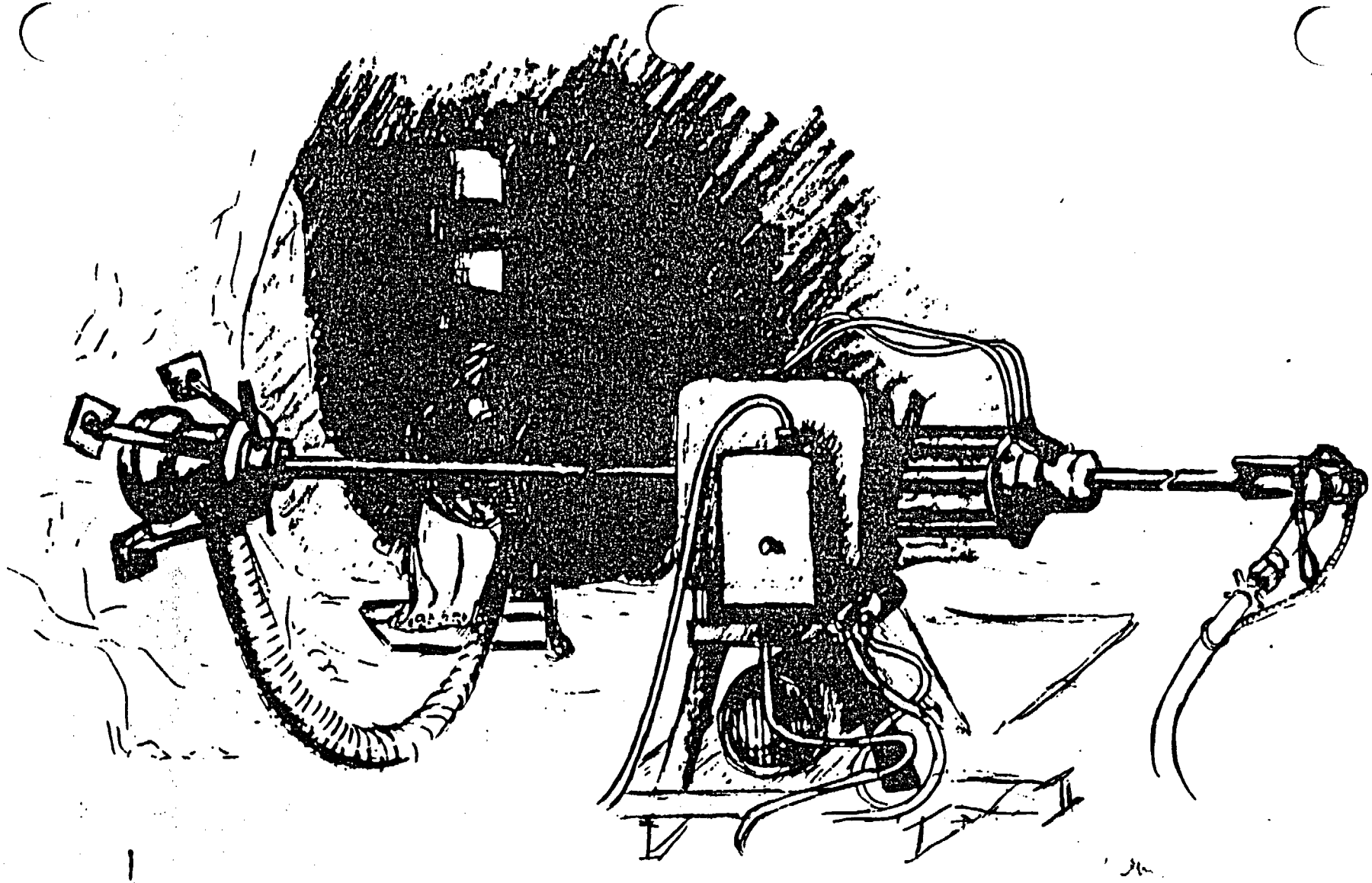
PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

- Underground coring using dry air can be performed while providing health protection by utilization of appropriate work practices, engineering, and administrative controls.

