



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

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MEMORANDUM

DATE: August 15, 1989

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

FROM: Paul T. Prestholt, Sr. DR *PJP* YMP

SUBJECT: Yucca Mountain Project (YMP) Site Report for the month
of July, 1989

I. GEOLOGY-GEOPHYSICS

A. The prototype drilling program moved to a site near Milford, Utah, adjacent to the old "Horn Silver" mine. It was expected that the water table would occur at about 1100 feet; however, perched water was encountered at 120 feet. Hole number 1 was plugged and the rig moved to a second location. If shallow water is again encountered, the activity will be moved to another location altogether.

Mr. John Peshel, HLEN, and I are planning to spend several days observing this drilling activity in early August.

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B. The "Sample Management Facility" (SMF) is now fully operational. All procedures for SMF operation have been approved. Copies of the procedures have been forwarded to D.C.

C. Mr. Jerry Szymanski's revised and expanded report along with the peer technical review of Mr. Szymanski's original report, has been released to the public. A copy of these documents has been forwarded to D.C.

The Project Office (YMPO) will conduct two reviews of Mr. Szymanski's revised report. The first review will be by an independent peer review panel consisting of five members, two chosen by Mr. Szymanski, two chosen by the Project Office and the fifth chosen by the first four. The Project Office (YMPO) will ask the National Academy of Sciences (NAS) Board on Radioactive Waste Management to conduct the second review. It is expected that the review process will take from 6 to 12 months.

D. The "Technical Assessment Review" (TAR) board that is looking into the possibility that the resistivity anomaly identified by Smith and Ross (1982) in the vicinity of the Exploratory Shafts (ESF) in Coyote Wash is a fault met several times during July and produced a draft report.

Preliminary findings of the TAR team are as follows (from the enclosed handout):

**PRELIMINARY FINDINGS OF TAR TEAM
(TEAM STILL WORKING ON RECOMMENDATIONS):**

- ◆ Agree with previous mapping done in Coyote Wash (possibility of undetected minor faults).

- ◆ Evidence against faulting in the vicinity of the ES: Previous mapping, aerial photography, lithologic logs from boréholes and geologic cross-sections, review of contacts mapped upslope from shaft locations; Flanigan (1981) EM survey.
- ◆ Reinterpretation of Smith and Ross data indicates the presence of a resistivity anomaly in the vicinity of the Smith and Ross interpreted fault; extent and depth of contrast not well constrained by the data; possible interpretations of anomaly: Perched water, percolation of runoff in Coyote Wash; compositional or hydrologic variation in PTn; percolation and associated clay alteration from changes in fracture density, or a buried fault. Available data does not allow any discrimination among the interpretations.

Implication: Possibility of fault at depth, in the vicinity of the ES, cannot be discounted; geologic data however, suggest that this is not likely.

- ◆ Based on current data and hydrological models, the presence of a possible fault through the ES would not impact long term waste isolation performance.
- ◆ ES constructability and safety would not be compromised unless a major fault were encountered in the course of shaft construction.

The following are the possible recommendations of the TAR team (from the handout enclosed):

POSSIBLE RECOMMENDATIONS OF TAR TEAM

- ◆ Clean and carefully map the exposed contacts and fractures along the south side of Dead Yucca Ridge; would provide additional confidence on the absence of a fault.

- ♦ Map exposures created by ES pad excavation (\pm 20 m).
- ♦ Drill and log shallow boreholes or MPBHs before pad construction; to gain additional confidence on the remaining uncertainty in the geophysical interpretation regarding the presence of fracture zones at depth.

II. HYDROLOGY

A hydrology field trip was conducted by YMPO and the USGS for members of the NRC hydrology section, HLGP, on July 24, 25, 26, and 27. Mr. William Hughes, DOE-YMPO and Mr. Tony Buono, USGS hosted the field trip for the DOE and Dr. Donald Chery, hydrology section leader, HLGP let the NRC contingent.

The trip included visits to "G" tunnel, the Carpetbag Fault, the Sample Management Facility (SMF), the USGS hydrology labs in area 25, the various field activities on-going in the Yucca Mountain area, the Ash Meadows springs and Death Valley.

The DOE-YMPO and the USGS have stated that the interactions were positive and that the staffs' visit was worthwhile. As has been the case with past NRC-USGS informal technical meetings, the discussions were conducted in an open fully professional manner with both groups receiving maximum benefit from the discussions.

III. GEOCHEMISTRY

This office has received a copy of the Los Alamos National Laboratory (LANL) "Project Status Report" for June and July, 1989. This report (copy enclosed) lists the ongoing activities by WBS element and describes the status of each element.

IV. REPOSITORY ENGINEERING

A task force has been formed by the Project office (YMPO) to perform a risk-benefit analysis on the characterization of the Calico Hills unit in response to the Staff "Point Paper" objection #2 to DOE's SCP-CD. Pending the outcome of the risk-benefit analysis and further consultation with the staff, DOE has deferred plans to sink Exploratory Shaft Number 1 (ESF-1) into the Calico Hills unit.

This activity will start on August 10 and is expected to be completed in 120 days. Organizations and personnel that will be taking part in this activity include (from the handout):

- Project Office and scientific participants
- DOE/Hq
- Consultants in performance assessment, hydrogeology and decision methodology

V. LICENSING AND DOE-NRC INTERACTIONS

A. During the July 27 TPO-Project Manager meeting, Mr. Carl Gertz, the DOE Yucca Mountain Project Manager stated that Dr. Don Deere, Chairman of the NWTRB stated, in a letter, that he (Dr. Deere) "believes there are no holes in the U.S. Department of Energy (DOE) program and is exceptionally pleased with DOE scientific work to date." Dr. Deere also stated that he feels it is necessary to get on with that work.

NOTE: In last month's report, I stated that Dr. Clarence R. Allen was the chairman of the NWTRB. That was an error; Dr. Allen is a member of the board, however, Dr. Don U. Deere is the chairman.

Dr. Deere is an International Consultant in the construction of shafts, tunnels and dams, and in engineering geology and rock mechanics. Dr. Deere is Adjunct Professor, University of Florida in Gainesville.

B. There has been no action by the State of Nevada on permits for site characterization activities at the NTS. DOE has announced plans to initiate litigation proceedings in the near future. YMPD has been informed that the applications for permits are complete, but it is not clear how the recently passed law prohibiting a nuclear waste repository (AB-222) in Nevada will affect the permitting process.

C. Sandia, Los Alamos and the USGS have been audited by the GAO as to how the DOE and its contractors spend money when awarding contracts. The GAO team interviewed P.I.'s and looked at contract records on waste fund disbursements. There is a congressional mandate to the GAO to investigate DOE costs and schedules, as well as how contractors are spending money. The GAO will audit all DOE and contractor field offices.

D. A TAR team will be established by DOE-YMPD to look into the recent U. S. Fish and Wildlife designation of endangered species for the desert tortoise. This action directly effects site characterization activities at Yucca Mountain.

E. The DOE-YMPD is considering preparing a Biannual Status Report (BSR). The BSR would be designed to more easily satisfy the YMPD reporting requirements for the Semiannual Progress Report (SPR) that is required by law and will be prepared by DOE-Hq.

The BSR will also report on details of technical progress by the Project found to be inappropriate for the SPR. The first BSR will cover the period April 15 to September 15, 1989. No date for public release was given.

ATTACHMENT 1

YUCCA MOUNTAIN PROJECT
PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING 1/89
AGENDA

N-AD-028

Location: 101 Convention Center Drive , Room 450
 Las Vegas, NV 89109

REVISED

Page: 1 of 1
 Date: ~~1/27~~ 27, 1989

TIME	WHAT	WHO	EXPECTED OUTCOME
9:00-9:15	Introduction/Roles Agenda/Outcome Review 5-26-89 Minutes Date(s) for Future Meeting(s)	C. Gertz	Agree to Agenda/ Outcome Approve Minutes Agree to Date(s)
9:15-9:30	Manager FYIs	C. Gertz	Understand FYI Items
9:30-10:30	FYIs	Division Directors/TPOs	Understand FYI Items
10:30-10:45	Break		
10:45-11:05	Technical Assessment Review Update	R. Lee	Understand Update
11:05-11:25	Topics for Future NRC Meetings	M. Blanchard	Agree to Topics and Schedule
11:25-11:40	International Conference on High-Level Radioactive Waste	M. Blanchard	Agree to Provide Abstracts/Papers On Schedule
11:40-12:00	Proposed Biannual Status Report	T. Bjerstedt	Understand Status
12:00-12:10	Task Force for Risk-Benefit Analysis of Calico Hills Characterization	E. Hardin	Understand Status and Schedule

Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
June 1989

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**Los Alamos National Laboratory
Yucca Mountain Project**

**PROJECT STATUS REPORT
June 1989**

WBS: 2.1.2.4.A

Project Title: Systems Engineering Integration

Principal Investigator: R. Herbst

The objective of this task is to integrate Yucca Mountain Project technical work through the application of systems engineering techniques.

ACTIVITIES AND ACCOMPLISHMENTS:

No activity to report this month.

WBS: 2.3.2.3.1.A

Project Title: Tectonics and Volcanism

Principal Investigators: B. Crowe and F. Perry

The objective of these volcanism studies is to determine the hazards of future volcanic activities with respect to siting a high-level radioactive waste repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

Samples were collected in the Yucca Mountain region for paleomagnetic studies. Sampling locations include a second population of samples from the Lathrop Wells volcanic center, the two cones of Sleeping Butte (Little Black Peak center and Sleeping Butte center), and sites in the 3.7 Ma basalt of Crater Flat and Black Cone center.

A paper entitled "Volcanic Hazard Studies for the Yucca Mountain Project" was published in Waste Management 89 (Volume I, p. 485-491). An oral paper presenting evidence for the polycyclic eruptive patterns of small volume basalt centers of the southern Great Basin was presented at a conference in Santa Fe, New Mexico, sponsored by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

Final editing was completed of personnel certifications for personnel involved in the volcanism studies. A management diagram of the volcanism project was also completed, and the package was assembled and submitted to the N-5 office in Los Alamos.

Talks on volcanism studies were presented during the meeting session in Las Vegas and on site at Yucca Mountain for the program review by the National Technical Waste Review board.

Mineral separations for the U-Th studies were completed. Magnetite separated from the north lava flows of the Lathrop Wells center may be altered and is possibly unsuitable for analysis.

Thirty basalt samples from the "A" cone in the Cima volcanic field and the Lathrop Wells center were crushed and submitted for x-ray fluorescence analysis.

The rough draft of a manuscript on the results of proton microprobe studies of basaltic ash in trenches of the Yucca Mountain area was completed. The manuscript will be edited by coauthors and prepared as a Level III milestone report.

PLANNED WORK:

Sampling of deposits for thermoluminescence age determinations by S. Forman of the University of Colorado will take place during the first week of July. Samples will be collected from the Lathrop Wells volcanic center and the "A" cone at the Cima volcanic center.

A meeting to review comments on the Study Plan "Characterization of Volcanic Features" will take place at Las Vegas during the second week of July.

Mass spectrometry instrumentation time for the first U-Th measurements of basalt samples is scheduled for August.

BIBLIOGRAPHY:

<u>Author(s)</u>	<u>Title</u>	<u>Type of Publication</u>	<u>Status</u>
Crowe, Harrington, Perry, Wells, McFadden, Renault, Turrin, and Champion	Volcanic Hazard Studies for the Yucca Mountain Project	Paper for Waste Management 89	Published.
Turrin, Crowe, and Fleck	K-Ar Determinations of Lava Flow Units at the Lathrop Wells Volcanic Center	Journal article (to be determined)	In review.

MILESTONE PROGRESS:

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
T404	9/30/88	Progress Report on Rock Varnish Work	Revision sent to Project Office 2/28/89.

WBS: 2.3.4.1.1.A

Project Title: Groundwater Chemistry

Principal Investigator: M. H. Ebinger

The goal of this investigation is to provide conceptual and mathematical models of the groundwater chemistry at Yucca Mountain. These models will explain the present groundwater composition in relation to interactions of minerals and groundwater and will be used to predict groundwater compositions as a result of anticipated and unanticipated environments.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation 8.3.1.3.1.1 was split into two activities. Activity 8.3.1.3.1.1.1 will be concerned with development of a conceptual model of groundwater chemistry, and the mathematical model of groundwater chemistry will be developed in Activity 8.3.1.3.1.1.2, which will begin after the conceptual model is developed.

The draft of the Study Plan for Activity 8.3.1.3.1.1.1 (Conceptual Model of Groundwater Chemistry) will be completed and submitted for internal review in July 1989.

PLANNED WORK:

Continue development of Study Plan for Activity 8.3.1.3.1.1.1, and circulate draft for internal LANL review.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

No milestones scheduled in the next three months.

WBS: 2.3.4.1.2.A

Project Title: Natural Isotope Chemistry

Principal Investigator: A. E. Norris

The objective of the natural isotope chemistry task is to determine the distribution of naturally occurring radioactive elements at Yucca Mountain as part of the work to characterize the infiltration of precipitation, the velocity of water movement through the unsaturated zone, and the retardation of radionuclide transport relative to water velocity.

ACTIVITIES AND ACCOMPLISHMENTS:

The ^{36}Cl analyses of Yucca Mountain Project samples performed this year at the University of Rochester's accelerator mass spectrometer indicated a strong dependence of the $^{36}\text{Cl}/\text{Cl}$ ratio on the particle size of the tuff being analyzed. These results led to the hypothesis that there are two ^{36}Cl components in the tuff: one associated with chloride of meteoric origin, and the second associated with subsurface production of ^{36}Cl . Work this month concentrated on analyses of the chloride and bromide contents of Yucca Mountain tuffs

and soils to determine whether the Cl/Br ratio will be useful for deconvoluting the ^{36}Cl data. The Cl/Br ratio was measured for 24 USW UZ-1 samples, 8 USW UZ-N43 samples, and 10 trench 14 samples, and the data were used to perform an end-member analysis. The Cl/Br ratio for the meteoric component appears to be ~ 150 , while the ratio for the hypogene component is ~ 500 . The bromide concentrations are so low in the deeper samples (~ 5 ppb) that they are near the limit of detection of the ion chromatograph used for the analyses. The interpretation of the data is still in progress.

On June 14, samples of dust from three locations in G-Tunnel were collected to determine the ^{36}Cl background. One sample was collected in the experiment drift, where high values of ^{36}Cl have been observed in drill hole cuttings, and the other samples were collected in drift CFE 3&4 and in drift CFE 2. A sample of cuttings from drift CFE 3&4 is being processed for ^{36}Cl analysis. Additional analyses of ^{36}Cl in cuttings from air-cored hole AC-1 will help define the western extent of the bomb pulse observed in the experiment drift. For this work, J. Ray released 147 kg of AC-1 cuttings that were collected from the G-Tunnel portal by A. Norris and shipped this month to Hydro Geo Chem.

The quality assurance procedures for this task were discussed with Project personnel in Nevada. Los Alamos procedures will be written to govern collection of cuttings for Los Alamos work and water samples for ^{36}Cl analyses. Other procedures will be written as the needs are identified.

A total volume of 10 liters is required for ^{36}Cl analyses of water from dry-drilled holes at Yucca Mountain. Fenix & Scisson suggested using a 6-in.-diam bailer constructed for another project, which Dresser-Atlas personnel helped locate at the Nevada Test Site. Its capacity was determined to be 67 liters: the convenience of using a smaller water collector might well justify the cost of constructing one specifically for this task. The design of such a sampler was initiated by WX-4 personnel.

PLANNED WORK:

The full text of the paper "The Use of Chlorine Isotope Measurements to Trace Water Movements at Yucca Mountain" will be prepared for publication in the proceedings of the DOE/American Nuclear Society meeting "Focus '89" to be held in Las Vegas, Nevada, in September.

MILESTONE PROGRESS:

No level II milestones are scheduled this fiscal year.

WBS 2.3.4.1.3.A

Project Title: Hydrothermal Geochemistry

Principal Investigator: C. Duffy

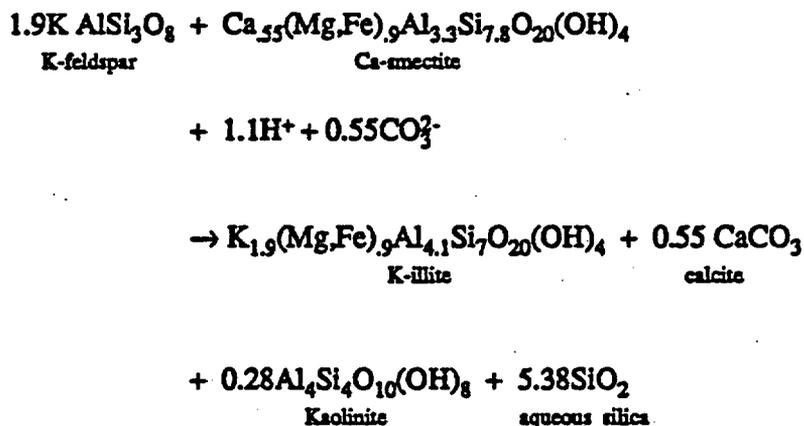
The objective of the hydrothermal geochemistry task is to produce a model for past and future mineral alteration in Yucca Mountain. The model is intended to explain 1) natural mineral evolution resulting from the transformation of metastable mineral assemblages to more stable assemblages and 2) the effects of a repository emplacement.

ACTIVITIES AND ACCOMPLISHMENTS:

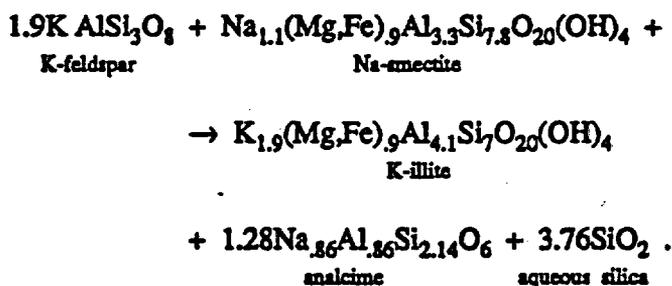
We continue to prepare detailed technical procedures and review quality assurance (QA) procedures. We are continuing to make progress on the data acquisition system for the flexible-cell hydrothermal system.

We are also continuing scoping studies on the kinetics of the cristobalite-to-quartz transition. Our major effort, however, is directed toward the preparation of a milestone report on the smectite/illite transition.

Assuming that smectite/illite can be represented by a solid solution of Ca-smectite, Na-smectite, and K-illite endmembers, reactions among the endmembers can be described by



and



There is considerable published information relating the degree of smectite transformation to illite to temperature; however, there is considerable variation in the temperature correlated with a given amount of transformation. From the above equations, it can be seen that the amount of smectite present is also dependent on the pH, a CO_3^{2-} , and $a_{\text{SiO}_2, \text{aq}}$. The water of hydration in the clays has been neglected in the above equation, but its inclusion would show that the extent of transformation is also dependent on the $a_{\text{H}_2\text{O}}$. One of the report's goals will be to examine possible magnitudes of the effects of each of these variables.

