



United States Department of the Interior

GEOLOGICAL SURVEY  
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DENVER, COLORADO 80225

*I-30312x To: Ken Hooks*



IN REPLY REFER TO:

December 10, 1990

WBS: 1.2.9.2  
QA: N/A

*Blanchard  
Laird  
Roberson  
Ditt's  
Secum-d  
Hertz  
Johnson*

Carl P. Gertz, Project Manager  
Yucca Mountain Project Office  
U.S. Department of Energy  
P.O. Box 98608  
Las Vegas, Nevada 89193-8608

SUBJECT: U.S. Geological Survey Yucca Mountain Project Monthly Summary for November 1990

*12-14-90*

Dear Carl:

In compliance with the revised Yucca Mountain Project monthly reporting procedures, following is the YMP USGS input for the month of November, 1990. If you have any questions, please contact Raye Ritchey at FTS 776-0517.

WBS 1.2.3 - SITE INVESTIGATIONS

Comments from DOE/YMPO were received for the following study plans during November:

8.3.1.2.3.2, "Saturated Zone Hydrochemistry"

The following study plans were approved by OCRWM during November:

8.3.1.2.3.1.1-.6,R0, "Characterization of the Site Saturated-Zone Ground Water Flow System"

The following papers for inclusion at the International High Level Radioactive Waste Management Conference in April 1991 are in various stages of review/acceptance:

A report titled "Distribution of Rubidium, Strontium, and Zirconium in tuffs from two deep coreholes at Yucca Mountain, Nevada" (Spengler, Peterman)

A paper titled "Geophysical borehole logging in the unsaturated zone, Yucca Mountain, Nevada" (Schimschal, Nelson)

"Isotopic Discontinuities in Ground Water Beneath Yucca Mountain, Nevada (Stuckless, Whelan, Steinkampf)

"Strontium Isotopes in Carbonate Deposits at Crater Flat, Nevada" (Marshall, Peterman, Futa, Stuckless)

"Preliminary isotopic data on unsaturated-zone flows at Yucca Mountain, Nevada" (Yang)

*V.  
Please get me  
a copy of this paper!*

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*ADD: Ken Hooks*

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**"Pore-water Extraction from Unsaturated Tuffs Using One-Dimensional Compression"  
(Higgins)**

A paper "Permeability of Rough-Walled Fractures" (Zimmerman, Kumar, Bodvarsson)

In support of past discharge studies, a semi-quantitative estimate of chrysophyte cyst abundance was created for samples from Ruby Marsh sites and surrounding areas. That information was then plotted on all graphs showing all pair wise combinations of available chemical data.

The tectonic modeling and synthesis project completed a technical review of the Reconnaissance geologic map of the Elliston Region; completed field review of a map of Trench 14, Bow Ridge Fault, Yucca Mountain; and examined contact of Johnnie formation with the Sterling Quartzite - determined that the existing map of this area cannot meet QA.

The stratigraphy project reports that Z. Peterman completed a manuscript titled "Assessing the natural performance of felsic tuffs using the Rb-Sr and Sm-Nd systems--a study of the altered zone in the Topopah Spring Member, Paintbrush Tuff, Yucca Mountain, Nevada" (Z. Peterman, R. Spengler, K. Futa, B. Marshall, and S. Mahan) for an invited contribution to a Materials Research Symposium (MRS) on the "Scientific Basis for Nuclear Waste Management XIV". The paper was presented orally at the MRS meeting in Boston, November 26, 1990. The abstract of the paper follows:

Core samples of the Topopah Spring Member of the Paintbrush Tuff from drill hole UE25A#1 were analyzed for Sr and Nd isotopes and selected minor and trace elements to constrain the origin of a zeolitized zone associated with the lower vitrophyre. The Sm-Nd radiogenic isotope system is unperturbed by the alteration. The Rb-Sr system shows open-system behavior due primarily to the addition of Sr to the altered zones. The thick densely welded high silica rhyolite is remarkably uniform in composition and shows only a slight decrease in initial  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios with depth (0.7129-0.7125). Quartz latite in upper Topopah Spring has significantly lower initial Sr isotope ratios (0.7095-0.7114). Locally in the altered zone in and near the lower vitrophyre, Sr and Ca were gained in substantial amounts, and K, Rb, and Y were depleted. Ti, Zr, Nb, Ba, La, Ce, Sm, and Nd were relatively immobile during the alteration. Sr added to the altered zone had an isotopic composition of  $0.7119 \pm 0.0002$  and was probably derived from dissolution of glass in the bulk Topopah (high silica rhyolite + quartz latite) and transported downward by infiltration.