- Horizontal air coring in fractured welded tuff (to at least 150 ft) can be accomplished by proper selection, integration, and minor modification of standard drilling equipment, using appropriate procedures and engineering controls.

- Prototype test of air coring in shaft-size space should be conducted prior to ES construction

- Long (150+ ft) horizontal air cored hole in Topopah Spring welded tuff should be considered prior to in situ testing in ESF



MATRIX OF HOLE-TYPE AND FOOTAGE

	HORIZ	VERT	ANG	TBD	TOTAL
DRY CORED	13 / 760	10 / 254	2 / 100	40 / 160	65 / 1274
DRY BORED	0 / 0	0 / 0	0 / 0	10 / 40	10 / 40
DRY PERCUSSED	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
TOTAL	13 / 760	10 / 254	2 / 100	50 / 200	75 / 1314

TOTAL DRY FOOTAGE

	HORIZ	VERT	ANG	TBD	TOTAL
WET CORED	2 / 60	0 / 0	14 / 386	0 / 0	16 / 446
WET BORED	14 / 143	14 / 143	24 / 240	0 / 0	52 / 526
WET PERCUSSED	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
TOTAL	16 / 203	14 / 143	38 / 626	0 / 0	68 / 972

TOTAL WET FOOTAGE

ORIENTATION	HORIZ	VERT	ANG	TBD	TOTAL
TOTAL	29 / 963	24 / 397	40 / 726	50 / 200	143 / 2286

TOTAL HOLES CORED =	81	TOTAL FOOTAGE CORED =	1720
TOTAL HOLES BORED =	62	TOTAL FOOTAGE BORED =	566
TOTAL HOLES PERCUSSED =	0	TOTAL FOOTAGE PERCUSSED =	0
TOTAL HOLES =	143	TOTAL FOOTAGE =	2286

SAMPLE MATRIX

NO. OF HOLES / FOOTAGE

Rev. Date 5/27/88

Fig. 1. Hole types and respective total footages (rounded to nearest foot) for drill holes required by PIs for funded prototype tests.

SURFACE BASED INVESTIGATIONS

UNSATURATED ZONE DRILLING

1) Neutron boreholes (OOEX)