We have also noted that the rate of transformation of smectite to illite observed in some laboratory experiments is similar to the rate of quartz crystallization. We will therefore examine the possibility that the rate of crystallization of quartz controls the rate of the smectite/illite transformation. This seems a reasonable possibility because, if the smectite/illite transformation is maintained near equilibrium, the SiO_2 liberated by the transformation must be crystallized before further transformation can take place.

PLANNED WORK:

Work will continue as needed to achieve a fully qualified QA program. We will also continue scoping studies on the kinetics of silica polymorph transitions using cold-seal hydrothermal techniques. Most of

the effort will be directed toward preparation of a milestone report on the smectite/illite transition due at the end of September.

PROBLEM AREAS:

Project-wide problems with the traceability of standards preclude the possibility of standardizing our hydrothermal lab at this time. Because of the long duration of many hydrothermal experiments, this problem could impact the milestone schedule if not corrected in the near future.

MILESTONE PROGRESS:

Work on the smectite/illite transition milestone is on schedule.

WBS: 2.3.4.1.4.A

Project Title: Solubility Determination

Principal Investigator: D. Hobart

The objective of the solubility determination task is to determine the solubilities and speciation of important waste elements under conditions characteristic of the repository and along flow paths from the repository into the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

The final draft version of the Solubility Task Study Plan was returned to us for final approval prior to technical review. We continued to center most of our effort on quality assurance (QA). Detailed procedure (DP) TWS-INC-DP-78 (Preparation of Pure Oxidation States of Neptunium, Plutonium, and Americium) has been returned with the reviewer's comments addressed. H. Nitsche has addressed the reviewer's comments and made revisions on DPs YMP-LBL-DP-05 (Sodium Concentration Determination in Radionuclide Solutions) and YMP-LBL-DP-07, which has been returned to Los Alamos, and YMP-LBL-DP-02 is currently under revision.

H. Nitsche reports that the remaining neptunium experiments in UE 25#1 have been completed. Measurements on the supernatant show solution species of NpO_2^{2+} and NpO_2CO_3 at pH 7. At pH 8.5, the solution species were exclusively neptunium carbonate complexes. The ^{241}Am solubility experiments at pH 8.5 have reached steady state and will be finished next month. The pH 6 and 7 solutions are still being monitored.

Work continued on assembling and testing the integrated photoacoustic/photothermal deflection spectroscopy system. For the present testing phase, we are confining ourselves to signal detection by photoacoustic (PAS) methods using lead-zirconate-titanate (PZT) transducers. Preliminary versions of the interface routines for the laser power meter, the dye laser wavelength controller, the boxcar averager, and the digital oscilloscope have been completed and are undergoing testing. Plans have been completed for the in-house construction of high sensitivity/low noise preamplifiers for PAS signal processing. These preamplifiers are critical components for ultratrace PAS work, and construction work on them should begin in next month. Preliminary photoacoustic spectra have been obtained on the existing system (using single-stage amplification) for Nd^{3+} in several different aqueous media. The spectral ranges probed for Nd^{3+} transitions include both the 560 - 585 nm region (using Rhodamine 590 as a dye-laser medium) and the 490 - 540 nm region (using Coumarin 500 as the laser medium). In all cases, the spectral band fidelity for the

Nd^{3+} transitions has been excellent. We have also begun investigating signal-to-noise optimization and noise minimization for both acoustic and electronic noise sources. We have found that both the laser dye circulator and the laser power supply are sources of significant acoustic noise, and we have taken steps to acoustically isolate the cell holder/PZT housing from these noise sources.

The following DP's are in progress:

- Determining UV-VIS-IR Absorption and Diffuse Reflectance Spectra.
- X-Ray Powder Diffraction Analysis for Solubility (YMP-LBL-DP-03).
- Sodium Concentration Determination in Radionuclide Solutions (YMP-LBL-DP-05).

Completed and submitted DPs include the following:

- The Preparation of Solutions of Pure Oxidation States of Neptunium, Plutonium, and Americium (TWS-INC-DP-78) (It should be noted that the DP for preparation of pure oxidation states of neptunium, plutonium, and americium is a joint effort by LANL and LBL and will be revised with LBL additions soon.)
- Eh (Oxidation--Reduction) Potential Measurements (YMP-LBL-DP-06).
- Sample Identification and Handling.
- Purification of Colloidal Plutonium(IV) by Centrifugation and Ion Exchange (YMP-INC-DP-80).
- Calibration of Low Energy Gamma Counters (YMP-LBL-DP-02).
- Trace Element Characterization by Atomic Emission Spectroscopy (YMP-LBL-DP-04).

PLANNED WORK:

We will continue work on a number of DPs that are due this fiscal year.

We will continue to work with the present spectroscopy system until the preamplifiers are constructed. Work will focus on determining detection limits (principally for the Nd^{3+} test system) with the existing single-stage amplification system and on PAS signal properties as a function of system variables such as beam focus, beam-to-PZT distance, etc. We will also begin to explore more sophisticated mathematical means of PAS waveform analysis.

MILESTONE PROGRESS:

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
M367	11/17/88	Progress Report on Colloid Stability	Revision sent to Project Office 4/11/89.
P379	11/17/88	Photoacoustic Spectroscopy Methodology	Sent to Project Office 1/18/89.
T418	11/30/88	Solubility Measurements	Revision sent to Project Office 3/27/89.

WBS: 2.3.4.1.5.A**Project Title: Sorption****Principal Investigator: A. Meijer**

The objective of the sorption and precipitation task is to provide sorption coefficients for elements of interest in order to be able to predict radionuclide movements from the repository to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation of the effects of water/rock ratios on sorption coefficients has continued. We have investigated the causes for the increases in sorption ratios for Ba, Cs, and Sr with increasing water/rock ratios observed in simple batch experiments on a zeolitic tuff (G4-1502). Imperfect separation of liquid from solid material in the experiments was identified as one cause, and differences in background electrolyte composition due to solid dissolution was suspected as a secondary cause. Analysis of the waters from the batch experiments were initiated this month. Concentrations of the major cations are similar in each of the solutions showing variations within a factor of two, and analysis of the other major constituents are under way. Full evaluation of this potential cause for variations in the sorption ratio must await the availability of complete analyses.

We have continued the study of Am sorptive behavior using natural and synthetic groundwaters and pure minerals. This month, we completed the pre-equilibration step and started the batch sorption equilibration using Am solutions with a concentration of 10^{-11} M. Two teflon containers are being equilibrated with a solution of Am in J-13 water. The following samples are being equilibrated with a solution of Am in a 7.4 sodium bicarbonate/sodium carbonate buffer: two empty teflon containers, two clinoptilolite samples in teflon containers, and two romanechite samples in teflon containers.

We completed the sorption experiment with Np and pure minerals. The Np solution used for this experiment was prepared with millipore water and buffered with sodium bicarbonate and sodium carbonate to a pH of 8.5. The results follow.

Mineral	Rd calculated from sorption experiment
synthetic calcite	2.1×10^1
calcite from Mexico	3.9×10^2
synthetic hematite	5.1×10^4
montmorillonite from AZ	7.8×10^1
cryptomelane from NM	7.8×10^3
romanechite from AZ	1.5×10^3
purified clinoptilolite from ID	3.0×10^1
synthetic goethite	5.1×10^4

These results confirm our suspicions about the potential importance of trace minerals, such as hematite and cryptomelane, to the retardation of actinides in the Yucca Mountain groundwater flow system. Further studies will investigate the sensitivity of the Np sorption ratio on these minerals to variations in water compositions and radionuclide concentrations.

The desorption experiment of Np in pure minerals was also completed this month. Desorption involved equilibrating the mineral from the sorption step with a sodium bicarbonate/sodium carbonate buffer having a pH of 8.5 and separating the phases by centrifugation. The equilibrated solutions are presently being counted.

We have started the study of Tc sorption and desorption on pure minerals. This month we expect to finish the presorption step, which involves equilibrating the pure minerals with a sodium bicarbonate/sodium carbonate buffer having a pH of 8.5. This pH is common in groundwaters extracted from wells at Yucca Mountain.

Because zeolites will likely be an important barrier to the transport of many of the important radionuclides present in nuclear waste, their sorption behavior should be well understood. One aspect that has not been investigated in detail by the YMP is the effect of variations in zeolite compositions on sorption ratios. Although rock samples (1 g) used in batch sorption experiments are typically "pre-equilibrated" with 20 ml of the groundwater to be used in the experiment, when zeolitic tuffs are used in the experiment, equilibration cannot be achieved because zeolites have high cation exchange capacities and J-13 water is quite dilute in terms of major cations. To investigate this aspect of batch experiments on zeolitic tuffs, we have "equilibrated" a 10 gram sample of zeolitic tuff (G4-1502) with 20 liters of J-13 water in a flow-thru column. The resulting sample will be analyzed for the major components and used in batch sorption experiments to determine the effect of major cation compositions of the zeolites on the sorption ratios of the important radionuclides.

The Stanford group has investigated the degree to which the uranyl ion adsorbs to various laboratory container materials to select an appropriate material for isotherm measurements. At an initial concentration of 4.2×10^{-7} M, most of the uranyl ions sorb to the walls of teflon, glass, and polycarbonate test tubes in the pH range from 6 to 6.5. This indicates that adsorption to container walls must be taken into account in batch experiments at these concentration levels. Work has also continued on the development of an analytical method for neptunium.

The status of the detailed procedures that have been rewritten according to TWS-QAS-QP 5.2, R1 follows.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-05	Sorption, Desorption Ratio Determination of Geologic Materials by a Batch Method	Submitted to the INC QAL.
TWS-INC-DP-79	Liquid Scintillation Counting of Samples	Submitted to the INC QAL.

PLANNED WORK:

Continue the study of Am, Np, and Tc sorptive behavior using synthetic and natural groundwaters and pure minerals.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Ines R. Triay and Robert S. Rundberg	Application of Deconvolution to the Analysis of Univalent Ion-Exchange Isotherms in Zeolites X and Y	Journal article	Accepted by <i>Zeolites</i>
N. Patera, D. Hobart, A. Meijer, and R. Rundberg	Chemical and Physical Processes of Radio-Nuclide Migration at Yucca Mountain, Nevada	Journal article	In internal review.

MILESTONE STATUS:

Milestone	Date Due	Description or title	Status
T419	5/15/88	Position Paper on NNWSI Sorption Studies and Data Needs	Revised after technical reviews and forwarded to Project Office on 6/28/89.

WBS: 2.3.4.1.6.A

Project Title: Dynamic Transport Process

Principal Investigator: R. Rundberg

The objectives of the dynamic transport process task are to determine the rate of radionuclide movement along the potential flow paths to the accessible environment and to examine the effect of diffusion, adsorption, dispersion, anion exclusion, sorption kinetics, and colloid movements in the flow geometries and hydrologic conditions that are expected to exist along the flow path to the accessible environment in the scenarios to be used for performance assessment.

ACTIVITIES AND ACCOMPLISHMENTS:

Our study using Calico Hills and Topopah solid rock columns to investigate the ability of Yucca Mountain to act as a natural filter for particulate matter continues. We utilize for these studies two columns made of the Calico Hills tuff G4-1502 and two columns made of Topopah tuff GU3-1119. This month we have initiated the elution of 0.09 micrometer fluorescing colloids through these columns. To analyze the amount of colloid eluted, we perform fluorometric analysis. Consequently, we are in the process of obtaining a calibration curve using standards with known concentrations of the 0.09 micrometer colloid.

The study of the sorption of radionuclides as a function of time using beakers made of Yucca Mountain tuffs is still in progress (see schedule given in February's monthly report).

We initiated the validation of the Autocorrelation Photon Spectroscopy technique by analyzing NBS standards. The results for the analysis of four colloids follow:

Colloid No.	Actual Size (micrometer)	Measured Size (micrometer)
1691	0.269	0.268
1690	0.895	0.903
1960	9.89	*
1961	29.64	*

*These samples could not be analyzed because they were too large.

These results seem to indicate that particles larger than one micrometer can not be analyzed with this technique. In addition we analyzed mixtures of the NBS colloids 1691 and 1690 to determine the ability of this system to analyze suspensions containing more than one size colloid. The results of these studies will be reported next month.

We have moved some of the YMP equipment at RC-1, TA-48 to a new room within RC-1. After the equipment was moved it was re-installed and checked. We will continue this process through the next few months.

PLANNED WORK:

Continue solid rock column experiments.

Continue rock beakers experiment.

Start transport work with pure minerals.

Continue to validate the Autocorrelation Photon Spectroscopy technique using NBS standards.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
A. J. Mitchell, R. S. Rundberg, M. A. Ott, and I. R. Triay	Instrumentation and Operation of an Autocorrelated Photon Spectrometer Used for Particle Size Determinations	Abstract for 198th National Meeting of the American Chemical Society, Miami, FL, September 10-15, 1989	Received Project Office approval 6/2/89; presentation cancelled.
M. A. Ott, R. S. Rundberg, and I. R. Triay	Mechanical Manipulation of Intact Tuffaceous Rock to Fabricate and Assemble Solid Rock Columns and Rock Beakers	Abstract for 198th National Meeting of American Chemical Society	Received Project Office approval 6/2/89; presentation cancelled.
I. R. Triay, R.S. Rundberg, A.J. Mitchell, and M. A. Ott	Utilization of Inversion Techniques for Particle Size Determinations Using Auto- correlation Photon Spectroscopy	Abstract for 198th National Meeting of the American Chemical Society	Received Project Office approval 6/6/89.
I. R. Triay, R. S. Rundberg, A. J. Mitchell, M. A. Ott, D. E. Hobart, and P. D. Palmer	Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy	Abstract for 2nd International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Monterey, CA, November 6-10, 1989 (Migration 89)	Submitted to Project Office 5/18/89.
R. S. Rundberg, I. R. Triay, M. A. Ott, and A. J. Mitchell	Observation of Time Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns	Abstract for Migration 89	Submitted to Project Office 5/16/89.
I. R. Triay, A. Meijer, M. R. Cisneros, G. G. Miller, P. D. Palmer, R. E. Perrin, and R. D. Aguilar	Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters	Abstract for Migration 89	Submitted to Project Office 5/19/89.

MILESTONE PROGRESS:

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
R743	8/16/88	Dynamic Transport of Colloidal Tracers through Fractured Tuff: 0.10- to 9.55- μ m-Diameter Carboxylated Polystyrene Spheres	Revision sent to Project Office 12/7/88.

WBS: 2.3.4.1.7.A**Project Title: Retardation Sensitivity Analysis****Principal Investigator: K. Eggert**

The objectives of the retardation sensitivity analysis task are to construct a geochemical/geophysical model of Yucca Mountain and to use this model to examine the physical and chemical controls on radionuclide transport along flow paths to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:**Analysis of Physical/Chemical Processes**

FEHMN/FEHMSN. Adaptive solution procedures have been developed for two-phase, two-component, non-isothermal flow. These methods should prove useful in unsaturated zone calculations. The coupled flow/stress model is implemented and undergoing testing.

Colloid Transport Modeling. Two cases for CTCN (Colloid Transport Code - Nuclear) were investigated. First, Tang's analytical solution to the filtration capture submodel was applied to Rundberg's experiment, and his results were verified. Next, the same equation was solved numerically using the MOL1D code. There were overflow and underflow problems while running the code on a SUN, and the results obtained were inaccurate: the same problem was encountered on the Cray. Repeated attempts at debugging were fruitless.

For the other case, Rundberg's experiment was modeled by an electrokinetic model. The equations obtained by neglecting diffusion in the rock matrix and in the fluid were solved, and an analytic solution was obtained. However, to model Rundberg's experiment, these effects could not be neglected. We attempted to solve the new set of equations incorporating diffusion using MOL1D. The same problems were encountered as before, and less complex models are being tested to identify the problem. The problem is most probably due to the fact that Rundberg used a step input of the tracer. Most numerical codes have problems with step input boundary conditions, but this is especially true for Method of Lines (MOL) codes. Although MOL codes can solve most problems over a wider range than most other techniques, step inputs have been seen to cause overflow/underflow problems from the ODE integrator. Work was started on extending the MOL1D code to more dimensions. Objectives at this stage are developing the 2- and 3-D versions of CTCN and trying to find a method to circumvent the problems encountered for step inputs (if possible).

H. E. Nuttall delivered a professional paper entitled "Ion versus Colloid Transport in Fracture Medium" at the 63rd ACS Colloid and Surface Science Symposium, University of Washington, Seattle, Washington, June 18-22, 1989.

Geochemical/Geophysical Model

The grid was completed to run a 3-D forward transport calculation with TRACRN. The grid is based on a 3-D model of the hydrologic stratigraphy at Yucca Mountain developed at Sandia National Laboratories (Ortiz et al. 1985) and included tilted beds and the Ghost Dance Fault. The grid information was given to K. Campbell, who will return mineralogy data based on position and sorption data based on mineralogy. Initial flow calculations are ready to be run.

QA and Programmatic

The team participated in a practice audit conducted by quality assurance support staff and R. Herbst of N-5.

Team members completed QA reading assignments and updated QA manuals.

Work was started on the software requirements and software design (SRSD) portion of the baseline manual for CTCN.

K. Eggert compiled a set of input parameters for sample transport problems. This data was sent to A. Van Luik and will be incorporated into a set of Technical Integration Group sponsored performance assessment calculations. K. Eggert is a member of the working group responsible for these problems.

Interviews are being arranged to hire a staff member to work on inverse calculations, and one candidate was interviewed in June.

PLANNED WORK:

Geochemical/Geophysical Model

Work will be continued on 3-D forward transport calculation.

Transport Models and Related Support

Coupled geochemistry will be added to FEHMN.

BIBLIOGRAPHY:

<u>Author(s)</u>	<u>Title</u>	<u>Type of Publication</u>	<u>Status</u>
G. Zyvoloski and S. Keikar	FEHMS - A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Los Alamos National Lab document LA-UR-87-1323	

MILESTONE PROGRESS:

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
R343	5/1/87	Preliminary Geochemical/Geophysical Model of Yucca Mountain	Revision sent to Project Office 1/9/89.
R346	3/31/87	FEHMS: A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Memo addressing review comments sent to Project Office 5/23/89.
R749	7/30/88	Results of the COVE2a Benchmarking Calculations Run with TRACR3D	Revision sent to Project Office 12/9/88.
T421	12/15/88	TRACR3D Documentation for Baseline-Review.	Revision sent to Project Office 6/2/89.