In 1986, as part of the regional tectonic investigations, 35 deep-penetrating electrical soundings were acquired using the magneto telluric (MT) method. The purpose of this field experiment was to provide information on the resistivity structure on a profile from the Death Valley area, across Amargosa Desert and eastward across Yucca Mountain and the southern part of the test site. This data was intended to provide information related to deep low- and high-angle faulting, the presence of magma or high-temperature geothermal regimes, deep lithology and crustal constitution. Resistivity structure will eventually be integrated with velocity structure from seismic investigations, density structure from gravity, and thermal structure from heat-flow and magnetic cure-temperature mapping. This reporting period was in part devoted to an initial resistivity depth analysis of these data, resulting in contoured sections that show the main features of resistivity structure along several contiguous sections totaling 170 km in length, and penetrating up to 25 km in depth. The sections are produced by a method that directly reduces observed data (frequency-impedance) to depth-resistivity. The method which was developed by Francis Bostick (University of Texas, Austin) graphically displays the uncertainties, resolution, depth of penetration, and probable true resistivities with a minimum of subjective judgements such as required in forward modeling. The sections are to be part of the data report for the 1986 MT survey.

In support of historical and current seismicity studies, seismometer testing benchmarks were established and a testing schedule determined. The 16 portable seismometers are currently being

tested in the field by deploying them across and around Yucca Mountain and recording broadband ground motion.

R. W. Spengler prepared and presented at the TPO meeting, a presentation titled "Status of the DOE/SKB technical exchange and potential benefits to the rock characteristics program."

In support of structural studies within the site area, reconnaissance fieldwork was conducted in the northeastern part of the YMP study area October 31-November 6. This trip was designed to 1) establish criteria for distinguishing between rhyolite flows of the Paintbrush Member of the Timber Mountain Tuff, 2) define the structural fabric between Forty Mile Canyon and Yucca Wash, and 3) test the sample handling procedures of the Sample Management Facility. For the first objective, rhyolite flows near Yucca Wash and Paintbrush Canyon were studied in the field and 20 samples were collected for more detailed study; for the second, faults mapped by Christiansen and Lipman (1965) and Scott and Bonk (1984) were examined in the field; and for the third objective, the Apache Leap Tuff core was examined in the Sample Management Facility (SMF) and selected samples were marked for removal. Two boxes of core samples from the Apache Leap Tuff were shipped to Denver from the SMF.

H. Oliver and W. Mooney presented a two-hour program to the Peninsula Geological Society at Stanford University on the question, "Is Yucca Mountain a safe place to store high-level nuclear waste" on 11/15/90. The topic drew a standing room only attendance including some Bay Area reporters. The following advantages of Yucca Mountain were discussed: low rainfall; deep water table - storage in unsaturated zone; closed structural basin; remote from population; located on U.S. DOE property; NTS already partly contaminated; some natural barriers. Present state of knowledge was considered on the following major issues: storage conditions for canisters; will ground water reach biosphere <10,000 years?; future volcanism within the repository; possible rise in water table; can Yucca Mountain breathe?; future exploration. Much of this information is contained in a new report by Oliver and others "Status of data, major results, and plans for geophysical activities, Yucca Mountain Project." The report has just been released by DOE as YMP/90-38, 191 p., and is currently being distributed.

The Yucca Mountain region received light precipitation from showers November 20 and 26. Both events were the result of frontal passages with low pressure centers developing east of the Sierra-Nevada Mountains and moving across southern Nevada. Rainfall averaged about 0.14 inch over most of Yucca Mountain. Surface-water runoff was not observed or reported. No streamflow was observed in Fortymile Wash.