2) deep UZ boreholes ✓

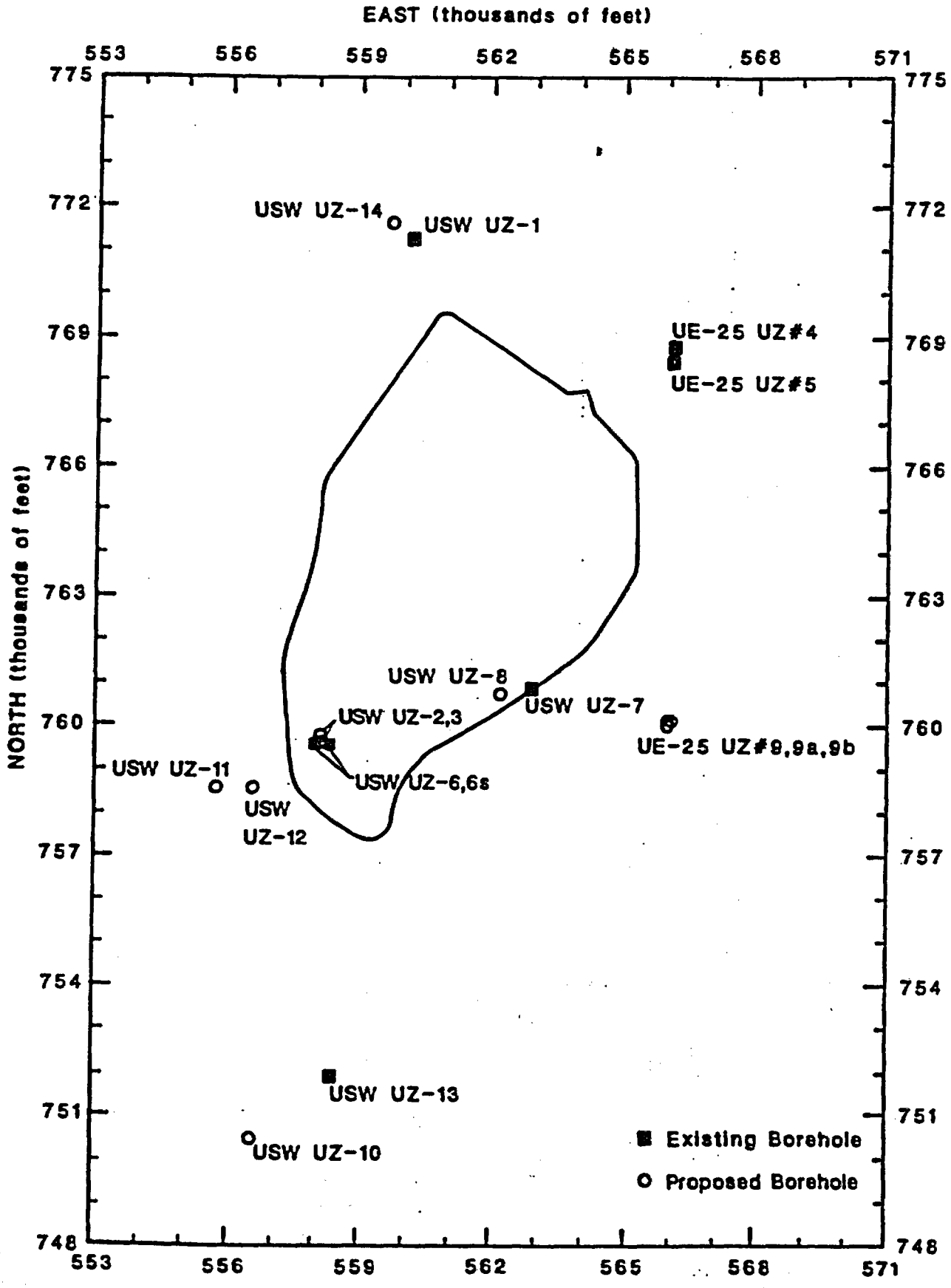
DEEP UZ BOREHOLES

SUMMARY STATS

• number required	17 - 19*
• total footage	18,500 - 22,500 ft **
• existing footage	5000 ft (27 - 22%)
• maximum depth	2500 ft
• diameter	6" / 12"
• locations	(see map)

* includes provision for 2 Vertical Seismic Profiling Boreholes (prototype BH used for VSP)

** total footage could be as high as 37,000 ft if decision is made to extend all boreholes thru Calico Hills unit to the water table



Map of Existing and Proposed Borehole Locations, Yucca Mountain, Nevada.

APPLICATION

DEEP UZ BOREHOLES

1) CORE & CUTTINGS

- geology / mineralogy / petrology
- matrix hydrologic properties
- physical rock properties
- hydrochemistry - age dating
  - Cl^{36} (50 lbs per sample)
  - pore water squeezing (2.37" diameter core)

APPLICATION
DEEP UZ BOREHOLES

2) BOREHOLE

- geophysical logging (6"ϕ)
- air permeability testing (6"ϕ)
- in situ monitoring (12"ϕ)
  - pressure, temp, water potential
- shut-in pressure testing (6"ϕ)
- gas-sampling - hydrochemistry (12"ϕ)
- water injection testing (12"ϕ)
- gas tracer diffusion testing (12"ϕ)

BOREHOLE DIAMETER REQUIREMENTS

6" ϕ

- maximize quality of GP logs
- facilitate placement and seating of straddle packer assembly
- minimize impact of borehole skin effects on air permeability testing
- maximize stability of borehole for in-hole testing