WBS: 2.3.4.1.8.A**Project Title: Reactive Tracer Testing****Principal Investigator: E. Springer**

Experiments will be conducted at the C-well complex (holes UE25c#1, UE25c#2, and UE25c#3) and in other wells in the vicinity of Yucca Mountain. Reactive tracers will be used to characterize retardation and transport properties on a scale larger than that currently used in laboratory experiments.

ACTIVITIES AND ACCOMPLISHMENTS:

The study plan for this activity was revised and returned following two comments from Headquarters and 18 comments from the Project Office.

Training for detailed technical procedures (DPs) that are critical to mineral separation and preparation was completed. Efforts continue to test new equipment, the polarograph and the particle-size analyzer, so we can develop DPs for these items.

A key in linking laboratory estimates of sorption with field test results is to develop the capability to adjust parameter values of the sorption expression for various conditions based on laboratory data. Although empirical isotherms will be used in the transport models to analyze the field test, constants in these isotherms can be used to estimate thermodynamic constants to provide a basis to adjust isotherm parameters for various conditions, such as solid to liquid ratios and/or solution composition. Mathematical derivations of the relationship between parameters found in the isotherms and thermodynamic equilibrium constants have been made for the case when the Modified Freundlich isotherm represents sorption by ion exchange. Initial testing of these hypotheses can use data from individual mineral experiments. If this approach is successful, the capability to estimate parameters for conditions other than those used in the laboratory will be enhanced.

Verification of the computer code FEHMN continued. The heat conduction algorithm was tested for various geometries, and a problem was found with left-facing triangles in a mixed triangular (both right and left facing) mesh or a mixed triangular and rectangular mesh. The problem is geometric and efforts to

locate the coding error are under way. Heat and fluid flow in a fracture were also tested. Final verification of the hydraulics using the Theis and dual porosity solutions was completed. The transport component is still having mass balance problems that have been traced to the implementation of a boundary condition algorithm.

PLANNED ACTIVITIES:

Continue training in DPs and develop requirements for remaining procedures.

Initiate laboratory experiments using individual minerals.

Develop approach of using isotherms to derive thermodynamic parameters.

Implement corrections to FEHMN for left-facing triangle and solute transport problems and continue verification simulations.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

<u>Author</u>	<u>Title</u>	<u>Type of Publication</u>	<u>Status</u>
B. Newman, H. Fuentes, and W. Polzer	An Evaluation of Lithium Sorption Isotherms and Their Application to Groundwater Transport	Groundwater (Journal)	In technical review.

MILESTONE PROGRESS:

No milestones are due in the next three months.

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
R397	3/31/87	Reactive Tracer Experiments in the C-Wells and Other Wells in the Yucca Mountain Vicinity	Revision submitted to Project Office (Study Plan).
T426	9/1/88	FRACNET - Fracture Network Model for Water Flow and Solute Transport	Being revised after Project Office review.

WBS 2.3.4.1.9.A

Project Title: Biological Sorption and Transport

Principal Investigator: L. Hersman

The purpose of this research is to determine whether microbial activity can influence the movement of plutonium in tuff. Because fluids are used extensively in the exploration of locations for a nuclear repository, of special interest are those microorganisms capable of utilizing drilling fluids as growth substrates.

ACTIVITIES AND ACCOMPLISHMENTS:

Work has continued on the purification of siderophore from species 11c using both sephadex C-25 and bio-rad P-2 columns. Iron 59 was ordered from New England Chemicals and will be used to determine the formation constant of the siderophore for ⁵⁹Fe.

Colloidal agglomeration experiments are also being conducted. We are currently enhancing the image analysis system. Although it is easy to observe the accelerated formation of colloidal agglomerates in the presence of spent medium, it has been difficult to get the image analysis system to recognize the agglomerate as one unit and to not count all the individual particles within the agglomerate. We have been working with representatives from Olympus Corporation to solve this problem and are making progress in determining the effect of microorganisms on colloidal agglomeration.

PLANNED WORK:

We will continue to study colloidal agglomeration. In addition, chelation experiments will be directed towards determining a formation constant with ²³⁹Pu.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

No Level II milestone reports are due in the next three months.

WBS: 2.3.4.1.11.A

Project Title: Geochemical Field Tests for Validation

Principal Investigator: J. A. Canepa

The purpose of this activity is to test the validity of the laboratory geochemistry data generated by the Geochemistry Test Program and to test the geochemical transport modules. Five subtasks constitute this activity: 1) natural analogs, 2) large block test, 3) caisson test, 4) unsaturated zone geochemistry field test, and 5) radionuclide migration studies at the Nevada Test Site.

ACTIVITIES AND ACCOMPLISHMENTS:

Natural Analog Task

Work scope and a funding profile for the joint natural analog task with the Atomic Energy of Canada Limited (AECL) were provided to the Department of Energy (DOE).

Large Block Test

Work scope and a funding profile for the joint large block test with the AECL were provided to DOE.

Radionuclide Migration Studies at the Nevada Test Site

No action.

Caisson Tests

No action this month because of the requested efforts to support the request for problem formulation by the Performance Assessment Technical Integration Group (TIG).

Geochemistry Field Tests

The field test designs proposed by LLNL and Los Alamos/Argonne/Sandia in 1981 - 1982 for G-Tunnel tuff and climax granite transport experiments, as well as technical peer review comments of these programs, were reviewed. It was useful to read the criticism of the experiments, because their general objectives and designs are similar to the field effort we envision.

A draft of the compilation of what is known of the Calico Hills tuff below the repository is complete. This document will be formally reviewed for technical and policy concerns and will form the basis for justification of Calico Hills geochemistry field tests, as well as being a useful catalogue of hydrologic and transport properties.

We have talked to the US Geological Survey experimenters regarding details of the measurement and sampling techniques they will apply in their hydrology experiments in G-tunnel and the Exploratory Shaft Facility (ESF). They are improving their thermocouple psychrometers for pore pressure diagnostics and are developing calibration capability at the Nevada Test Site for their customized psychrometers. *In situ* fluid sampling is being approached by developing techniques to extract pore fluid from cores taken from the medium (triaxial squeezing, centrifuge, freeze drying, and displacing the pore fluid with non-aqueous liquids). Their previous *in situ* block infiltration experiment at the ESF is now planned to be a laboratory block test.

We have also set up simple TRACRN problems for parametric studies to determine scaling relationships (both flow and retardation). This work will continue for several months, eventually culminating in detailed analyses of the experiment design.

WBS: 2.3.4.2.1.A**Project Title: Fracture Mineralogy****Principal Investigator: B. Carlos**

The purpose of this task is to study fracture-lining minerals and their paragenesis to (1) assess the role of fractures as transport pathways during past alteration, (2) determine the conditions under which various minerals were deposited, (3) determine the nature of fracture surfaces along possible transport pathways, and (4) evaluate the occurrence of potentially hazardous minerals in the intervals to be mined.

ACTIVITIES AND ACCOMPLISHMENTS:

Developing and implementing a qualified quality assurance (QA) program continue to be a top priority, and we are continuing writing, reviewing, and training in various QA procedures and detailed procedures.

Some additional analytical work was done on the manganese oxides in the Crater Flat tuff of USW G-4. The milestone report is written and will now undergo internal review.

Work continues on fractures in the Topopah Spring Member in USW G-1, G-2, and GU-3. Stilbite was identified from a fracture at 1517 ft in USW G-2. The fracture is in the densely welded Topopah Spring Member approximately 117 ft above the vitrophyre. This is the first stilbite identified at Yucca Mountain. It occurs with mordenite and cannot be distinguished from heulandite at 50x magnification. Heulandite and mordenite are the most common fracture-coating minerals at this stratigraphic depth in other drill holes at Yucca Mountain.

D. Broxton and B. Carlos attended the Sample Overview Committee meeting held at the Sample Management Facility on June 20. Results of the prototype drilling in Utah were presented, and the samples obtained by the various methods were examined. Reverse vacuum coring presents difficulties in operation, and the results did not meet the needs of any of the Principal Investigators (PIs) present. We therefore recommend that this method be discontinued and that future prototype coring concentrate on normal circulation dry drilling. It was also apparent that there is an acute need for integration of the surface-based investigations similar to the function performed by the integration office for the Exploratory Shaft Facility. Because the plans change often, it is difficult to keep up with the latest plan and assure that it meets the needs of the various investigations. Not all of the participants agreed on the depth, locations, or diameter of planned core holes: PIs may be planning their experiments around an obsolete drilling plan and find that the location or diameter of the hole has been changed and they cannot perform their investigation.

PLANNED WORK:

Work towards developing and implementing a qualified QA program will continue.

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USW G-1, G-2, and GU3 will continue as time and sample availability allow.

Review and revision of the Los Alamos report on manganese oxide fracture fillings in the Crater Flat tuff in USW G-4 will begin next month.

MILESTONE PROGRESS:

No Level II milestone reports are due in the next three months.

WBS: 2.3.4.2.2.A

Project Title: Alteration History

Principal Investigator: S. Levy

The objective of the alteration history task is to characterize past and present natural alteration processes that have affected the potential geologic repository and to predict future effects of natural and repository-induced alteration.

ACTIVITIES AND ACCOMPLISHMENTS:

Efforts this month were concentrated on revising the alteration history study plan following the DOE Headquarters comment resolution session on May 31.

An invited presentation by Professor Kevin Crowley, Miami University, on "Annealing of Fission Tracks in Apatite, with Applications to Geothermal History" was given here on June 6. We are looking into the possibility of sponsoring fission-track annealing studies of Yucca Mountain samples to complement the illite-smectite transformation studies of paleogeothermal gradients being done by D. Bish.

S. Levy prepared the statement of proposed mineralogy-petrology tests for the prototype shaft, with input from B. Carlos (fracture mineralogy). The principal objective of our proposed tests is to check the workability of sampling arrangements, including procedures and interfaces. The fracture mineralogy input includes the added objective of evaluating the representativeness of *in situ* and muck-pile fracture samples. Levy delivered the draft version of our proposed tests at the Exploratory Shaft Test Plan meeting in Albuquerque, New Mexico, on June 15.

Quality assurance (QA) emphasis this month has been on training for read-only quality procedures (QPs). Several draft QPs were also reviewed.

PLANNED ACTIVITIES:

Top priority will be on completion of the alteration history study plan revision. Scanning electron microscope study of fault breccia textures will continue. S. Levy will make a presentation on alteration history research at the US Geological Survey, Denver, in July. An official version of the prototype shaft test plan input will be prepared and delivered. We have been requested to provide mineralogic information to the Technical Adviseement Review committee investigation of a possible fault at the Exploratory Shaft site.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Milestone reports are delayed to redirect effort toward the QA program.

WBS: 2.3.4.2.3.A

Project Title: Mineralogy of Transport Pathways

Principal Investigator: D. Vaniman

The purpose of this activity is to define the important mineralogic and geochemical variables along transport pathways at Yucca Mountain in support of performance assessment and to evaluate the impact of repository construction on natural waste transport barriers.

ACTIVITIES AND ACCOMPLISHMENTS:

Data files of petrographic, x-ray diffraction (XRD), and INAA chemical analyses of devitrified Topopah Spring Member samples for the Exploratory Shaft mineralogy-petrology test have been completed. The data files will be used to determine the modes of stratigraphic and vapor-phase variation. The data will also be analyzed statistically to determine the sample size and sampling density necessary to adequately characterize the rock mass to be excavated during shaft and drift construction.

Four samples from UE-25a#1 were crushed and sieved to less than 75 micrometers for separation of phases with density greater than about 2.8. The samples crushed were from the devitrified Topopah Spring Member at the proposed repository elevation, from the altered zone above the basal vitrophyre, from the vitrophyre, and from zeolitized tuff of Calico Hills. Na-metatungstate heavy liquid was used, with density separation at 2.82 - 2.83. Weights recorded before and after separation show that the heavy mineral fraction accounts for about 0.05% of the devitrified and vitrophyre samples and about 0.03 to 0.05% of the zeolitized samples. The separated materials are being analyzed by XRD and will be used in mossbauer analysis.

D. Broxton and D. Vaniman gave presentations to the Nuclear Waste Technical Review Board in the field at the NTS on June 28th.

The sample identification and control procedure for mineralogy-petrology studies has been integrated with the electronic sample-tracking database.

PLANNED WORK:

Continue work on quality assurance program development.

Development of Exploratory Shaft Sampling plan using data from the Solitario Canyon outcrop.

Evaluation of revised XRD data using multivariate methods.

Work on image analysis methods to generate porosity distribution maps and on trace-mineral analysis.

Statistical methods development, especially the development of tools for handling compositional data.

Simulation of spatial distribution of compositional data for use in transport models such as TRACRN.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

<u>Author</u>	<u>Title</u>	<u>Type of Publication</u>	<u>Status</u>
K. Campbell	Sampling for Site Characterization of a Potential Waste Repository	Journal (<i>Mathematical Geology</i>)	Being revised following internal review.
K. Campbell	Statistical Guidelines for Planning a Limited Drilling Program	Article for journal (to be determined)	In technical review.

MILESTONE PROGRESS:

<u>Milestone</u>	<u>Date Due</u>	<u>Description or title</u>	<u>Status</u>
T433		XRD Analysis of Batch Sorption Samples	Project Office approved 6/13/89.

WBS: 2.5.2.2.A**Project Title: Regulatory and Institutional****Principal Investigator: J. A. Canepa**

The purpose of this task is to coordinate the regulatory and institutional Project requirements within the Los Alamos programmatic structure. The focus of this coordination effort is on the integration of the technical work within the regulatory and institutional framework.

ACTIVITIES AND ACCOMPLISHMENTS:**Site Characterization Plan**

No action required this month.

Semiannual Progress Report

No action required this month.

Study Plans

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Yucca Mountain Project Office (Project Office) 1/6/89. Approved by Project Office and Department of Energy Headquarters (DOE/HQ); sent to Nuclear Regulatory Commission (NRC) and State of Nevada.

Diffusion Test in the Exploratory Shaft, R0 (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ 4/18/89. Abstract and SCP-based network submitted to Project Office 5/25/89 and to DOE/HQ 6/30/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89. Revision 2, which incorporates DOE/HQ and Project Office comments, was submitted to the Project Office 6/27/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.1.3.2.1). Revision 3, which incorporates Project Office AP- 1.10Q review comments, was submitted to the Project Office 5/25/89. Study Plan was approved by the Project Office and transmitted to DOE/HQ on 6/16/89. A Study Plan Assessment was developed for this study and transmitted to DOE/HQ on 6/22/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). Project Office and DOE/HQ comments were received 5/25/89. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Project Office AP-1.10Q review comments were received 6/1/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89. Undergoing Project Office AP-1.10Q review (6/16/89).

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP3.2 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Diffusion, R0 (8.3.1.3.6.2). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of a Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (1/25/89). Project Office AP1.10-Q comments received 6/9/89. A Comment Resolution Meeting for Project Office and DOE/HQ comments will be held July 11-12, 1989.

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of the abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89. Project Office AP-1.10Q comments received 6/28/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

WBS: 2.6.A

Project Title: Exploratory Shaft Management and Planning

Principal Investigator: H. Kalia

These exploratory shaft (ES) tasks will address the issues and information needs associated with the feasibility of storing high-level nuclear waste in a geologic repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

We continued to support the updating of the Subsystems Design Requirements Documents (SDRD). Work primarily consisted of incorporating unresolved Technical Assessment Review Comments (TAR) on Bench Mark 4 of the SDRD. The effort is underway to issue Revision 1 of the SDRD and to completing this activity.

Work continued for the preparation of Test Support Requirements Document (TSRD). To date, support requirements have been determined on all of the tests in the Shaft and requirements are being developed for the tests in the main test level.

Work continued to prepare the Exploratory Shaft Test Description Document (ESTD). Draft of this document is expected to be ready for Los Alamos review by the end of July.

Work continued for the preparation of project testing networks. We discussed the logic of the test networks with Sandia, Lawrence Livermore, US Geological Survey (USGS), and Los Alamos Principal Investigators.

We continued to support the WTT-4 effort and Long Range Planning Networks by providing information on testing for the network.

Work continued for the preparation of the Annual report and the Summary Report for the Prototype Testing Program. Work was initiated to obtain photographs to prepare an album for the prototype testing.

Continued to support project efforts in integrating Exploratory Shaft Facility (ESF) testing with construction and design by participating in design integration meetings.

Initiated work for the preparation of information to be used by the Project Office to define US Bureau of Mines (USBM) Pittsburgh and Minneapolis centers role.

Supported FSN effort in developing specifications to modify CMM-2 drill rig.

Participated in a meeting on water usage and in Interface Control meetings. Continued to participate in Readiness Review meetings both as a team and board member.

Work continued on *in situ* stress measurements. Problems have been encountered on overcoring because the core fragments cannot be used to obtain modules. The drilling technique has been modified to obtain overcore; however, additional funds are requested to complete this activity.

Prototype data collection continued for the Engineered Barrier Test and Drill Hole Instrumentation test. Drilling for Phase II of the Prototype Intact Fracture tests was initiated, and drilling for perched water continued during this period. We prepared input for the prototype shaft for planned testing and coordinated input with Sandia, USGS, and Los Alamos. Held a prototype budget discussion with participants and project staff to obtain the current status of the prototype budget for reaming tests and plans for FY 1990. Completed and distributed Readiness Review memorandum for Prototype Blast Effects Tests.

Participated in Exploratory Shaft Test Coordination Meeting hosted by Sandia at Albuquerque. Next meeting is scheduled for August at Denver, Colorado, to be hosted by USGS.

Work was initiated to prepare Preliminary Safety Analysis Report (PSAR) for testing. Coordinated the preparation of Project PSAR with other participants.

Participated in a workshop conducted by NTS on applicable DOE orders.

Contract to utilize Golder Associates from Seattle was finalized.

Cody Milligan was transferred from Los Alamos, NM to Los Alamos, YMP Las Vegas office. He will coordinate REECo activities, PSAR, and safety aspects of testing.

PLANNED WORK:

Work will continue to support and coordinate the prototype testing effort and to update the Prototype Testing Budget. Work will continue to plan and implement Readiness Reviews for the prototype tests.

Work will continue to update and to complete the response to DOE/HQ comments on SDRD Appendix B and C.

Work will continue to prepare Exploratory Shaft Test Descriptions Document and Test Support Requirements Documents.

Meetings will be scheduled with REECo to develop drilling time for tests.

Work will continue to develop detailed logic networks for ESF testing.

Work will continue for the preparation of the PSAR.

Work will continue to develop the scope of work for USBM effort for Dust Hazard and Drilling activities.

Work will continue to support WIT-4, LRP, and other integration activities.

PROBLEM AREAS:

Competing demand for resources is straining the capacity to maintain schedule, so work on several activities is being performed on priority basis.