In support of debris transport studies, deposits from the Olancho flood site of August 1989 were sampled and the samples shipped to Cascade Volcanoes Observatory (CVO) for particle-size analysis. Samples of the matrix of a debris-flow deposit that was emplaced near Carson City in 1983 were collected and sent to CVO for particle-size analysis. The hydraulic characteristics of this debris flow were unusual but similar to those at Olancho. Results will be compared with those from Olancho in an attempt to better understand hydraulic characteristics of both flows.

J. Czarnecki organized a talk for a panel from the National Academy of Sciences concerned with the question "Is the water table likely to rise into the Yucca Mountain repository?" The meeting took place November 30.

The matrix hydrologic property testing project reports that water content, bulk density and porosity measurements were completed on core from the Apache Leap prototype drilling site were completed. Simulations of imbibition of water into rock core are being conducted to evaluate the appropriate formulations of moisture retention characteristic and relative permeability functions and to determine sensitivities to various physical parameters. This will also aid in the identification of appropriateness of different types of methods of measurement for the same parameter.

In support of the surface based boreholes study, the Nevada Test Site materials testing laboratory began their measurements of the thermal conductivity and volumetric heat capacity characteristics of nine core samples recovered during drilling of the two prototype drill hole instrumentation boreholes. These data are needed to finalize prototype drill hole instrumentation test results.

The vertical seismic profiling project obtained a preliminary 3-D physical model data set from their new 3-D model. The model is a concrete monolith approximately 6'x 6'x 2'. A new improved version of the wave mode separation program was developed which generates a much better shear wave mode data set.

In support of percolation studies, fracture porosity and total porosity were measured on a core of welded tuff containing a single, axially-oriented fracture. This sample had previously been used in two transient imbibition tests; in the first, the core was strapped together so fluid could be imbibed into the core through the fracture and in the second, the two halves of core were separated so the fracture contribution was removed. In the present phase of testing, the core was fitted with porous plates in an attempt to measure the water transmitting capacity of the fracture at various water tensions. The fracture surface appears to be free of clays but may contain some very porous calcite deposits.

The unsaturated zone fractured rock hydrology project reports that several numerical simulations were run using a modified version of VS2DT code that simulates gas flow. Simulations sought to examine the effect that fractures may have on the recovery of gaseous tracers injected into partially welded tuff units at the Apache Leap site as part of the prototype (dry) drilling activity. Simulations have focused on the effect that pumping rates, delay times between drilling and sampling, and fracture/matrix permeability ratios exert on the total mass of tracer recovered, and on tracer concentration relative to input concentration of the pumped air. Simulated results are being used to support a hypothesis concerning optimal pumping rates for gaseous tracer recovery currently being developed.

In support of single- and multiple-well hydraulic stress testing, hydraulic pressure and water level data from UE-25 c#1 which was collected during 1990 was analyzed for barometric and earth tide responses. Monitoring continued at three shallow neutron holes instrumented with a differential transducer to monitor gas pressure. This data is being collected to help develop the method for obtaining pneumatic diffusivity from gas pressure measurements. Plans have been made to instrument other sites, both shallow unsaturated and deep saturated boreholes, to refine this method. The criteria letter to remove packers and tubing from the c-holes was completed on 11/28/90.

In support of calcite silica studies, all necessary technical procedures for work in Trench 14 have been completed. Training to these procedures has also been completed. Environmental training has been completed by all personnel who expect to go to the field and safety training is scheduled for December 10.

#### **WBS 1.2.9 - PROJECT MANAGEMENT**

In support of PACS, the task of closing off all open ends and rolling up outyear planning packages for the APECS systems was completed. All Level I and approximately 90 percent of Level II milestones have been reestablished in the network. The remainder of the month was dedicated to clean-up and modification of networks for management utilization and budget input and control.

Sincerely,

*for* 

Larry R. Hayes  
Technical Project Officer  
Yucca Mountain Project  
U.S. Geological Survey

cc: D. Appel, USGS/Denver  
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