BOREHOLE DIAMETER REQUIREMENTS

12" ϕ

- provide sufficient space to install downhole sensors
  - pressure transducers
  - thermocouple psychrometers
  - heat dissipation probes
  - thermistors
  - solenoid values
  - electrical cable
  - teflon tubing
  - sensor screens
  - central support rod
- facilitate placement of grout and stemming materials to isolate individual instrument stations
- minimize equilibration times

BOREHOLE DRILLING SPECIFICATIONS

- CORING
  - CONTINUOUS IN NON to partially welded units
  - 5 ft (2 ft) core every 10 feet in welded units
- DRY DRILLED & CORED
- 6 inch diameter to support
  - GP logging
  - AIR K testing
  - SHUT IN PRESSURE TESTING
- REAM (ENLARGE) TO 12 inch diameter to support
  - IN SITU INSTRUMENTATION / STEMMING
  - other tests identified under Borehole applications
- CLEAN BOREHOLE WALLS PRIOR TO AIR K TESTING

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YUCCA MOUNTAIN

OGR

LOS ALAMOS GEOCHEMISTRY
SCIENTIFIC NEEDS

U.S. DOE WORKSHOP ON DRY DRILLING AND CORING TECHNOLOGY

SCIENTIFIC NEEDS OF LOS ALAMOS NATIONAL LABORATORY GEOCHEMICAL WORK

A. E. NORRIS

LAS VEGAS, NEVADA
JULY 26, 1988

U.S. DEPARTMENT OF ENERGY

OCRWM

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LOS ALAMOS GEOCHEMISTRY SCIENTIFIC NEEDS

1. MINERALOGY–PETROLOGY TASK

GELS IN FRACTURES OBSERVABLE ONLY WITH DRY DRILLING

CORE LOGGING SHOULD NOTE PRESENCE OF GELS IN FRACTURES. S. LEVY SHOULD BE NOTIFIED

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LOS ALAMOS GEOCHEMISTRY SCIENTIFIC NEEDS

2. NATURAL ISOTOPE CHEMISTRY TASK

- ^{36}CL: USEFUL WATER TRACER IN UNSATURATED ZONE
- COSMOGENIC ORIGIN
- 300,000 YEAR HALF-LIFE
- WATER SOLUBLE; DRY DRILLING REQUIRED

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LOS ALAMOS GEOCHEMISTRY SCIENTIFIC NEEDS

2. ^{36}CL (CONTINUED)