WBS: 2.69.2.4.A**Project Title: Geochemical Testing****Principal Investigator: A. E. Norris**

Two geochemical tests have been proposed as part of the site characterization work associated with the construction of the exploratory shaft (ES). One is the measurement of the rate of water movement through the unsaturated zone as traced by chlorine-36. The second is the measurement of effective diffusivity coefficients under *in situ* conditions in two of the tuffs that will be penetrated by the ES. The data from both tests will be used in assessing the suitability of the Yucca Mountain site for a nuclear waste repository.

ACTIVITIES AND ACCOMPLISHMENTS:

U. S. Bureau of Reclamation requested this month that the control panel for the prototype diffusion test in G-Tunnel's experiment drift be moved closer to the right rib to provide clearance for drilling in the headwall for the intact fracture test. On June 14, the control panel was moved, the nitrogen gas lines were replumbed, and a new solenoid was installed to replace one that failed during the move. Clearance between the drill rig for the intact fracture test and the prototype diffusion test control panel is likely to be minimal at best. A request was sent to the Test Manager to have a protective barrier built around the control panel before the drill rig is moved into position.

Cuttings from the prototype air coring test conducted at Toelle, Utah, were examined on June 20 at the Sample Management Facility. If similar cuttings are obtained from the prototype air corehole planned for the Nevada Test Site, they are likely to be satisfactory for procedure-development work.

The new motor for the ESS-1 rock saw has not solved all the problems involved in the dry sectioning of a 12-in.-diam core of welded tuff. This month, the fastest sectioning was done by making three cuts with an 18-in. blade, rather than a single cut with a 36-in. blade. Additional work will be done in an attempt to section the core more rapidly.

Revisions to the April version of the Exploratory Shaft diffusion test network were documented and sent to the Test Manager's Office.

PLANNED WORK:

Overcoring for the prototype diffusion test will be restarted as soon as the equipment is available.

MILESTONE PROGRESS:

No level II milestones are scheduled, and level III milestones are on schedule.

WBS: 2.69.3.A**Project Title: Exploratory Shaft Integrated Data System****Principal Investigator: H. N. Kalia**

The integrated data system (IDS) is part of the supporting facilities for the Exploratory Shaft Facility (ESF). The IDS supports the data acquisition needs of the ESF test program by providing a central facility to automatically measure and control aspects of the ESF tests. The primary purpose of the IDS is to assist

the principal investigators (PIs) in acquiring high-quality test data in a uniform, controlled fashion and to transfer those data to the PIs' organizations for data management and analysis.

ACTIVITIES AND ACCOMPLISHMENTS:

Work continued to prepare the IDS Quality Assurance Program Plan (QAPP) and the Basis for Design and Functional Requirements Document for the design of IDS.

Work continued for the development of the Configuration Management Plan for the IDS.

Contract document was revised and reissued defining Los Alamos and Edgertown, Germeshausen & Grier, Inc., (EG&G) responsibilities.

Continued with the preparation of the IDS network, and we provided network-related information for the integrated network.

Continue to integrate IDS with ESF design effort.

PLANNED WORK:

Work will continue to finalize IDS Functional Requirements Document (FRD) and Design Basis Document.

Work will continue to develop EG&G QAPP and procedures required to start the IDS Title II design.

Work will continue to prepare the IDS Configuration Management Plan, Data Interface Documents, and Hardware Configuration Plan.

We will seek authorization for YMP to start Title II Phase IA design of the IDS.

Continue to develop IDS network to completion of ESF testing and integrate this network with ESF design and construction network and with the testing network.

Initiate work to identify IDS operational requirements including resources and budgets.

Schedule meeting between users and designers on IDS test construction and scheduling.

PROBLEM AREAS:

Work on this activity remains behind schedule because of staffing problems at EG&G and Los Alamos; however, efforts are being made to find qualified scientists and engineers.

WBS: 2.9.1.4.A

Project Title: Records Management

Principal Investigator: G. Ortiz

The objective of this task is to manage records and documents related to the licensing of a geologic repository for the disposal of high-level radioactive waste. The requirements are to support the

development, implementation, and maintenance of a comprehensive, automated, and integrated information management system.

ACTIVITIES AND ACCOMPLISHMENTS:

A records coordinators meeting was held on June 6 to discuss the new revision of Administrative Procedure AP-1.7Q. Many issues were addressed by Project participants regarding requirements imposed by the procedure, and requests were made to change some of these requirements.

The Quality Assurance staff conducted an audit of the Records Processing Center (RPC) on June 14 and 15. Two observations and six findings were made during the audit. Most of the findings addressed are, and will be, on-going activities, and we will take corrective actions for the deficiencies and appropriate steps to reduce recurrences. The audit team found that the records processing function had systems in place to process records carefully, completely, and in a logical manner.

PROBLEM AREAS:

The RPC has a responsibility of notifying the groups that their records have been microfilmed by the Central Records Facility (CRF). However, the CRF is backlogged with records to microfilm, causing a substantial delay in RPC's notification to the groups.

PLANNED WORK:

A standard form will be implemented for the resident file log to give a status of the records and to maintain uniformity throughout the Project.

WBS: 2.9.3.A

Project Title: Quality Assurance

Principal Investigator: H. P. Nunes

The Quality Assurance Program provides quality assurance support to Los Alamos Yucca Mountain Project (YMP) participants. This support is designed to ensure that the YMP efforts of Los Alamos will provide admissible data and evidence for the repository licensing process.

ACTIVITIES AND ACCOMPLISHMENTS:

The biweekly Los Alamos meetings to achieve a qualified quality assurance (QA) Program were completed; however, monthly meetings will continue until the last procedures are issued. The 39 quality procedure revisions are on schedule. A total of 34 procedures are completed and issued: all of the remaining 5 are in the review-comment resolution cycle. All procedures for which formal training is required before the start of the Title II Design Efforts have been issued, and all procedures that impact the Title II effort have been completed and issued. Three formal training modules need to be prepared to support the final Los Alamos training needs for the remaining procedures currently being developed.

The effort at Edgerton, Germeshausen & Grier (EG&G) is now directed towards revising the EG&G QA Program Plan. This effort, caused by a Project Office directive to prepare a QA Plan for the IDS that was directly traceable to the YMP QA Plan/88-9, R2, is still scheduled for completion by July 10, 1989. EG&G has been directed to revise its program plan, prepare the needed revisions, and submit them with the

appropriate QA Plan/88-9, R2, checklist to the QA Program Leader for review and approval. Additional direction was provided to ensure that the internal implementing procedures will be compatible with the resulting program plan.

The Los Alamos QA staff effort to review the completed quality administrative procedures to the checklists based on the approved QAPP, R4.3 has been completed. These checklists are being used to evaluate the completed implementing procedures assuring ourselves that all procedures reflect the needed requirements of the approved QAPP.

PLANNED WORK:

Continuation of Los Alamos efforts to achieve a qualified QA program that supports the start of the Title II IDS design efforts is still the first priority of the Los Alamos QA staff. Training the Los Alamos staff will be a second priority to ensure the start of the ongoing research efforts in accordance with the revised Los Alamos QAPP.

The Los Alamos QA staff will revise the existing procedures to incorporate the information derived from the checklist review of the implementing procedures against the approved QAPP, R4.3. Revisions will be issued in each case where omissions are found.

Additional staff have been assigned to track and close the outstanding standard deficiency reports, nonconformance reports, and corrective actions reports. These efforts will allow the timely closure of issues associated with the start of Title II IDS design efforts or the Los Alamos Test Manager's Office activities.

**LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
June 30, 1989**

Policy Reviews

1. Milestone R743 report: resubmitted 12/7/88 with response to Project Office review.
2. Milestone R749 report: resubmitted 12/12/88 with response to Project Office review.
3. Milestone P379 report: resubmitted 1/18/89.
4. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review.
5. Milestone R346 report: resubmitted 4/4/89; responded to Project Office comments 5/23/89.
6. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review.
7. Milestone T415 report: submitted 5/9/89.
8. Milestone T427 report: submitted 5/24/89.
9. Book contributions - B. Crowe, "GSA Field Trip Segment: Lathrop Wells Volcanic Center" and "GSA Field Trip Segment: Crater Flats": submitted 4/27/89.
10. Abstract - H. Nitsche, "Solubility Studies of Transuranium Elements for Nuclear Waste Disposal: Principles and Overview": submitted 5/11/89.
11. Abstract - R. A. Rundberg et al., "Observation of Time-Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns": submitted 5/16/89.
12. Abstract - L. E. Hersman, "Effects of Microorganisms on the Transport of Actinide Elements": submitted 5/16/89.
13. Abstract - I. R. Triay et al., "Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters": submitted 5/19/89.
14. Abstract - I. R. Triay et al., "Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy": submitted 5/19/89.

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT
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NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
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NO. MILESTONES IN THIS SECTION: 0

JUNE PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
 MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
 RESPONSIBILITY CODE: LANL
 30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.1.1.A							
Compile Draft ES Test Procedure (Construction Phase)	Girdley	2	M287 (P)	01 Sep 89	29 Sep 89		DELAYED DUE TO DELAY IN THE START OF THE ES
WBS: 1.2.3.4							
Submit Draft Geochemistry Test Program Study Plans to YMPO for Review	Blanchard	2	T001 (P)	21 Jul 89	25 Aug 89		DELAYED DUE TO ADDITIONAL REVIEW REQUIRED
WBS: 1.2.3.4.1.1.A							
Study Plan Approved (Ground Water Chemistry Model)	Clanton	2	T535 (P)	25 Aug 89	29 Dec 89		DELAYED DUE TO STABILITY STUDY PLAN REVIEW
WBS: 1.2.3.4.3.1.A							
Complete Design of the Exploratory Shaft Water Tracer System	Robson	2	R321 (P)	28 Jul 89	29 Sep 89		DESIGN COMPLETE, OPERATING MANUAL 2nd REVISION
WBS: 1.2.6.8.2.3.A							
IDS Phase 1 Final Design Issued	Waters	2	M667 (P)	30 Sep 89			IDS PHASE I DESIGN IS BEING REVIEWED - MAY BE DELETED FROM BASELINE.

*

* CURRENTLY UNDER REVIEW

JUNE PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
 MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
 RESPONSIBILITY CODE: LANL
 30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS

PROJ RESP

LEV

MILESTONE NUMBERS

PROJ/HQ DATE

FORECAST DATE TO PROJ

PENDING C/SCR #

COMMENT

WBS: 1.2.9.3

Project Completes LANL QA Program Qualification Audit

Blaylock

1

T499 (P)

15 Jul 89

1 SEPT 89

DELAYED DUE TO
 PROJECT OFFICE
 SCHEDULING CONSTRAINTS

NO. MILESTONES IN THIS SECTION: 6

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: YMP/LANL
30 June 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT
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NO. MILESTONES IN THIS SECTION: 0

JUNE PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: /LANL
30 June 1989

SIGNIFICANT MILESTONES OPEN

PROJ RESP

LEV

MILESTONE
NUMBERS

PROJ/HQ
DATE

FORECAST DATE
TO PROJ

PENDING
C/SCR

COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: YMP/LANL
30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR	COMMENT
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NO. MILESTONES IN THIS SECTION: 0

YMP MONTHLY MILESTONE STATUS REPORT

ATTACHMENT 1
07/01/89

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments

FY89 Milestones - Level 1 Completed as of July 01, 1989					

NONE					

FY89 Milestones - Level 2 Completed as of July 01, 1989					

T478	12/15/84		12311A	N-5	<p>Prototype Test Plans, Volume 2 (FY-89 Funded Tests)</p> <p>This milestone is the other part of milestone T435 (Volume 1). The schedulers are incorrectly using M253 for Volume 2. This milestone should not be confused with M105, which is the submission of the prototype test plans for review. M105 is completed. The report entitled "Prototype Test Plans, Volume 2 (FY-89 Funded Tests)" was completed and sent to the Project Office for policy review on 12/15/88, ref. TWS-NS-12-88-034.</p>
T404	09/28/88		1232312A	ESS-1	<p>Progress Report on Rock-Varnish Work</p> <p>Report entitled "Progress Report on Rock-Varnish Work" was completed and sent to the Project Office for policy review on 11/16/88, ref. TWS-NS-10-88-046.</p>
T414	02/28/89		123363A	ESS-1	<p>Final Dust Hazard Assessment Report</p> <p>Report entitled "Evaluation of Dust-Related Health Hazards Associated with Air Coring at G-Tunnel, Nevada Test Site" was completed and sent to the Project Office for review on 04/14/89, ref. TWS-NS-04-89-055.</p>
T415	12/16/88		123363A	ESS-1	<p>Final Drilling and Technology Report</p> <p>The final report draft of the Prototype Air Coring Test was completed and sent to the Project Office on 01/17/89, ref. TWS-ESS-1-1/89-11. Report entitled "The Yucca Mountain Project Prototype Air-Coring Test, U12g Tunnel, Nevada Test Site" was sent to the Project Office for policy review on 05/09/89, ref. TWS-NS-89-045.</p>
M367	11/17/88		123414A	INC-11	<p>Interim Progress Report on Colloid Stability</p> <p>Report entitled "Interim Progress Report on Colloid Stability: Voltammetric Studies of the Redox Reactivity of Plutonium (IV) Colloid" was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-NS-12-88-033.</p>
P379	11/17/88		123414A	INC-11	<p>Progress Report: Photoacoustic Spectroscopy Methodology (PAS)</p> <p>Report entitled "Photoacoustic Spectroscopy Methodology" was completed and submitted to the Project Office for policy review on 01/18/89, ref. TWS-NS-01-89-058.</p>

YMP MONTHLY MILESTONE STATUS REPORT

ATTACHMENT 1
07/01/89

LOS ALAMOS NATIONAL LABORATORY

Number	LANL	CCB	WBS Element	Organization Responsible	Description Comments
	Proposed Date	Baseline Date			
T469	02/28/89		123423A	ESS-1	Issue Report on Erionite Abundances at Yucca Mountain. Report entitled "The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada" was completed and sent to the Project Office for policy review on 02/14/89, ref. TWS-N5-02-89-045.
R321	12/23/88		123431A	MX-4	Complete Design of the Exploratory Shaft Water Tracer System Demonstrated to M&N use of the equipment and provided drawings to K&N. No further action is required. This milestone was completed on 03/09/89, ref. TWS-ESS-LV-1-03-89-17.
T163	11/30/88		12611A	MX-4	Revised NNWSI 'White Paper' on 'ES Fluids and Materials Usage' Delivered to WMPO. Report entitled 'Nevada Nuclear Waste Storage Investigations: Exploratory Shaft Facility and Materials Evaluation' was completed and sent to the Project Office on 12/15/88, ref. TWS-N5-12/88/043.

LOS ALAMOS NATIONAL LABORATORY

Number	LANL	CCB	New WBS Element	Organization Responsible	Description	Comments
	Proposed Date	Baseline Date				

FY89 Level 1 Open Milestone List

NONE

FY89 Level 2 Open Milestone List

New WBS Number 1.2.3

M287	09/01/89		1231	ESS1/WX	Compile Draft ES Test Procedures (Construction Phase) Precursor to M651.
N160	07/31/89		1234	N-5	SCP Progress Report: Results of Geochemistry Investigations All geochemistry input to the progress report (SPR) has been submitted to the DOE/YMP for review. The action for this milestone is concluded. This milestone N160 is completed.
R785	06/30/89		1232122	INC-7	Issue Letter Report: Thermodynamics and Kinetics of Phases Important to Silica Activity at Yucca Mountain
T535	04/17/89		123411	HSE-12	Study Plan Approved (Ground Water Chemistry Model)

New WBS Number 1.2.5

T001	03/15/89		12522	N-5	Submit draft ongoing Geochemistry Test Program Study Plans to WMPO/NV for review. Will be completed when all study plans are submitted to the Project Office.
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New WBS Number 1.2.6

M657	02/24/89		12684	WX-4	IDS Phase 1 Final Design Issued Review completed.
T062	01/10/89		12684	WX-4	IDS Phase 2 Final Design Issued. Delayed due to fully qualified QA program effort.
T436	06/08/88		12684	WX-4	IDS Development System - Status Report #1
T437	06/10/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #1

YMP MONTHLY MILESTONE STATUS REPORT

ATTACHMENT 1
07/01/89

LOS ALAMOS NATIONAL LABORATORY

Number	LANL	CCB	New WBS Element	Organization Responsible	Description Comments
	Proposed Date	Baseline Date			
T438	10/17/88		12684	WX-4	IDS Phase 1 & 2 Facilities - Detailed Requirements
T439	10/17/88		12684	WX-4	IDS Phase 1 Hardware - Interim Design Report
T440	10/17/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #2
T443	02/01/89		12684	WX-4	IDS Phase 2 Hardware - Interim Design Report
T444	02/01/89		12684	WX-4	IDS Development System - Status Report #2
T445	05/01/89		12684	WX-4	IDS Phase 1 Software - Validation and Verification Report
T446	05/01/89		12684	WX-4	IDS Phase 1 Hardware - Acceptance Test Report
T447	05/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #1
T448	09/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #2

ASSUMPTIONS:

