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OCT 18 1985

MEMORANDUM FOR: Malcolm R. Knapp, Chief  
WMGT

FROM: Abou-Bakr Ibrahim  
Geology-Geophysics Section, WMGT

SUBJECT: TRIP REPORT: APPENDIX 7 (DOE/NRC SITE SPECIFIC PROCEDURAL  
AGREEMENT) VISIT TO REPOSITORY SITES AND DOE CONTRACTORS

From September 17th to 26th, 1985, I visited the Yucca Mountain area, Nevada; United States Geological Survey (USGS) offices in Las Vegas, Nevada, and Menlo Park, California; the Hanford site, Washington and the Rockwell Hanford office in Richland, Washington. The purposes of these visits were:

1. to examine the results of recent trenching conducted near Yucca Mountain,
2. to discuss the results of a long seismic refraction line across the Hanford reservation shot by the USGS, Menlo Park office,
3. to discuss the results of the seismic reflection line shot in the Hanford reservation by Walker Geophysical Co,
4. to examine the geophysical anomaly files at the Rockwell Hanford office, and
5. to make reconnaissance geological field observations at the Yucca mountain and the Hanford sites.

The following is a summary of activities and observations conducted during my visit

A. Yucca Mountain, Nevada visit:

Activities are summarized in the field trip report dated October 3, 1985 form J. Trapp to M. Knapp

B. USGS office, Menlo Park, California Visit:

The purpose of my visit was to discuss with the USGS staff a long seismic refraction survey conducted across the Columbia Plateau, in August 1984, in conjunction with the DOE/Rockwell Hanford operation. The seismic line was 260 km long centered on the Pasco Basin. The survey consisted of 4 shot points with charges ranging in size from about 1000 kg to 2300 kg and 240 recording stations with a separation of 930 m. The main purpose of the survey was to study the regional structure in the Columbia Plateau and estimate the thickness of the basalt in the area. The interpretation of

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the data shows that the basalt in the area varies in thickness, and is generally less than 7 km deep below the surface. The refraction data interpretation indicates also that this area of the Columbia Plateau may have resulted from a continental rift which may be similar to the rift associated with the Mississippi Embayment.

This survey did not provide any information about the structure of the suprabasalt. I would suggest that if the Rockwell Hanford office will conduct a high resolution seismic reflection survey in the future, seismic refraction data should be collected at the same time. Also, Rockwell should consider elaborating on the USGS suggestion that the Columbia Plateau may have resulted from a continental rift and what is the consequence of a rift, if it exists, on the ability of the site to isolate wastes in the next 10,000 years.

I had the chance to discuss further refraction surveys in the Yucca Mountain area since the one conducted in 1982. I learned that in 1985, the USGS shot 3 refraction surveys. One survey was 40 km long and running NS, the other two surveys were 50 km and 70 km long and running EW. The 50 km survey crossed Yucca Mountain and Bare Mountain. I looked at the preliminary processed data, and it is of high quality, the signal to noise ratio is very high and the onsets of the first arrivals are very clear. I expect valuable information about the crustal structure in Yucca Mountain will be obtained after the complete interpretations of these lines are finished. Also, it is suggested that reflection data may be extracted from the seismic survey which may enhance the structural interpretation in the area. The crustal structure generated from the refraction survey plus the density measurements obtained from boreholes will be used to calculate theoretical gravity models to be compared to the empirical gravity data collected in the area.

Personnel involved in the discussion: W. Mooney, Howard Oliver, R. Carchings, V. Sutton, and other USGS research staff.

C. Rockwell Hanford Office Visit:

The status of the seismic reflection test line shot in the Hanford site was discussed. I learned that the data collected by the 10 Hz geophones after our discussion in Austin, Texas in July 1985, (see trip report from A. Ibrahim to M. Knapp dated September 6, 1985) will not be processed in FY 85. I had a chance to look at the preliminary processing of the air gun data collected using the 40 Hz geophones. It was clear from the section that the quality of the data for the suprabasalt is much better

than those collected by the Seismograph Service Corporation in 1978. Between shot points 300-310, on the preliminary processed section, there is an anomaly, the source of this anomaly should be investigated thoroughly.