SAMPLE SIZE: ~50 LBS/ANALYSIS

SAMPLE FORM: CUTTINGS OR CORE

SAMPLING FREQUENCY: VARIABLE, DEPENDING ON STRATIGRAPHY

ADDITIONAL DATA: STRATIGRAPHY; DEPTH WHERE SAMPLE COLLECTED

EXAMPLES: ES SAMPLING INTERVALS; UZ-1 DATA

S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

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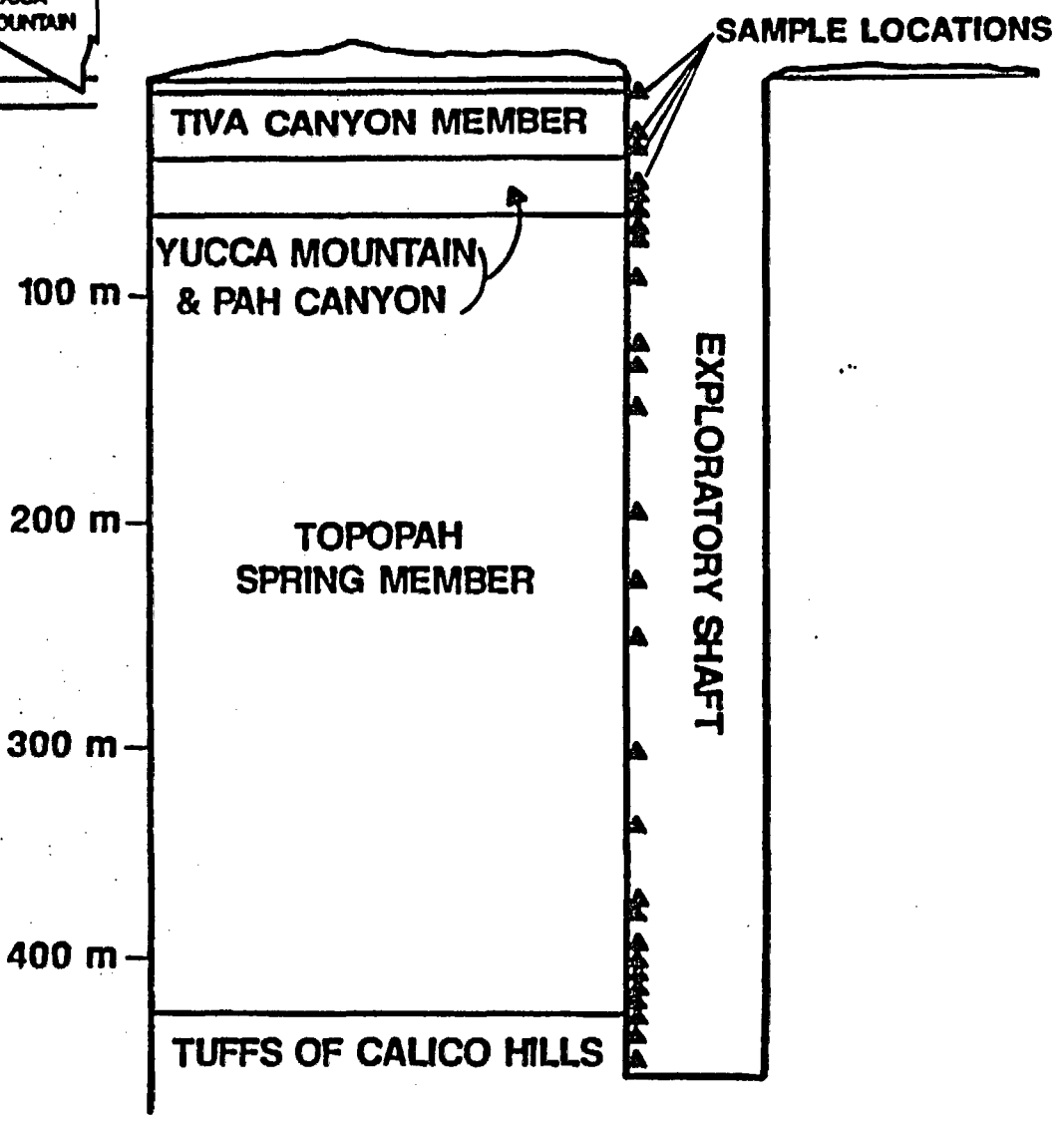
LOS ALAMOS GEOCHEMISTRY SCIENTIFIC NEEDS



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LOS ALAMOS GEOCHEMISTRY SCIENTIFIC NEEDS

UZ-1 DATA

DEPTH (feet)	$^{36}Cl/Cl$
170-176	$(2498 \pm 198) \times 10^{-15}$
395-400	$(390 \pm 48) \times 10^{-15}$

COSMOGENIC BACKGROUND (YW-6 AND ES DATA) 519×10^{-15}

INFERENCE: FIRST SAMPLE CONTAMINATED WITH BOMB PULSE ^{36}CL, PROBABLY TRANSPORTED BY INITIAL DRILLING FLUID

RECOMMENDATIONS: USE NO WATER FOR DRILLING; ARCHIVE MORE SAMPLES THAN DONE FOR UZ-1

FULLY QUALIFIED QA PROGRAM GROUP/ PILOT STUDY PLAN GROUP STATUS

PRESENTED BY

Vince Iorii

JULY 26, 1988

BACKGROUND

- APRIL 1988
  - R. P. SAGET, ACTING DIRECTOR, OFFICE OF QUALITY ASSURANCE, OCRWM - REVIEWED PROJECT QA PROGRAM; MADE COMMENTS
- MAY 10, 1988
  - DRAFT SET OF COMMENTS SENT TO PROJECT FOR REVIEW