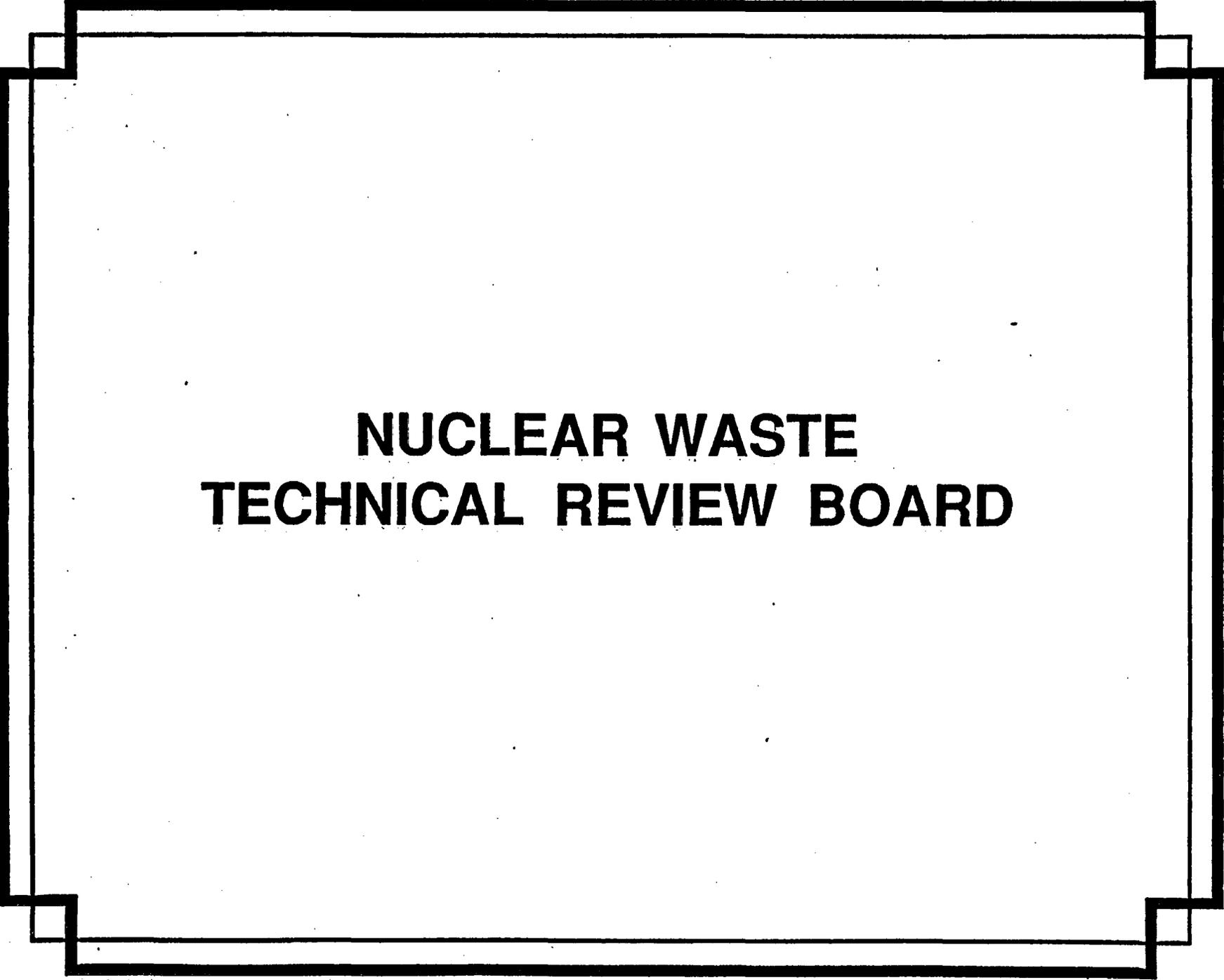
ES start date 11/89
WBS Structure baseline 7/22/86
Prep: 07/01/89
A. Pratt

DISTRIBUTION:

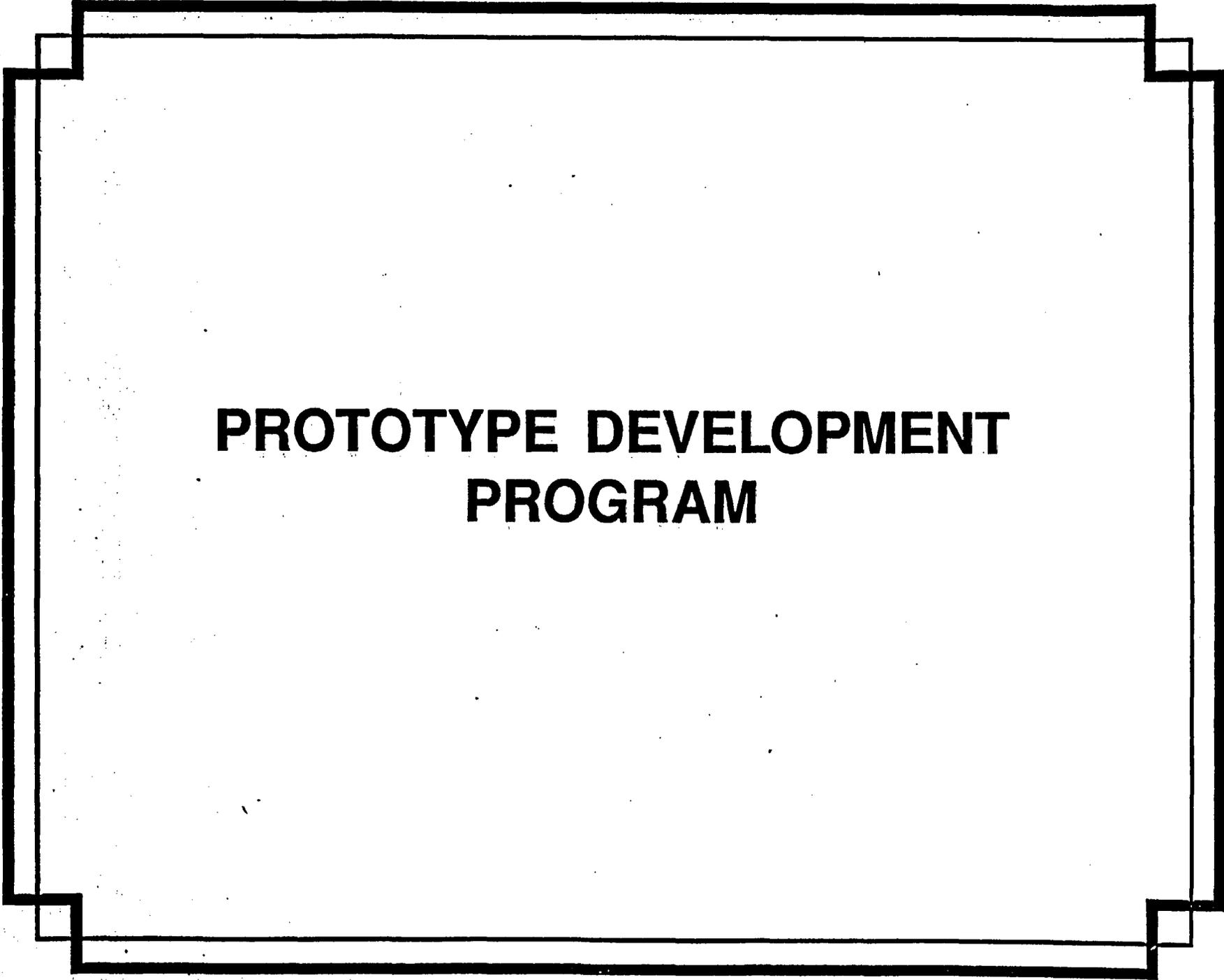
J.A. Canepa, N-5, J521
H.M. Kalfa, ESS-1, J900/527
R.L. Byers, N-5, J521
D.T. Oakley, N-5, J521
K.A. West, N-5, J521

AGENDA

- **NUCLEAR WASTE TECHNICAL REVIEW BOARD**
- **PROTOTYPE DEVELOPMENT PROGRAM**
- **M&O STATUS**
- **MEDIA BRIEFING 7/26/89**
- **PRESENTATION NOTIFICATION**
- **CURRENT STATUS OF 1990 APPROPRIATIONS**
- **OUTREACH ACTIVITIES**



**NUCLEAR WASTE
TECHNICAL REVIEW BOARD**

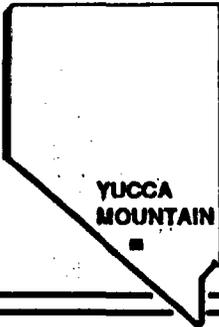


**PROTOTYPE DEVELOPMENT
PROGRAM**

M&O STATUS

U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN PROJECT

MEDIA BRIEFING SUMMARY

JULY 26, 1989

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

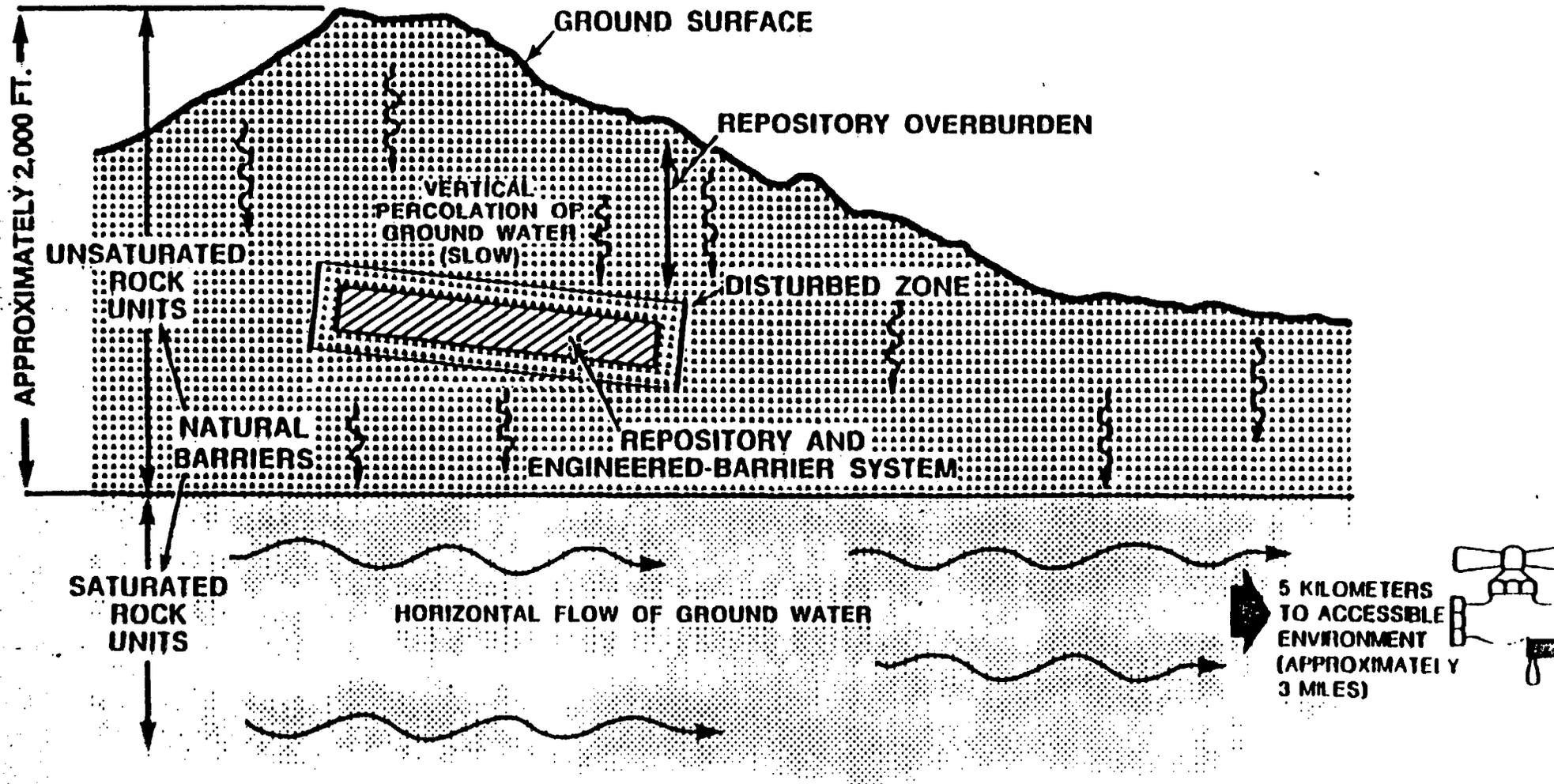


BRIEFING PURPOSE

- **RELEASE TWO DOCUMENTS**
- **FULFILLS COMMITMENT MADE BY PROJECT OFFICE**
- **GENERAL CONCLUSION OF BOTH REPORTS IS ADDITIONAL DATA ARE NEEDED TO RESOLVE DIFFERING SCIENTIFIC THEORIES ON WATER MOVEMENT AT YUCCA MOUNTAIN**

**TO SAFELY ISOLATE HIGH LEVEL
RADIOACTIVE WASTE AT YUCCA
MOUNTAIN FOR 10,000 YEARS,
DOE MUST UNDERSTAND WHAT
HAPPENS TO THE WATER TABLE**

REPOSITORY OBJECTIVE IS TO ISOLATE RADIOACTIVE MATERIALS BY USING NATURAL AND ENGINEERED BARRIERS



SZYMANSKI PROPOSES THAT UNDER CERTAIN GEOLOGIC CONDITIONS, THE WATER TABLE AT YUCCA MOUNTAIN COULD RISE SIGNIFICANTLY

- **CONVENTIONAL THEORY SUGGESTS THAT THE DEPOSITS FOUND AT YUCCA MOUNTAIN CAME FROM WATER FILTERING DOWN FROM THE SURFACE**
- **SZYMANSKI SUGGESTS THAT DEPOSITS FOUND AT YUCCA MOUNTAIN RESULT FROM WATER THAT INTERMITTENTLY WELLS UP IN RESPONSE TO ONGOING EARTHQUAKE PROCESSES**

SUMMARY OF EVENTS

(ABBREVIATED)

- 1984** **SZYMANSKI FIRST DISCUSSED HIS CONCERNS**
- NOVEMBER 2, 1987** **SZYMANSKI REQUESTED TO PROVIDE DRAFT
REPORT TO DOE**
- DECEMBER 22, 1987** **SZYMANSKI DELIVERS DRAFT REPORT TO DOE**
- JANUARY 1988** **PROJECT OFFICE INTERNAL REVIEW PROCESS
INITIATED**
- JANUARY 22, 1988** **STATE OF NEVADA RELEASES REPORT**
- MARCH 25, 1988** **PRESENTATION TO NATIONAL ACADEMY OF
SCIENCES**
- APRIL 1988** **WORKSHOP HELD WITH NRC**
- SUMMER 1988-
JULY 1989** **DISCUSSIONS ON TECHNICAL ISSUES HELD
REVIEW REPORT PREPARED
SZYMANSKI REVISES HIS REPORT**

TECHNICAL REVIEW REPORT GENERALLY CONCLUDES THAT SZYMANSKI'S REPORT LACKS SUFFICIENT TECHNICAL BASIS

- **REPORT RECOMMENDS SPECIFIC TESTS AND TESTING PROCEDURES TO OBTAIN DATA**
 - **MOST ARE INCLUDED IN STUDIES ALREADY PLANNED**
- **REVIEW REPORT CONCLUDES EXTENSIVE REVISIONS ARE NEEDED IN SZYMANSKI'S REPORT TO SUPPORT HIS THEORY**

SZYMANSKI CONCLUDES IN HIS REVISED REPORT THAT HIS ORIGINAL THEORY HAS NOT CHANGED, AND IN FACT HAS BEEN "SUBSTANTIALLY REINFORCED"

- **REPORT CLARIFIES CONCEPTS AND INTERPRETS ADDITIONAL DATA**
- **ALSO INCORPORATES COMMENTS RECEIVED BY SZYMANSKI FROM DOE, STATE OF NEVADA AND OTHER SCIENTISTS**

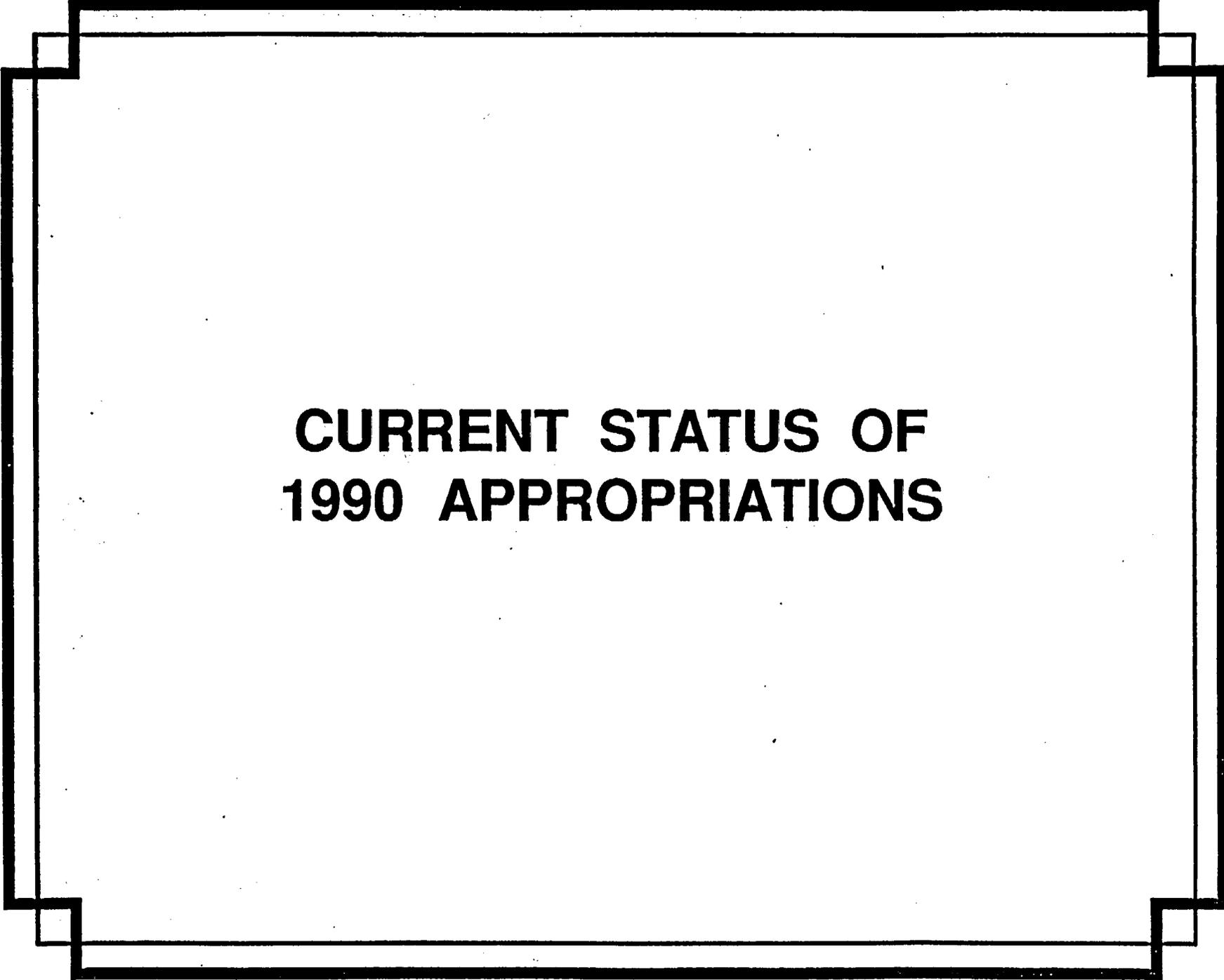
**PROJECT OFFICE WILL CONDUCT TWO
REVIEWS OF THE REVISED SZYMANSKI
REPORT AND WHEN COMPLETE, DETERMINE IF
ANY FIELD ACTIVITIES SHOULD BE
ACCELERATED OR ADDED TO CURRENT
PLANS FOR DATA COLLECTION**

- **INDEPENDENT REVIEW PANEL TO INCLUDE:**
 - **PROJECT MANAGER SELECTS THREE MEMBERS**
 - **SZYMANSKI CHOOSES TWO MEMBERS**