Also, I had a chance to discuss the results of the long seismic refraction line shot by the USGS in the Columbia Plateau with the Rockwell staff. I suggested that the Rockwell staff should examine the USGS data and supplement it with their data collected from the seismic stations and provide a structural model for the Hanford site. Compare the model generated from their interpretation with that of the USGS and explain any differences between the two models if any exists. Also, I talked with three geologists who are mapping the stratigraphy and estimating the thickness of the dense interior of the cohasset flow. Preliminary estimates indicate that the dense interior varies from about 35 m to 70 m. A report discussing these data will be out for review very soon.

I went on a field trip with Rockwell and DOE representatives. We visited the location of the seismic reflection survey and looked at the topography in the area. The area is flat except the northern part of the reflection survey crossed a step rise in the elevation. This step can clearly be identified on the preliminary processed seismic section where the coherence in the reflection characters is poor. Also, we visited the site for the Exploratory Shaft (ES), no activity is going on at the shaft site with the drilling rig in place and idle. The reflection survey was about few hundred feet from the ES location.

Before our return to the office, we examined a few exposures (Grande Ronde) at Umtanum Ridge which consists of columnar structure with vertical fracture. The exposed formations are folded and faulted.

The anomaly files which consist of tabulations of different interpretations of different geophysical data were made available to me at the Rockwell Hanford office. These anomalies were identified by different contractors such as Geotronics, Weston Geophysical, AeroServices, and Emerald Exploration. The anomalies were generated from seismic reflection gravity, magnetic, aeromagnetic and magnetotelluric data. At this stage, each file lists the different anomalies based on interpretation of a particular geophysical method. I suggest that the Rockwell staff should correlate the anomalies observed from the different geophysical methods and identify those common anomalies, and their sources. For those anomalies which do not show common correlation, an explanation should be provided for their cause.

Personnel involved in the discussions: S. Price, A. Tallman, A. Rohay, J. Fassett, T. Ault, K. Bergstrom, J. Kunk, T. Mitchell, R. Cross, P. Long, and B. Hurley (DOE).

Abou-Bakr Ibrahim  
Geology-Geophysics Section, WMG

**TRIP REPORT - APPENDIX 7 VISIT TO NNWSI  
September 16-19, 1985**

On September 16 through 18, 1985, Dinesh Gupta, David Tiktinsky, and consultants (Jaak Daemen, University of Arizona; Swapan Bhattacharya, EI; and Kanaan Hanna, U.S. Bureau of Mines) visited the office of NNWSI On-Site Representative (Paul Prestholt) in Las Vegas, Nevada. The primary purpose of this visit was to become familiar with the draft of the NNWSI Exploratory Shaft Test Plan available at Paul Prestholt's office.

On September 19th, David Tiktinsky, Swapan Bhattacharya and Kanaan Hanna visited the G-Tunnel and the Yucca Mountain Site.

The draft ESTP document consists of two parts and two appendices. Part I describes the purpose of the test program and background information about NNWSI, the site and the testing approach. Part II of the ESTP describes test plans for a suite of 30 tests under consideration for conducting in-situ test measurements. Appendix A consists of a Glossary of terms. Appendix B was not available at the time of our visit; it is expected to contain description of costs and schedules. A copy of the Table of Contents of the draft ESTP document is attached (Attachment 1).

Because of time constraints, we concentrated our effort on reviewing Chapter 5 (Part I), "Rationale for Exploratory Shaft Facility Tests" and Chapter 3 (Part II), "Geomechanics Testing for Performance and Design Data." However, we scanned through the entire document (about 1000-1500 pages) to become familiar with the overall contents of the draft ESTP.

In describing the rationale for the proposed test plan (Chapter 5, Part I), the DOE has stated that the purpose of the planned ES tests is to:

1. Validate models
2. Reduce uncertainty
3. Provide information for NRC Siting Criteria
4. Simulate processes of components of the repository system

In addition, the DOE has stated in the ESTP that the in-situ test results would provide information to design engineered components (drifts, emplacement holes,

canisters etc.) and to address DOE's issues hierarchy (four key issues, 44 issues and 171 information needs related to performance and siting criteria).