PROJECT TASKS

HAVE A FULLY-QUALIFIED QA PROGRAM IN PLACE BY 1/1/89, SPECIFICALLY:

1. NETWORK ALL NEW OR RESTART OF TECHNICAL ACTIVITIES THROUGH 6/30/89
2. IDENTIFY MINIMUM TECHNICAL AND QA PREREQUISITES FOR EACH TECHNICAL ACTIVITY
3. INTEGRATE ITEMS 1 AND 2
4. A SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF A DETAILED READINESS REVIEW PLAN AND PROCEDURES SUBMITTED TO OCRWM FOR APPROVAL
5. SCHEDULE OF PARTICIPANTS QA PROGRAM PLANS AND PROCEDURES
6. SCHEDULED DATES FOR DOE PROJECT APPROVAL OF THE CONTRACTORS QA PROCEDURES REQUIRED TO SUPPORT TECHNICAL ACTIVITIES

PROJECT TASKS
(CONTINUED)

7. SCHEDULED DATES FOR THE PROJECT OFFICE TO SUBMIT QA PROGRAM PLANS TO OCRWM AND TO NRC FOR REVIEW

8. SCHEDULE OF PROJECT AUDITS OF CONTRACTOR QAP

ALL THIS DUE 7/29/88

BACKGROUND
(CONTINUED)

- JUNE 6, 1988

  - FULLY QUALIFIED QA PROGRAM ADVISORY GROUP WAS ESTABLISHED

    V. IORII, WMPO
    W. MANSEL, WMPO
    W. MACNABB, SAIC
    J. MADSEN, MACTECH

  - SAIC, TECHNICAL AND MANAGEMENT SUPPORT SERVICES WORKING GROUP

    R. BAHORICH - OVERALL RESPONSIBLE FOR CARRYING OUT THE PLANNED ACTIVITIES

    D. MALCOLM - RESPONSIBLE FOR NETWORKS AND SCHEDULES

    S. KLEIN - RESPONSIBLE FOR QA RELATED

IMPLEMENTATION PLAN

QA PROGRAM REQUIRES THE FOLLOWING BE ACCOMPLISHED:

PHASE I

- DOCUMENTATION
  - TOP-LEVEL PLANS (PMP, CMP, ETC.)
  - QAP (WMPO)
  - QAPP (WMPO, PARTICIPANTS)
  - QA PROCEDURES (WMPO, PARTICIPANTS)
  - TECHNICAL PROCEDURES (WMPO, PARTICIPANTS)
- ORGANIZATION/STAFFING
  - PARTICIPANTS ORGANIZATIONS DOCUMENTATION APPROVED
  - PD EXISTS FOR ELEMENTS OF ORGANIZATION
- INDOCTRINATION AND TRAINING
  - QA ORIENTATION
  - PERSONNEL QUALIFICATIONS/TRAINING/CERTIFICATION COMPLETED/FILED

IMPLEMENTATION PLAN
(CONTINUED)

PHASE I (CONTINUED)

- INFORMATION SYSTEMS
  - DOCUMENT CONTROL, RECORDS MANAGEMENT
  - COMMITMENT TRACKING, AUDITS, ETC.
- ASSESSMENTS, AUDITS, SURVEILLANCE
  - REQUIRED TO EVALUATE THE READINESS OF THE QA PROGRAM