- **IN ACCORDANCE WITH PROJECT OFFICE
PROCEDURES, A PROJECT PEER REVIEW
ALSO WILL BE CONDUCTED**
 - **NATIONAL ACADEMY OF SCIENCES BOARD ON
RADIOACTIVE WASTE MANAGEMENT WILL BE ASKED
TO CONDUCT THIS REVIEW**

RESOLVING DIFFERING INTERPRETATIONS OF WATER MOVEMENT AT YUCCA MOUNTAIN DEPENDS UPON

- **ADDITIONAL DATA BEING COLLECTED DURING SITE CHARACTERIZATION (APPROPRIATE PERMITS NEEDED FROM THE STATE OF NEVADA BEFORE WORK CAN BEGIN)**
- **EXTENSIVE MULTI-DISCIPLINE DISCUSSIONS AMONG PROJECT SCIENTISTS**
- **FOCUSED REVIEWS AND CRITIQUES OF DATA AND INTERPRETATION BY PROJECT SCIENTISTS AND INDEPENDENT TECHNICAL EXPERTS**



**CURRENT STATUS OF
1990 APPROPRIATIONS**

OUTREACH ACTIVITIES

● **RECENT PUBLIC PRESENTATIONS**

- **WIPP TOUR WITH LINCOLN COUNTY OFFICIALS**
- **AMERICAN NUCLEAR SOCIETY ANNUAL MEETING**
- **DOE CONTRACTOR'S TRAFFIC MANAGER ASSOCIATION**
- **PATRAM**
- **COMPETITION ADVOCATES WORKING MEETING**
- **NUCLEAR WASTE TECHNICAL REVIEW BOARD**
- **INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT**

OUTREACH ACTIVITIES

● UPCOMING INTERACTIONS

- **PIOCHE CHAMBER OF COMMERCE** **AUGUST 8, 1989**
- **INDUSTRIAL RELATIONS CONFERENCE** **AUGUST 10, 1989**
- **RENO-GAZETTE EDITORIAL BOARD** **AUGUST 11, 1989**
- **ENERGY AND ENVIRONMENTAL
CONFERENCE** **SEPT. 12, 1989**
- **NATIONAL CONGRESS OF
AMERICAN INDIANS** **SEPT. 13, 1989**
- **NUCLEAR PLANT EXPERIENCE
CONFERENCE** **SEPT. 16-20, 1989**
- **LAS VEGAS CHAMBER OF COMMERCE** **SEPT. 22, 1989**

NUCLEAR REGULATORY COMMISSION (NRC) MEMO (JULY 3, 1989) FROM MCCONNELL TO JUSTUS ON ADDITIONAL EVIDENCE FOR POSSIBLE FAULTING IN THE VICINITY OF THE EXPLORATORY SHAFTS

SUMMARY

Internal NRC memo states that a staff member believes he has developed additional evidence to support possible faulting in the vicinity of the exploratory shafts.

U.S. DEPARTMENT OF ENERGY (DOE) RESPONSE

DOE scientists have looked at the Yucca Mountain data and developed over 100 alternative conceptual models that will be studied during site characterization. Approximately 21 alternative models consider the effects of tectonics (including faulting) in the vicinity of Yucca Mountain.

The current DOE position, before conducting the technical assessment review, is that the study by Smith and Ross is the only published work currently available to the DOE that supports the presence of a possible fault in the vicinity of the exploratory shaft.

DOE scientists will examine the evidence outlined in the memo, and if appropriate, will include it as an additional alternative conceptual model to be studied.

The author of the memo stated that there are more than one possible answer to the questions that he raised and that some of the answers would not necessarily involve faulting.

DOE welcomes all discussion on the suitability of Yucca Mountain as a site for a high level nuclear repository, but until DOE begins data collection at the site, these issues can not be fully resolved.

One prerequisite that must be met before activities can start is issuance of the appropriate permits by the State of Nevada.



Department of Energy

Nevada Operations Office

P. O. Box 98518

Las Vegas, NV 89193-8518

WBS #1.2.9

"QA: N/A"

NNA-890607-0066

MAY 26 1989

Leslie J. Jardine, LLNL, Livermore, CA
Larry R. Hayes, USGS, Las Vegas, NV
Richard J. Herbst, LANL, Los Alamos, NM
Thomas O. Hunter, SNL, 6310, Albuquerque, NM
John H. Nelson, SAIC, Las Vegas, NV
Joseph C. Calovini, H&N, Las Vegas, NV
Robert F. Pritchett, REECO, Las Vegas, NV
Richard L. Bullock, FSN, Las Vegas, NV
Addanki M. Sastry, MACTEC, Las Vegas, NV

YUCCA MOUNTAIN PROJECT OFFICE (PROJECT OFFICE) NOTIFICATION OF PRESENTATION SCHEDULE

In order to better coordinate the schedules of various presenters from the several participant organizations and to remain proactive to the needs of the public, the Project Office requests notification of all scheduled presentations at least two weeks in advance of the presentation date. This is to include all presentations, speeches, and demonstrations, whether technical or non-technical, and all participant organizations.

Notification will be provided to Amelia Landeros at (702) 794-7964 or FTS 544-7964, and may be either written or verbal. The notification will include location of the presentation, description of the audience, date and time, who will be speaking, topic, project attendees other than the speaker, and any other pertinent comments.

Thank you for your cooperation in this matter. Should you have any questions regarding the foregoing, please contact Edwin L. Wilmot at (702) 794-7137 or FTS 544-7137.

Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:MEA-3905



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

JUL 13 1989

Mr. Ralph Stein, Associate Director
Office of Systems Integration and Regulations
Office of Civilian Radioactive Waste Management
U. S. Department of Energy, RW-24
Washington, D. C. 20545

Dear Mr. Stein:

Enclosed is preliminary information the NRC staff has developed related to the potential anomaly near the exploratory shaft. This information is being sent for information only; no response is required.

Sincerely,

A handwritten signature in cursive script, appearing to read "John J. Linehan".

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

Enclosure: As stated

cc: R. Loux, State of Nevada
M. Baughman, Lincoln County, NV
S. Bradhurst, Nye County, NV
D. Bechtel, Clark County, NV
~~C. G. ...~~

JUL 08 1989

DRAFT

NOTE FOR: Phil Justus
FROM: Keith McConnell *KM*
SUBJECT: ADDITIONAL EVIDENCE FOR POSSIBLE FAULTING IN THE VICINITY OF
THE EXPLORATORY SHAFTS

In reviewing several publications (of early 80's vintage), I have developed what I believe is additional evidence to support possible faulting in the vicinity of the Exploratory Shafts. Generally, my analysis compares and contrasts relationships observed in boreholes G-4 and UE25a-6. These boreholes define an west-east trending section running just south of the sites of the proposed exploratory shafts in Coyote Wash. To the best of my knowledge, the DOE in its investigation of shaft location concerns has not carried out a similar comparison between these two boreholes, a task that would seem to be routine in a thorough examination of available data.

The analysis of the data in the two boreholes suggests that a conceptual model of faulting is possible in which the current locations of the ES are in or adjacent to an extension of the zone of imbricate faulting that has been referred to in the SCP as bordering the repository on the east. The validity of this model is open to debate, however, there is enough data available supporting the model to warrant consideration. In any event, DOE's claim in the Technical Assessment Review documentation that only the resistivity survey of Smith and Ross (1982) supports the presence of fault in the vicinity of the ES is not totally accurate.

Attachment 1 shows the relationship between borehole G-4, the exploratory shaft locations, and borehole UE25a-6. The boreholes are approximately 1400 ft. apart and borehole UE25a-6 is approximately 1000 ft east of the exploratory shaft locations. Both boreholes appear to be within the CPDB. A comparison of some pertinent data derived from the two boreholes is listed below.

	<u>G-4</u>	<u>UE25a-6</u>
Thickness of Alluvium	30'	20'
Avg. Strike	N 15 W	N 23 E
Avg. Dip	10 NE	08 SE
Elevation of base of Tiva Canyon	4028.6'	3907'
Elevation of top of Topopah Spring	3938.6'	3824'

Assuming a uniform dip of 9 degrees (i.e., average of dips in boreholes) to the northeast, the base of the Tiva Canyon at UE25a-6 should be approximately 221 feet below the level indicated in G-4 (i.e., 3806.9'). However, the base of

the Tiva Canyon is at an elevation of 3907' in UE25a-6 (Spengler and Rosenbaum, 1980), a difference of 100'.

Also of interest is that Daniels and others (1981) report that if the degree of welding is approximately the same for UE drillholes, then near-surface fracture zones are likely to occur near UE25a-6. Core recovery was poor in UE25a-6, the worst of all of the UE boreholes described by Spengler and Rosenbaum (1980). The poor core recovery is also suggestive of fracturing.

Several questions are raised by the comparison of boreholes G-4 and UE25a-6.

- 1) Why is the thickness of the alluvium in UE25a-6 (which is east of and presumably in a deeper part of Coyote Wash than G-4) equal to or less than that in G-4?
- 2) Why is the orientation of bedding so distinctly different between boreholes G-4 and UE25a-6?
- 3) Why is the elevation of the base of the Tiva Canyon 100' higher than would be suggested by a uniform dip of 9 degrees to the east?
- 4) What is the significance of the statement by Daniels and others (1981) that near-surface fracture zones may be present near UE25a-6 when viewed in the context of the poor core recovery and the areas of intense fracturing near the location of the exploratory shafts?

Each of these questions has more than one possible answer, some of which would not involve faulting. However, one possible model that does provide answers to all of these questions and support the "resistivity fault" of the Smith and others (1982) report would consider the possible presence of a major fault or series of minor faults (i.e., imbricates) between boreholes G-4 and UE25a-6 and including the area of the ES. Total vertical offset along this fault or series of faults would be on the order of 100'. This model is given added credence when viewed in the context of the statement made in the Bertram (1984) report that the western boundary of the zone of faults on the east side of the exploration block is not well defined and that a set-back distance of 2000' was used to place the shaft outside of that zone of faulting (Bertram, 1984, p. 54). If the zone of faulting mentioned in Bertram continues to the west through the area containing UE25a-6 and into the area of the shaft locations, then the criteria for set-back distance from the imbricate fault zone used in the Bertram report for shaft locations appears to be unsupported.

Perhaps the most significant question regarding the data available from UE25a-6 is why a simple cross-section between boreholes G-4 and UE25a-6 has not been presented by DOE. These two boreholes are the closest boreholes to the ES locations. No documentation has been presented to suggest that data related UE25a-6 was considered in the present location of the shafts or to indicate that this information is under consideration in the Technical Assessment Review.

References Cited

- Bertram, S., 1984, NNWSI Exploratory shaft site and construction method recommendation report: Sandia National Laboratory, SAND 84-1003, 100 p.
- Daniels, J.J., Scott, J.H., and Hagstrum, J.T., Interpretation of geophysical well-log measurements in drill holes UE25a-4, -5, -6, and -7, Yucca Mountain, Nevada Test Site: U.S. Geological Survey Open-File Report 81-389.
- Smith, C. and Ross, H.P., 1982, Interpretation of resistivity and induced polarization profiles with severe topographic effects, Yucca Mountain area, Nevada Test Site, Nevada: U.S. Geological Survey Open-File Report 82-182, 21 p.
- Spengler, R.W., and Rosenbaum, J.G., 1980, Preliminary interpretations of geologic results obtained from boreholes UE25a-4, -5, -6, and -7, Yucca Mountain, Nevada Test Site: U.S. Geological Survey Open-File Report 80-929, 33 p.
- Spengler, R.W., and Chornack, M.P., 1984, Stratigraphic and structural characteristics of volcanic rocks in core hole USW G-4, Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Open-File Report 84-789, 77 p.

CC: C.Abrams
J.Trapp
A.Ibrahim
K.Stablein
D.Gupta

Attachment 1 (After Scott & Bank 1984)



IN
THURSDAY,

DOE scientist stands firm against Yucca

By Mary Manning
SUN Staff Writer

While U.S. Department of Energy scientist Jerry Szymanski still believes Yucca Mountain is unlicensable as a nuclear dump, DOE said Wednesday it plans two more independent scientific reviews of his revised theory that deep water could rise into the repository.

DOE wants to do a \$2 billion study ranging over seven years to find out if Yucca Mountain is suitable.

After his first report, DOE asked Szymanski to expand his theory that heat, deep water, volcanos and earthquakes could combine to break open the repository that must keep highly radioactive wastes safe for 10,000 years.

Szymanski has submitted a three-volume report that "substantially reinforced" his original theory, he said Wednesday.

In 1987, then-Gov. Richard Bryan released Szymanski's first report a month after Congress targeted Yucca Mountain as the lone study site for the nation's first nuclear repository.

Szymanski said he discovered geological "footprints," traces of water marks left as veins in rocks in one trench and in core samples DOE took at Yucca Mountain. The calcium carbonate and opaline-silica deposits range from 10 feet to more than 1,800 feet deep.

"No one knows for sure where those veins come from," he said.

No scientist has tested those deposits for how old or where the water came from, Szymanski and DOE Yucca Mountain Project Manager Carl Gertz agreed.

"The performance of the repository can be impacted by ground water," Szymanski said. "What is important is the impact of volcanos on ground water and then on the waste."

Szymanski compared the volcanic evidence at Yucca Mountain, 90 miles northwest of Las Vegas, to a coffee pot when hot water percolates to the top and drips through the grounds.



Staff photo by LEE ZACHOCK

Jerry Frazer, left, listens as DOE scientist Jerry Szymanski explains position.

"Volcanos are telling you somewhere down there is molten rock," he said.

Calling it a "sleeping dog," Szymanski urged putting scientific facts ahead of bureaucratic bickering.

Gertz admitted it only takes one disqualifier to knock Yucca Mountain off center stage as the nation's nuclear dump.

"Jerry is challenging the traditional view," Gertz said. "He's on the cutting edge of technology."

While Szymanski's theory has had internal DOE scientific review, Gertz said that the independent studies of his revised report will include international experts (two suggested by Szymanski, two by DOE and one recommended by the panel itself) and a peer review by the National Academy of Sciences technical review board on radioactive waste management.

Those reviews could take six months to a year, Gertz said.

Szymanski said he fears the erosion of public confidence in the federal government's ability to manage nuclear waste if it does not critically consider Yucca Mountain's flaws.

Arriving at DOE's Nevada Operations Office in 1984, when the federal government had three nuclear dump sites under review (in Nevada, Washington and Texas), Szymanski said he questioned the minerals left on rock from water and how the



Yucca project manager Carl Gertz makes a point.

water moved through Yucca Mountain.

As a consultant for large nuclear power plant projects, Szymanski said he has been trained to seek a technical basis for satisfying licensing requirements before the Nuclear Regulatory Commission. The nuclear dump will be the first project of its kind.

The DOE review panel of 24 scientists submitted a variety of criticism of Szymanski's original theory 18 months ago.

"These comments were commonly quite detailed, sometimes redundant, sometimes contentious toward the author, and in some cases the reviewers differed in their perspective as to changes that were recommended," the

authors, led by U.S. Geological Survey hydrologist William Dudley, wrote.

Dr. Gerald A. Frazier of Science Applications International Corp., a DOE contractor at Yucca Mountain, supported Szymanski's theory.

"If the concepts are valid, the area of proposed waste emplacement could be flooded," Frazier wrote in an introduction.

"We see the earth alive and in motion," Frazier, whose specialty is tectonics, said. "For hydrology, it's (Szymanski's theory) more surprising."

Gertz said any scientific disputes after the two reviews will go before the nuclear waste technical review board, and ultimately, to the NRC.

Las Vegas Review-Journal/Thursday, July 27, 1989

Seismologist says Yucca shaft sites unsuitable

By Caryn Shetterly
Review-Journal

A Nuclear Regulatory Commission seismologist has said the Department of Energy's location for exploratory shafts in Yucca Mountain is unsuitable because of geologic faults.

Keith McConnell, in an internal memo provided to the Yucca Mountain Project Office here, wrote July 3 that the Energy Department has not thoroughly analyzed faults and fractures in the proposed shaft area.

McConnell based his comments on Energy Department opinions that U.S. Geological Survey tests showing faulting have been disproved.

At least one state official has

seized upon the memo as evidence the shafts should be moved, indefinitely postponing studies of the mountain as the nation's high-level nuclear waste repository. Federal regulations forbid location of exploratory shafts within 100 feet of a fault.

Robert Loux, executive director of Nevada's Nuclear Waste Projects Agency, said Wednesday his interpretation of McConnell's memo is that the shaft site is unsuitable.

Loux's office and Gov. Bob Miller urged the Energy Department last month to consider the fault dangers and re-evaluate its plans to sink the two, 1,000-foot shafts.

Please see FAULTS/4A

4A/Las Vegas Review-Journal/Thursday, July 27, 1989

Faults

From 1A

Loux said Wednesday he understands the Nuclear Regulatory Commission — the agency responsible for licensing the repository — will recommend the shafts be moved in the agency's comment on the Energy Department's site characterization plan for the mountain. The comments are expected to be issued Friday or early next week.

An agency spokesman said he does not think the comments will mention moving the shafts, and Yucca Mountain project chief Carl

Gertz said preliminary reports from the agency do not include such a recommendation.

McConnell compared information on two boreholes nearest the exploratory shaft site, and determined the Energy Department had neglected to perform an obvious assessment of faults and fractures through the mountain.

"To the best of my knowledge, the DOE in its investigation of shaft location concerns has not carried out a similar comparison between these two boreholes," he

wrote, "a task that would seem to be routine in a thorough examination of available data."

Gertz distributed the memo Wednesday to reporters. It is considered an "information only" document that requires no response from the Energy Department.

Gertz said the Energy Department stands by its opinion that the 1982 studies, which included electrical resistance readings of the rocks, were flawed. Energy Department geologists have said irregularities in the analyses could have

been caused by changes in rock porosity or moisture content.

McConnell disagrees with the Energy Department's confidence the 1982 studies by two geological survey scientists were refuted by later analyses.

"In any event, DOE's claim in the Technical Assessment Review documentation that only the resistivity survey of Smith and Ross (1982) supports the presence of fault in the vicinity of the ES (exploratory shafts) is not totally accurate," McConnell wrote.

Yucca Mountain project foe urges new studies

By Caryn Shetterly
Review-Journal

Department of Energy scientist and Yucca Mountain project rebel Jerry Szymanski stood by his 5-year-old opinion Wednesday that groundwater movement in the huge rock makes it a treacherous place to store the nation's high-level nuclear waste.

But he qualified his confidence by saying his theories can only be proven through additional studies of the mountain, and the state of Nevada should quickly grant air pollution and water permits to allow such analyses.