The DOE has also identified the priority data needed to meet the 10 CFR 60 performance objectives. These data needs are shown on Attachment 2. In this context, we identified two new reference documents: a) Hayden N. 1985, "Priority of Data Needs by Performance Assessment," letter of March 7, 1985 to W. Myers, Sandia National Laboratories, Albuquerque, N.M. and b) Ticeney, et.al., Sandia National Laboratory, "Priority of Data Needs by Performance Assessment, FY85." We requested Paul Prestholt to approach DOE to find out if these documents can be made available to us at this time.

In Chapter 3 (Part II) of the ESTP, DOE has provided a description of planned Geomechanical Tests to be conducted in the exploratory shaft. These tests include Shaft convergence, Overcore Stress, Demonstration Breakout Room, Sequential Drift-Mining Evaluations, Plate-Load Testing, Slot-Strength Testing, Geomechanical Laboratory Testing, and Demonstration of a Prototype Boring Machine.

Overall, our visit to Paul Prestholt's office was useful to us in getting an early insight into DOE's draft ESTP document.

**Attachments:**

1. Table of Contents - NNWSI Exploratory Shaft Test Plan
2. Priority data identified in the ESTP as needed to meet 10 CFR 60 Performance Objectives

TABLE OF CONTENTS

NNWSI EXPLORATORY SHAFT TEST PLAN  
REVISION 1  
AUGUST 1985

PART I

1. Introduction
2. General Concept of a Geologic Repository in the Unsaturated Zone at Yucca Mountain
3. Regional Geologic and Hydrologic Setting of Yucca Mountain
4. Evolution and Summary of Siting Requirements and Information Needs
5. Rationale for Exploratory Shaft Facility Tests
6. Construction and Testing Operations of the Exploratory Shaft Facility
7. Integrated Data System
8. Management of the Exploratory Shaft Facilities Operations
9. Safety and Environmental Impacts
10. QA Requirements

PART II

1. Introduction
2. Basic Geologic Data Tests
3. Geomechanics Testing for Performance and Design Data
4. Hydrologic and Transport Phenomena Tests
5. Near-Field and Thermally Perturbed Tests

Appendix A      Glossary of Terms  
Appendix B      ESTP Cost and Schedule Estimates

PRIORITY DATA IDENTIFIED IN THE DRAFT ESTP AS NEEDED  
TO MEET 10 CFR 60 PERFORMANCE OBJECTIVES

POST CLOSURE

Hydrology Data

$q$  - Percolation Flux - Infiltration at Surface in Upper Bound

$\bar{n}_{eff}$  - Spatial Average of Effective Matrix Porosity

$k_s$  - Spatial Average of Saturated Hydraulic Conductivity

Geochemistry Data

$r_f$  - Effective retardation factor

$D$  - Diffusion Coefficient

Waste Package Data

$s$  - Solubility Limit

$A$  - Effective Water intercept area of waste package

Geology Data

$d$  - Thickness of each unit

$b$  - Mean aperture of fractures

PRE-CLOSURE

Geomechanical Data for Ambient and Post-Emplacement Conditions

NRC FORM 412  
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## TRIP REPORT

TO:  King Stablein	TRAVELER FROM BRANCH William Lilley Repository Projects Branch
PLACES VISITED SAIC office Las Vegas and Yucca Mountain on Nevada Test Site	DATES OF TRIP September 24-27, 1985
PERSONS CONTACTED Paul Prestholt - NRC  Mike Foley, Ed McCann, Monica Dussman, MaryLou Brown, Mike Glora, Barbara McKinnon William McKee and Lu Goulding - SAIC	
PURPOSE OF TRIP Review of the environment plans and meteorology monitoring network	
ACCOMPLISHMENTS 1. Review and discussed meteorology monitoring plan. 2. Review schedule of environmental studies. 3. Inspect meteorology monitoring stations. 4. Observed environment of the Yucca Mountain Site. 5. Opened communications with SAIC environmental staff.	
PROBLEMS ENCOUNTERED 1. Too little time to review all the environmental plans and reports.	
PENDING ACTIONS 1. Follow-up on USGS precipitation monitoring stations locations and equipment.	
RECOMMENDATIONS 1. When the meteorology network is fully operational the data should be tracked from the site through the data reduction including review of data sheets and audit sheets.	
SIGNATURE - TRAVELER <i>William Lilley</i>	DATE 12/3/85