PHASE II

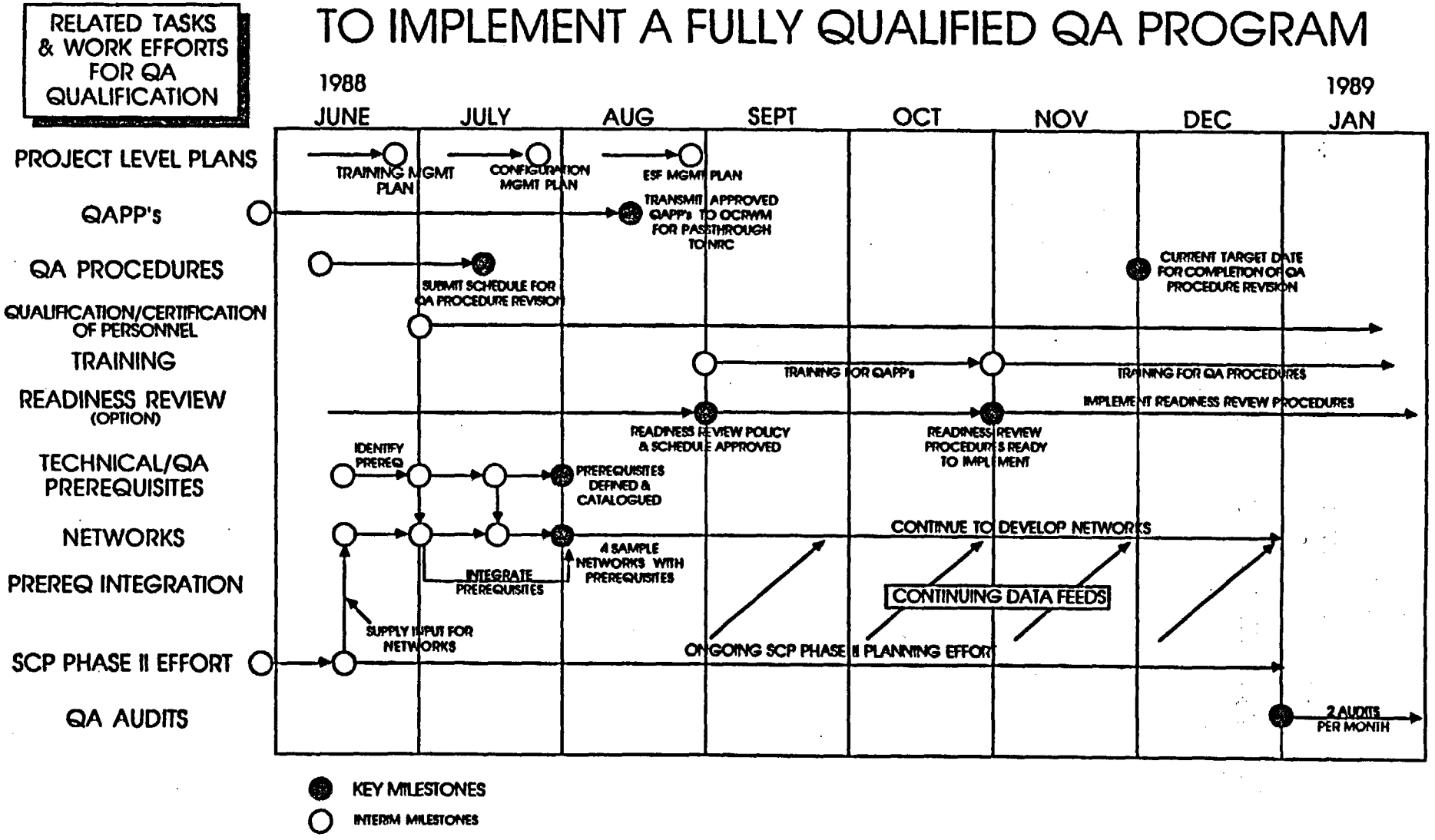
- QA INTEGRATION WITH TECHNICAL WORK
  - IDENTIFY PREREQUISITES AND PLACE ON LOGIC DIAGRAMS AND SCHEDULE - BUSY
  - ALTERNATIVE - DEVELOP A CHECKLIST OF PREREQUISITES TO BE MET PRIOR TO AUTHORIZATION OF WORK