"My personal view is that Yucca Mountain, having these conditions that must be substantiated and verified, is essentially unlicensable," he said during a news conference. "Although one thing I would like to underscore is that reacting on the basis of current knowledge, I think, would be irresponsible. So, my recommendation is let's go and check it, and let's be damn sure."

In 1984, Szymanski compiled data from his colleagues' scientific

reports and determined volcanic and earthquake activity near Yucca Mountain could cause the water table to rise and infiltrate the 1-square-mile repository within. The water table is located from 700 to 1,400 feet below the proposed repository.

Water contamination would cor-

rode waste containers, he said, potentially releasing some or all of the 70,000 metric tons of radioactive spent fuel into the public water supply.

Energy Department scientists generally agree the water movement issue merits study, but most think the water table would not

rise the some 1,000 feet predicted by Szymanski. State-contracted scientists, too, have embraced portions of Szymanski's theory, but are unsure about the potential for water table infiltration of the repository.

Carl Gertz, chief of the Yucca Mountain Project Office here, on Wednesday called Szymanski's opinion "kind of non-traditional thinking."

Szymanski submitted his findings in December 1987 to Gertz, and then Gov. Richard Bryan released the document the following January in a news conference during which he accused the Energy Department of hiding the information for four years.

Bryan, now a U.S. senator, and officials in the state Nuclear Waste Projects Agency championed Szymanski's cause at the time, and have since suggested air and water permits not be granted to the Energy Department to sink exploratory shafts as part of its site characterization studies of the mountain.

4A/Las Vegas Review-Journal/Thursday, July 27, 1989

NRC: Nuke storage OK until 2025

Associated Press

WASHINGTON — A Nuclear Regulatory Commission task force said Wednesday the nation's nuclear power plants have enough storage space for highly radioactive spent fuel until 2025, even if the proposed Yucca Mountain repository in Nevada is rejected.

In a report to commissioners, the commission's Waste Confidence Review Group said a new site could be selected and put into operation by then if necessary.

A deadline of 2025 would push back the previous deadline of 2007-2009 for an "off-site storage solution" that the commission gave in its previous "Waste Confidence Decision," a court-required assurance that spent fuel will find a permanent storage place.

The review group told the commission that the original dates were set to meet the requirements of the original court case, and are "not a requirement for (protection of) safety or (the) environment."

Group leader Robert Bernero, director of nuclear materials safety and safeguards for the commission, said new, safer storage technology for spent fuel and the trend toward longer use of nuclear reactors will help relieve some pressure to find a central storage site.

State

Geologist: Yucca Mountain too risky for nuclear dump

Government studies underestimate the chances of volcanic eruption at Nevada's Yucca Mountain, making the site unsuitable for a high-level nuclear waste repository, according to a Nuclear Regulatory Commission geologist's report released Tuesday.

Sunday
JULY 23, 1989
RENO GAZETTE-JOURNAL

Section D-1

Nuke waste group to meet

A national coalition will meet in Reno Aug. 11-13 to map out plans for a cross-country publicity campaign aimed at educating the public about the risks that would be posed by road and rail shipments of high-level nuclear waste to a proposed repository in Yucca Mountain.

Plans include the construction of a life-sized cask, resembling ones that would be used to carry the spent fuel rods from nuclear power plants, to help attract public attention in Denver, Salt Lake City, Albuquerque and other cities that lie along the proposed routes.

The Nuclear Waste Task Force, including scientists and citizen advocates representing a variety of groups, will hold its fifth annual meeting at the Foresta Institute in Washoe Valley, according to Citizen Alert, a Reno-based environmental action group that is part of the coalition.

The three-day session will also include a public presentation from 1:30-3:30 p.m. Aug. 12 at the institute by a panel of experts on nuclear waste transportation issues.

Sunday Section D-1
JULY 23, 1989
RENO GAZETTE-JOURNAL

Waste incinerator still eyed in Lincoln County

By Jane Ann Morrison/Gazette-Journal

LAS VEGAS — The idea of building a hazardous waste incinerator in Lincoln County has not been abandoned, despite the veto of a bill that would have permitted the operator to import waste from California.

"We're still proceeding, but we'll scale back the volume," said Phil Gentile Jr. of Disposal Control Service Inc. in Upland, Calif. The firm has been seeking the state's permission to build an incinerator in Caselton, a few miles from Pioche.

The project was originally designed to burn up to 100,000 tons of hazardous waste each year, including solvents and oils, generated within Nevada.

In Lincoln County, where more than half the residents are senior citizens on fixed incomes and the average income is \$10,000, that incinerator is viewed by many as a blessing from heaven. One poll showed that 85 percent of the population wants the incinerator, 5 percent don't have an opinion and 10 percent oppose it.

So when Gov. Bob Miller vetoed SB543, which would have allowed up to 50,000 tons of waste to be incinerated in Nevada each year, Lincoln County residents were irked.

But Miller said he had his reasons.

"Nevada is under increasing pressure to become the hazardous and nuclear waste disposal center of the nation," Miller said in his veto message. If this bill became law "it would be an open invitation for the

— See WASTE, page 30

Waste

From page 10

importation of thousands of tons of hazardous waste into Nevada each year."

Lincoln County has sought for the past two legislative sessions to pass legislation allowing a hazardous waste incinerator to import materials.

The 1987 Legislature turned them down after heavy lobbying by former Gov. Richard Bryan.

But the 1989 Legislature approved a bill which would have allowed up to 50,000 tons a year to be incinerated within Nevada.

Bryan felt so strongly about it, he asked his chief Nevada aide, Marlene Joiner, to contact the Miller administration and urge the veto.

But Miller's veto has raised the hackles of Lincoln County officials, who feel he turned his back on them.

Shelley Wadsworth, the executive director for economic development in Lincoln County, is still seething about the veto, since Clark County has been successful in obtaining the state's permission to incinerate hazardous waste in Apex.

"We've been trying for five years, and Las Vegas wants one and gets it in a matter of months," Wadsworth complained last week.

"We're beginning to feel there's some kind of alternative agenda. . . . We feel the governor let us down; he broke all his promises."

Wadsworth and Lincoln County Commissioner Ed Wright contend that Lincoln County suffers from a lack of "juice." The small, impoverished county, with only 4,200 residents, just doesn't carry the clout of Clark County's 700,000 people.

Lew Dodgion, head of the state's Divi-

son of Environmental Protection, denied his office favored the request for an incinerator in Apex, in Clark County, because the south has more political clout. He said the Apex operation is smaller (it would burn 7,000 tons a year of mostly infectious hospital waste) and met all the state's criteria. The Caselton plan puts the incinerator too close to homes.

Gentile said the 17 dwellings within a mile of the incinerator don't pose an insurmountable problem, and Commissioner Wright, who lives in one of those homes, agreed.

"I can see the kiln from my place, and I've got no problem with it."

One key to the dispute is a debate over how much hazardous waste is generated in Nevada. Gentile insists there are 15,000 tons per year, but state officials say it's around 600 tons.

The amount is critical because state regulations prohibit incineration of hazardous materials from other states. Gentile isn't certain there is enough in-state waste to make his operation feasible, but he said if he cuts the operation in half, it would still bring up to 120 jobs to Lincoln County.

And, he said, county coffers will receive an extra \$60,000 a year in tax money if he closes the deal to the buy the land.

Meanwhile, Lincoln County still is hoping to boost its economy with a 200-bed women's prison, but that, too, will be an uphill battle — even though Gov. Miller wants it there. The prison would create 50 jobs.

Assembly Ways and Means Chairman Marvin Sedway doesn't want the state to locate any more prisons in remote rural areas because it causes staffing and housing difficulties.

The site selection will be made during the next six months.

Abstention on nuke dump bill a badge of honor

By A.C. Robison

Jun Ralston's June 30 column criticizing the seven senators who abstained from voting on Assembly Bill 222 is misdirected.

I don't claim to be without bias on this issue, but I think I am qualified to comment on the Nevada scene. I have been an observer and participant in Nevada politics for many years. I served as Sen. Lazalt's administrative assistant in Washington and as principal deputy assistant secretary of energy for congressional and intergovernmental affairs. I am now with the Energy Department's Yucca Mountain Project.

I am a native Nevadan and my family has been part of Nevada for four generations.

Ralston may be right in his assertion that the nuclear waste issue is "bar none the most politicized issue in the state's history." The real question is: Why, and what does it mean?

It is important to understand that the waste issue has been politicized by a small and very verbal group of "opinion leaders" who have made it so. An objective analysis of the polls taken on this issue will confirm that the politicizing has not occurred because the rank-and-file citizen feels particularly strong about the issue.

These "opinion leaders" have impugned the motives of anyone

Readers Write

who has sought to approach the issue constructively or in terms of what is best for Nevada.

Witness the criticism of U.S. Rep. Barbara Vucanovich after her February speech to the Legislature. She suggested Nevada pursue a path to assure fair treatment by Congress and the DOE for the impact the repository is already having on our state. That certainly seems a reasonable approach, but she was hooted down for suggesting it.

In my years of observing and participating in Nevada politics, I have never seen the degree of demagoguery, often to the detriment of the state, as has been permitted on this issue. Such irresponsibility was not evident during the Equal Rights Amendment debates, nor during the debates on government consolidation, although those issues were just as hotly contested among political leaders.

So what does this have to do with the seven abstainers?

The very abstentions which Ralston criticizes may have been the most honest indicators of political courage in the legislative session.

Perhaps the abstainers were indeed voting their conscience by opposing the sordid way this "debate" has proceeded thus far.

Perhaps they were telling us, "This debate is so unfocused that the best interests of Nevada can't possibly be served by it. Thus, I abstain."

Ralston points out that "most of the senators who supported the bill did so for political reasons." What does that say for the integrity of those legislators? Where is the substantive debate we deserve from our legislators? Can it be that they have been so politically cowed by noisy "opinion leaders" that they are unable to effectively represent their constituents?

I was in Washington when the infamous Nuclear Waste Amendments Act of 1987 passed. I sat in the conference committee and watched as Jim Bilbray valiantly attempted to fend off the inevitable. I watched as Harry Reid's erstwhile House "friends" from Texas, Washington and Ohio (not Louisiana) jammed through the bill that singled out Yucca Mountain. As a Nevadan, I was outraged at the way it was done. It was an act of ultimate congressional arrogance. But it was done.

And it almost certainly will be tried and tested in the courts on a states' rights issue, but Nevada certainly will lose. The federal courts have, since the Civil War, been eroding the prerogatives of the states, particularly when those prerogatives are weighed against a national imperative. Whether we

like it or not, nuclear waste is a national imperative.

Have we as Nevadans counted the cost of tilting at windmills? Have our "leaders"? What are we losing in the process? Have we carefully reviewed what we might gain? Or are our "leaders" so caught up in the sound and fury of their own indignation that they are cutting off our collective nose to spite their face?

The nuclear option is here to stay. America has no other viable alternative to energy sources which create acid rain and the greenhouse effect. Our "leaders" should be looking at the issues objectively, based on the realities, rather than merely luxuriating in billowing bubbles of subjective rhetoric.

The seven abstainers may be among the few true statesmen of the 1989 Legislature. They are the only ones who refused to fall on their political swords over an issue which is so unfocused as to make the very debate irresponsible. They should be cheered for their insight and adherence to principle rather than castigated as cowards.

In a Legislature distinctly devoid of political courage, these seven came closest to showing it.

A.C. Robison is acting deputy project manager for the Yucca Mountain Project Office, Department of Energy.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WBS #: 1.2.9
QA: N/A

August 10, 1989

TWS-EES-13-08-89-051

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: JULY PROJECT STATUS REPORT

Attached are the July Project Status Report for Los Alamos' participation in the Yucca Mountain Project, the Technical Data Management System Submittal Record, and the Monthly Milestone Status Report. A list of outstanding policy reviews and other documents is also included. Documents checked on that list have been at the Project Office for at least two months; the authors are very eager to have those documents approved.

Sincerely,



R. J. Herbst

ABC/em

Attachment: a/s

MONTHLY STATUS REPORT -- JULY 1989

1.2.1 Systems

No action to report this month.

1.2.3.2 Geology

MAJOR ACCOMPLISHMENTS:

Samples were collected at the Lathrop Wells volcanic center and the "A" cone in the Cima volcanic field for testing the feasibility of dating volcanic events at these sites using the thermoluminescence dating technique. Also, thirteen samples of lava and scoria were collected from the Lathrop Wells volcanic center for geochemical analysis. Nine additional scoria and lava samples from the Lathrop Wells center and from the "A" cone were collected for x-ray fluorescence analysis.

A report on the probability of volcanic activity at Yucca Mountain was received from the Nuclear Regulatory Commission. The report was reviewed and summary comments were provided to the Department of Energy at Las Vegas.

Heavy mineral separates have been analyzed by XRD in support of the sorption task. The phases separated are dominated by hematite, magnetite, and ilmenite.

We are preparing a report describing the smectite/illite transitions. Preliminary results indicate that the activity of $\text{SiO}_2(\text{aq})$ may be a primary variable controlling smectite/illite transformation.

PLANNED WORK:

Continue ongoing surface-based tests (non-disturbing) in mineralogy, petrology, stability of minerals, and volcanism.

Revise Characterization of Volcanic Features, R0 (8.3.1.8.5.1).

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USE G-1, G-2, and GU-3 will continue as time and sample availability allow.

PROBLEM AREAS:

None.

1.2.3.3 Hydrology

MAJOR ACCOMPLISHMENTS:

The verification of the computer code SORBEQ has been completed for both the forward and inverse modes of operation. This work is in support of the reactive tracer testing in the C-holes. Verification of the code FEHMN continues.

PLANNED WORK:

Initiate laboratory tracer experiments using single minerals.

Begin documenting SORBEQ.

PROBLEM AREAS:

None.

1.2.3.4 Geochemistry

MAJOR ACCOMPLISHMENTS:

Permits for collecting water samples from the J-13 well and rock samples from the Busted Butte and Calico Hills areas have been approved.

All components of the photoacoustic spectrometer system have been configured and tested. This system supports and will significantly enhance the radionuclide solubility and speciation tasks.

Milestone report R343, "Preliminary Geochemical/Geophysical Model of Yucca Mountain," was approved by the Project Office on 7/10/89.

SIGNIFICANT MEETINGS:

An information exchange meeting with the investigators of the Retention Task of the Swedish Nuclear Fuel and Waste Management Co. was held. Discussions centered on dynamic transport processes (such as dispersion, diffusion, fracture flow, and colloid transport), solubility and speciation, radiocolloid formation, and sorption processes. Several areas of common interest where collaborations can be established were identified, including modeling fracture flow and studying colloid transport.

PLANNED WORK:

Simulation of spatial distribution of compositional data for use in transport models such as TRACR3D.

Continue transport work with pure minerals.

PROBLEM AREAS:

None.

1.2.5 Regulatory and Institutional

No action on the SCP occurred this month.

MAJOR ACCOMPLISHMENTS:

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Project Office 1/6/89. Approved by Project Office and DOE/HQ; sent to NRC and State of Nevada.

Diffusion Test in the Exploratory Shaft, R0 (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/IIQ 4/18/89. Abstract and SCP-based network submitted to Project Office 5/25/89 and to DOE/HQ 6/30/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89. Revision 2, which incorporates DOE/HQ and Project Office comments, was submitted to the Project Office 6/27/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.1.3.2.1). Revision 3, which incorporates Project Office AP-1.10Q review comments, was submitted to the Project Office 5/25/89. Study Plan was approved by the Project Office and transmitted to DOE/HQ on 6/16/89. A Study Plan Assessment was developed for this study and transmitted to DOE/HQ on 6/22/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). Project Office and DOE/HQ comments were received 5/25/89. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Project Office AP-1.10Q review comments were received 6/1/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89. Undergoing Project Office AP-1.10Q review (6/16/89).

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP3.2 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Submitted to Project Office 7/24/89.

Diffusion, R0 (8.3.1.6.2). Submitted to Project Office 7/24/89.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of Volcanic Features, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (1/25/89). Project Office AP-1.10Q comments received 6/9/89. A Comment Resolution Meeting for Project Office and DOE/HQ comments was held July 11-12, 1989.

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of the abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89. Project Office AP-1.10Q comments received 6/28/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

PROBLEM AREAS:

None.

1.2.6 Exploratory Shaft

MAJOR ACCOMPLISHMENTS:

Prepared a response to a DOE/HQ request on the status of prototype testing, and reviewed the feasibility report for the Prototype shaft. Initiated drilling for Phase II of the prototype intact fracture tests, and continued and completed perched water drilling.

Initiated preparation of information to be used by the Project Office to define the role of the US Bureau of Mines' Pittsburgh and Minneapolis centers.

Developed work sheets for critical path test durations to be used by DOE/HQ to develop Long Range Plans.

Reviewed IDS grading report. A survey was performed by T&MSS on the existing procedures for design control.

Contract document was revised and reissued defining Los Alamos and EG&G responsibilities. EG&G has provided comments to modify the document.

PLANNED WORK:

Develop IDS Title II Design Initiation Readiness Review Plan; complete IDS procedures; develop ID network to completion of EEP testing and integrate this network with EEP design and construction network and the testing network; and identify IDS operational requirements, including resources and budgets.

PROBLEM AREAS:

None.

1.2.9 Project Management

MAJOR ACCOMPLISHMENTS:

The Records Processing Center was relocated from LANL to Los Alamos Technical Associates.

SIGNIFICANT MEETINGS:

Staff were interviewed by a Government Accounting Office auditor for two days.

PROBLEM AREAS:

None.

LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
July 31, 1989

Policy Reviews

- ✓ 1. Milestone R749 report: resubmitted 12/7/88 with response to Project Office review.
- ✓ 2. Milestone R749 report: resubmitted 12/12/88 with response to Project Office review.
- ✓ 3. Milestone P379 report: resubmitted 1/18/89.
- ✓ 4. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review.
- ✓ 5. Milestone R346 report: resubmitted 4/4/89; responded to Project Office comments 5/23/89.
- ✓ 6. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review.
- ✓ 7. Milestone T415 report: submitted 5/9/89.
8. Milestone T421 report: resubmitted 6/2/89 with response to Project Office review.
9. Milestone T422 report: submitted 6/2/89.
10. Milestone T414 report: resubmitted 6/27/89 with response to Project Office review.
11. Milestone T419 report: resubmitted 6/28/89 with response to Project Office review.
- ✓ 12. Book contributions: B. Crowe, "GSA Field Trip Segment: Lathrop Wells Volcanic Center" and "GSA Field Trip Segment: Crater Flats": submitted 4/27/89.
13. Abstract: A. E. Norris, "³⁶Cl Studies at Yucca Mountain": submitted 7/28/89.
14. Abstract: A. E. Norris, "³⁶Cl Studies for a Nuclear Waste Repository in Nevada": submitted 7/28/89.