IMPLEMENTATION PLAN
(CONTINUED)

PHASE III

- QA READINESS REVIEW (AS APPROPRIATE) MEETING THE FOLLOWING CRITERIA
  - RESTART OF WORK SUBJECT FORMAL STOP WORK
  - PREDETERMINED HOLD PHASES OF DESIGN, CONSTRUCTION, TESTING
  - LARGE DOLLAR VALUE ACTIVITIES

SCHEDULE FOR MEETING REQUIREMENTS TO IMPLEMENT A FULLY QUALIFIED QA PROGRAM



PARALLEL EFFORT

PILOT STUDY PLAN GROUP

OBJECTIVE: MAP OUT AND SHAPE THE PROCESS OF REVIEWING AND APPROVING STUDY PLANS

COMBINED WORK EFFORTS

- FULLY QUALIFIED QA ADVISORY GROUP/PILOT STUDY PLAN GROUP

- UTILIZED THE KNOWLEDGE AND INITIAL WORK EFFORT AND PRODUCT OF THE PILOT STUDY PLAN GROUP TO BUILD A FULLY INTEGRATED NETWORK TO INCLUDE:

  - LAND ACCESS AND PERMITS
  - FACILITIES, EQUIPMENT, AND MATERIAL
  - NTS SUPPORT AND COMMERCIAL CONTRACTORS
  - DOCUMENTATION
  - TRAINING AND CERTIFICATION
  - PROTOTYPE TESTING
  - WORK INITIATION REVIEWS
  - TECHNICAL PREREQUISITE INTERFACES
  - MANAGEMENT SYSTEMS

NETWORK STRATEGY

- SELECTED FOUR SAMPLE STUDY PLAN ACTIVITIES FOR NETWORKING AND TO BE SUBMITTED TO HQ BY 7/29/88

  - 8.3.1.2.2.3 STUDY
    CHARACTERIZATION OF PERCOLATION IN THE UNSATURATED ZONE SURFACE-BASED STUDY

    ACTIVITY: VERTICAL BORE HOLE
    RESPONSIBLE AGENT: JOE ROUSSEAU, USGS

  - 8.3.1.17.4.6 STUDY
    QUATERNARY FAULTING WITHIN THE SITE AREA

    RESPONSIBLE AGENT: KEN FOX, USGS

  - 8.3.1.15.1.1 STUDY
    LABORATORY THERMAL PROPERTIES

    RESPONSIBLE AGENT: FRAN NIMICK, SNL

  - 8.3.1.17.4.2 STUDY
    LOCATION AND RECENCY OF FAULTING NEAR PROSPECTIVE SURFACE FACILITIES

    RESPONSIBLE AGENT: LES SHEPPARD

NETWORK STRATEGY
(CONTINUED)

- DEVELOPING CHECKLIST FOR INTERNAL REVIEW ONLY FOR TWO ONGOING ACTIVITIES

  - 8.3.1.17.4.1 STUDY
    HISTORIC AND CURRENT SEISMICITY

    RESPONSIBLE AGENT: AL ROGERS, USGS

  - 8.3.1.5.2.1 STUDY
    CHARACTERIZATION OF THE QUATERNARY REGIONAL HYDROLOGY

    RESPONSIBLE AGENT: JOHN STUCKLESS, USGS

PROCESS OF IMPLEMENTING FULLY QUALIFIED QA PROGRAM

TASK	SUMMARY OF PROCESS
TECHNICAL/QA PREREQUISITES	PRIORITIZATION OF REMAINING NETWORKS TO BE ESTABLISHED FOR THOSE BEYOND THE FOUR EXAMPLES
	NETWORKS WILL BE CREATED FOR EACH ACTIVITY SHOWING PREREQUISITES AND SCHEDULES
	(NOTE: RESOURCES FOR THIS EFFORT HAVE YET TO BE IDENTIFIED)