**TAR UPDATE: GEOLOGICAL AND GEOPHYSICAL EVIDENCE PERTAINING TO
STRUCTURAL GEOLOGY IN THE VICINITY OF THE PROPOSED EXPLORATORY SHAFT**

MOTIVATION FOR TAR

- NRC QUESTIONS ON INFERRED FAULT IN VICINITY OF ES BY SMITH AND ROSS (1982) (MAY, 1989 DOE/NRC/STATE OF NEVADA MEETING ON SCP COMMENTS).
- THE GEOPHYSICALLY INFERRED FAULT THROUGH THE PROPOSED ES LOCATION SHOWN IN FIG 1-40 OF THE SCP.
- CONCERN THAT THE POSSIBLE FAULT WAS NOT PROPERLY REFERENCED IN THE ES RELOCATION OF 1987.
- POSSIBLE FAULT MAY NOT HAVE BEEN FULLY CONSIDERED IN ESF TITLE I DESIGN

PURPOSE OF TAR

- ACCESS DATA & INTERPRETATION SUPPORTING THE SCP FIGURE AND USGS OFR 80-182 WITH REGARD TO INFERRED FAULT.
- REVIEW OTHER GEOLOGICAL AND GEOPHYSICAL DATA THAT BEAR ON FAULTING IN THE ES AREA.
- MAKE A DETERMINATION ON THE POSSIBLE INTERPRETATIONS ON FAULTING IN THE VICINITY OF THE ES.
- DETERMINE HOW GEOLOGICAL AND GEOPHYSICAL DATA WERE CONSIDERED IN MAKING THE ES LOCATION DETERMINATION; WERE BERTRUM (1984) RECOMMENDATIONS ADEQUATELY IMPLEMENTED.
- IF IT WAS CONCLUDED THAT A FAULT MIGHT EXIST IN THE VICINITY OF THE ES, WHAT IMPACTS ON ESF TITLE II DESIGN PROCESS.

TAR PLAN (CONDUCTED UNDER QMP 02-08) WAS PREPARED BY DAVE DOBSON AND
APPROVED BY PQM ON 5/18/89.

THREE TEAMS (SUBCOMMITTEES) WERE ASSEMBLED FOR THE TAR TEAM WITH SOME
EXPANSION OF SCOPE:

- o GEOLOGY; TO ALSO INCLUDE REVIEW OF MAPPING DONE IN VICINITY OF
COYOTE WASH.
- o GEOPHYSICS; TO ALSO REVIEW RESISTIVITY MODELING ASSUMPTIONS MADE
BY SMITH AND ROSS (1982).
- o ENGINEERING; TO ALSO CONSIDER SAFETY, PERFORMANCE, AND CONSTRUCT-
ABILITY ISSUES FOR A SUITE OF FAULTING SCENARIOS.

TAR TEAM FIELD TRIP AND START OF GEOLOGIC INVESTIGATIONS BEGAN WEEK
OF 6/7/89.

PRELIMINARY FINDINGS OF TAR TEAM

(TEAM STILL WORKING ON RECOMMENDATIONS):

- AGREE WITH PREVIOUS MAPPING DONE IN COYOTE WASH (POSSIBILITY OF UNDETECTED MINOR FAULTS).
- EVIDENCE AGAINST FAULTING IN THE VICINITY OF THE ES: PREVIOUS MAPPING, AERIAL PHOTOGRAPHY, LITHOLOGIC LOGS FROM BOREHOLES AND GEOLOGIC CROSS-SECTIONS, REVIEW OF CONTACTS MAPPED UPSLOPE FROM SHAFT LOCATIONS; FLANIGAN (1981) EM SURVEY.
- REINTERPRETATION OF SMITH AND ROSS DATA INDICATES THE PRESENCE OF A RESISTIVITY ANOMALY IN THE VICINITY OF THE SMITH AND ROSS INTERPRETED FAULT; EXTENT AND DEPTH OF CONTRAST NOT WELL CONSTRAINED BY THE DATA; POSSIBLE INTERPRETATIONS OF ANOMALY: PERCHED WATER; PERCOLATION OF RUNOFF IN COYOTE WASH; COMPOSITIONAL OR HYDROLOGIC VARIATION IN PTn; PERCOLATION AND ASSOCIATED CLAY ALTERATION FROM CHANGES IN FRACTURE DENSITY, OR A BURIED FAULT. AVAILABLE DATA DOES NOT ALLOW ANY DISCRIMINATION AMONG THE INTERPRETATIONS.

IMPLICATION: POSSIBILITY OF FAULT AT DEPTH, IN THE VICINITY OF THE ES, CANNOT BE DISCOUNTED; GEOLOGIC DATA HOWEVER, SUGGEST THAT THIS IS NOT LIKELY.

- BASED ON CURRENT DATA AND HYDROLOGICAL MODELS, THE PRESENCE OF A POSSIBLE FAULT THROUGH THE ES WOULD NOT IMPACT LONG TERM WASTE ISOLATION PERFORMANCE.**
- ES CONSTRUCTABILITY AND SAFETY WOULD NOT BE COMPROMISED UNLESS A MAJOR FAULT WERE ENCOUNTERED IN THE COURSE OF SHAFT CONSTRUCTION.**

POSSIBLE RECOMMENDATIONS OF TARE TEAM

- CLEAN AND CAREFULLY MAP THE EXPOSED CONTACTS AND FRACTURES ALONG THE SOUTH SIDE OF DEAD YUCCA RIDGE; WOULD PROVIDE ADDITIONAL CONFIDENCE ON THE ABSENCE OF A FAULT.**
- MAP EXPOSURES CREATED BY ES PAD EXCAVATION (~ 20 m).**
- A DRILL AND LOG SHALLOW BOREHOLES OR MPBHs BEFORE PAD CONSTRUCTION; TO GAIN ADDITIONAL CONFIDENCE ON THE REMAINING UNCERTAINTY IN THE GEOPHYSICAL INTERPRETATION REGARDING THE PRESENCE OF FRACTURE ZONES AT DEPTH.**

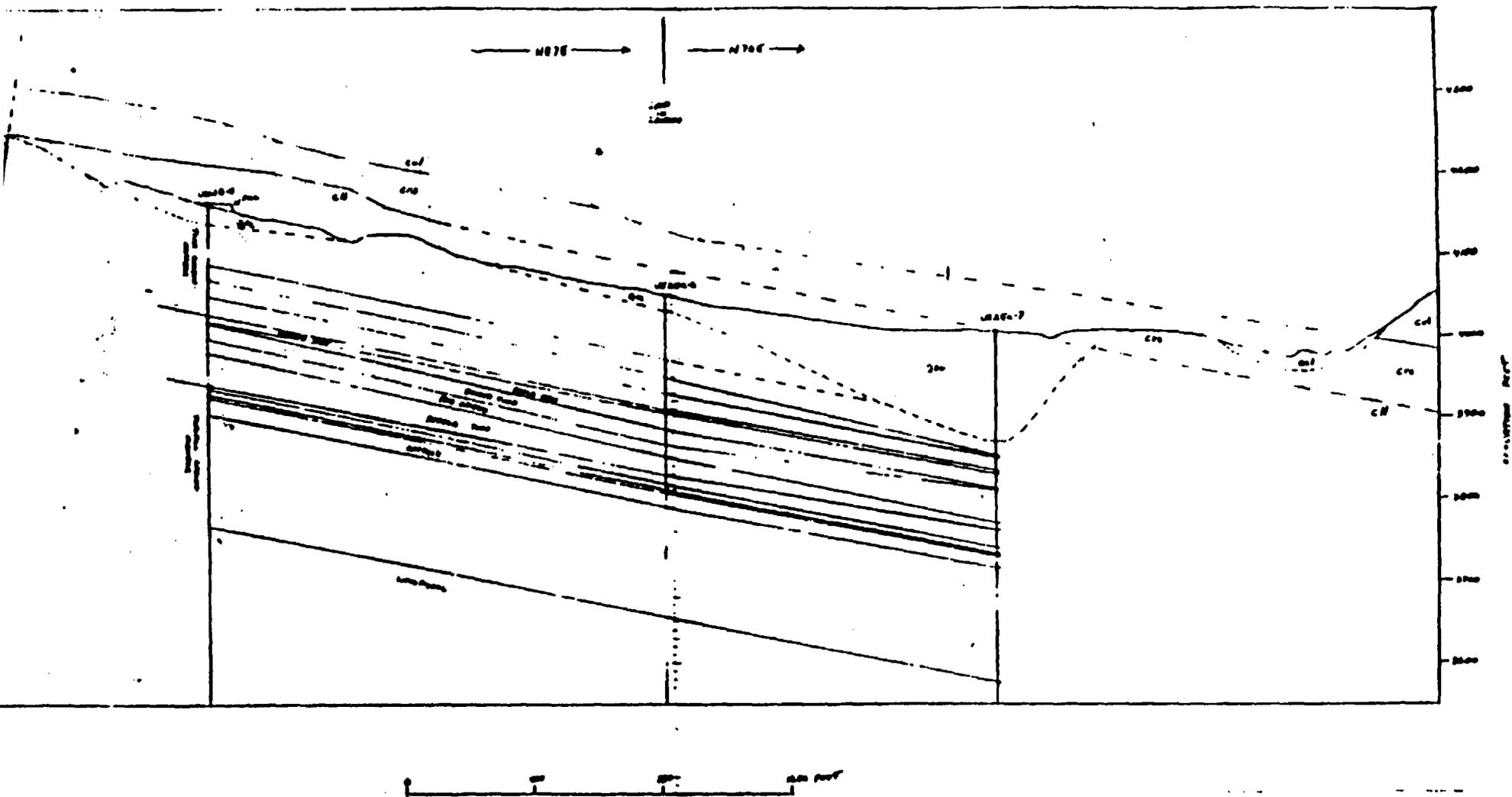


Figure 3-5. Cross section through boreholes UK25e-4, UK25e-6, and UK25e-7 showing the correlation of lithologic zones recorded on the core logs (Spangler and Rosenbaum, 1966; Spangler and others, 1964). Lithologic zones in the upper Tiva Canyon Member are taken from Scott and Bork (1964) and projected into the line of section.

TOPICS
FOR
FUTURE NRC INTERACTIONS

MAXWELL BLANCHARD
YUCCA MOUNTAIN PROJECT

INTERACTIONS WITH THE NRC

- o ASSUMPTIONS FOR PLANNING FUTURE INTERACTIONS WITH THE NRC
- o ^{July} JUNE 26 MEETING WITH THE NRC TO PLAN AND SCHEDULE INTERACTIONS FOR THE NEXT 18 MONTHS
- o RESULTING CALENDAR OF PLANNED INTERACTIONS
 - CONCENTRATED ON INTERACTIONS THROUGH DECEMBER 1989
 - SOME DATES ARE TENTATIVE

ASSUMPTIONS FOR PLANNING NRC INTERACTIONS

FORMAL MEETINGS

- o OBJECTIVE: TO OBTAIN A MUTUAL UNDERSTANDING OF ISSUES THAT MAY IMPACT LICENSING OF THE REPOSITORY
- o MEETING MINUTES TO BE PREPARED AND SIGNED BY ALL PARTICIPANTS
- o GENERALLY REQUIRE BOTH HQ & PO PARTICIPATION

ASSUMPTIONS FOR PLANNING NRC INTERACTIONS (CONTINUED)

TECHNICAL EXCHANGES

- o OBJECTIVE: TO PROMOTE A BETTER TECHNICAL UNDERSTANDING OF THE TOPIC BY EACH PARTICIPANT**
- o NO MEETING MINUTES TO BE WRITTEN, ACTION ITEMS GIVEN OR ACCEPTED, OR DRAFT DOCUMENTS TO BE EXCHANGED**
- o NO COMMITMENTS OR ACTION ITEMS TO RESULT--NO POLICY DISCUSSIONS**
- o LIMITED PARTICIPATION & PREPARATION TIME REQUIRED FOR MEETING (EG 8-10 TOTAL; 1 PO, 1 INTEGRATION, 1 OR 2 PIS)**
- o MEETINGS GENERALLY LAST ONE DAY OR LESS**
- o MAY BE ACCOMPLISHED THROUGH TELECONS, MOST OFTEN HELD AT THE PROJECT OFFICE OR PROJECT PARTICIPANT FACILITIES**

ASSUMPTIONS FOR PLANNING NRC INTERACTIONS (CONTINUED)

FIELD TRIPS

- CHARACTERIZED BY A LARGE CONTINGENT OF VISITORS TO THE SITE
- REQUIRES SIGNIFICANT PLANNING/COORDINATION & MAY INVOLVE MANY PROJECT OFFICE AND PARTICIPANT STAFF
- FREQUENCY OF NO MORE THAN 1 PER QUARTER

SITE VISITS

- LESS THAN 3 NRC PARTICIPANTS
- REQUIRES LITTLE PREPARATION/COORDINATION
- CAN BE SCHEDULED IN CONJUNCTION WITH ANY INFORMAL MEETING OR BY ITSELF

CALENDAR OF PLANNED INTERACTIONS

FORMAL INTERACTIONS

- AUG 30** **TECTONICS (NRC EXPLANATION OF THEIR SCA COMMENTS AND DISCUSSION OF RECENT TP ON TECTONICS)**
- OCT 31** **INTERACTIONS MEETING TO PLAN FOR THE NEXT THREE MONTHS**
- NOV 15** **INTEGRATION OF PERFORMANCE ASSESSMENT INTO SITE CHARACTERIZATION**

CALENDAR OF PLANNED INTERACTIONS (CONTINUED)

TECHNICAL EXCHANGES

- AUG 10-11 CORE DRILLING (SITE VISIT TO UTAH)
- AUG 15 SUBSTANTIALLY COMPLETE CONTAINMENT
- SEP 21 CALICO HILLS PLAN (OUTLINE)
- SEP 21 (?) ANTICIPATED/UNANTICIPATED PROCESSES AND EVENTS
- SEP 26 TECTONICS
- OCT 3-4 10 CFR 60 REQUIREMENTS APPLICABLE TO ESF DESIGN

CALENDAR OF PLANNED INTERACTIONS (CONTINUED)

TECHNICAL EXCHANGES (CONTINUED)

OCT 11-12	TAR ON THE GEOPHYSICAL ANOMALY
OCT 25	CONTAINER MATERIAL BACKGROUND
OCT 25-26	TECTONICS
NOV 1	DISTRIBUTION AND MANAGEMENT OF TECHNICAL DATA
NOV 28-29	TECTONICS
DEC 7	ESF TESTING
DEC 13	SCENARIO DEVELOPMENT
JAN -	PERFORMANCE ASSESSMENT WORKSHOP

PROPOSED YUCCA MOUNTAIN PROJECT BIENNIAL STATUS REPORT (BSR)

WHY IS A YMP BSR NEEDED?

- PROVIDE A MECHANISM FOR REPORTING DETAILS OF TECHNICAL PROGRESS FOUND INAPPROPRIATE FOR DOE/HQ SEMIENNIAL PROGRESS REPORT (SPR)
 - SPR INPUT GUIDANCE IS OVERLY RESTRICTIVE ON PARTICIPANTS' LATITUDE TO REPORT "PROGRESS" OF SITE PROGRAMS
 - FORMAT OF SPR WAS OPAQUE TO MUCH LEVEL-OF-EFFORT WORK ON PROJECT
- SERVE AS PROJECT OFFICE INPUT TO SPR ON STATUS OF SITE CHARACTERIZATION PROGRAMS
 - SYSTEM FOR PREPARATION/COMPILATION OF INPUT TO DOE/HQ SEMIENNIAL PROGRESS REPORT (SPR) WAS INADEQUATE

PROPOSED YUCCA MOUNTAIN PROJECT BIENNIAL STATUS REPORT (BSR)

WHY IS A YMP BSR NEEDED? (CONT.)

- SERVE AS FORMAL, REFERENCEABLE DOCUMENT THAT DOE/HQ CAN CITE IN SPR; DETAILS NOT ROLLED-UP INTO SPR CAN BE FOUND IN BSR
 - HQ IMPOSED PAGE LIMITS ON SPR (APPROX. 50 PAGES)
 - NO STRUCTURE FOR MANAGEMENT OR TECHNICAL REVIEW (BY PARTICIPANTS AND PROJECT OFFICE) OF DRAFT INPUT TO THE SPR
 - LACK OF REVIEW PRIOR TO INPUT TO HQ RESULTED IN BURDENSOME JOINT HQ/PROJECT OFFICE REVIEW AND COMMENT RESOLUTION PROCESS

PROPOSED YUCCA MOUNTAIN PROJECT BIANNUAL STATUS REPORT (BSR)

PROPOSED SCHEDULE

- LETTER FORMALIZING BSR PROCESS AND PROVIDING GUIDANCE FOR BSR INPUT TO BE DISTRIBUTED IN EARLY AUGUST. A SCHEDULE WILL BE INCLUDED
- THE FIRST BSR WILL COVER THE PERIOD FROM APRIL 15 THROUGH SEPTEMBER 30, 1989
- PARTICIPANT INPUT FOR THE FIRST BSR IS CURRENTLY EXPECTED TO BE SUBMITTED TO THE PROJECT OFFICE IN EARLY-MID OCTOBER

Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit (1 of 3)

Background

- SCP Consultation Draft
- NRC "Point Papers" Objection #2
- In response:

DOE agreed to defer plans to sink ES-1 into the Calico Hills unit pending analysis of alternatives and consultation with the NRC staff,

and the objection was "lifted."

- The Calico Hills unit is an important natural barrier, and timely development of a characterization strategy is appropriate.

7/27/89

Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit (2 of 3)

Approach

- **Multi-discipline working group:**
 - Geology/Geophysics**
 - Hydrology/Hydrogeology**
 - Performance Assessment**
 - Drilling/Mining Engineering**
 - Decision Methodology**
 - Regulatory Specialist**
- **Full QA**

Product

- **Formal report to the Project Office to include:**
 - Specific data needed**
 - Evaluation of available techniques (e.g., mining, drilling, geophysics)**
 - Alternative Strategies (e.g., onsite/offsite, extent of excavation or drilling)**
 - Methodology (i.e., details for figure-of-merit)**
 - Recommendation**

Consultation with NRC

7/27/89

**Risk/Benefit Analysis of Alternative Strategies
for Characterizing the Calico Hills Unit (3 of 3)**

Approved Plan

**"Plan for Risk/Benefit Analysis of Alternative
Strategies for Characterizing the Calico Hills Unit
at Yucca Mountain," Rev. 2 (dated 7-6-89).**

Participation

- **Project Office and scientific participants**
- **DOE/HQ**
- **Consultants in performance assessment,
hydrogeology, and decision methodology**

Schedule

- **Kickoff 8-10-89 in Las Vegas**
- **Flexibility to accommodate schedules of scientific
personnel**
- **Completion in 120 days**

7/27/89