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February 21, 1995

MEMORANDUM TO: Mysore Nataraja, Acting Section Leader
ENGB/DWM/NMSS

FROM: John S. Trapp for Raj
Geosciences/Geotechnical Engineering Section
ENGB/DWM/NMSS

SUBJECT: TRIP REPORT TO LAS VEGAS, NV, FEBRUARY 8-10, 1995
VISIT TO YUCCA MOUNTAIN AND DOE

On February 8, 1995, I visited the Yucca Mountain site and reviewed operations in the ESF tunnel. On February 9, 1995, I visited the DOE offices in Las Vegas to discuss an Appendix 7 issue related to the upcoming DOE expert elicitation on volcanic probability. The following provides the main observations that came as a result of this trip:

ESF Water Budget

Prior to going into the tunnel, I observed the weekly tunneling management meeting. During this meeting, it was pointed out that the water for underground construction has been limited, based on DOE directions. Construction water is all water that goes into the tunnel, however, a large amount of this water is used for dust suppression on the conveyor belt. As such, this water goes into the muck and is directly transported outside. In other words, while there is a report of construction water, which includes the water used to wash the walls for mapping, a large portion of this water does not stay underground. In order to have a true accounting of water that actually enters the underground, it would be necessary to install additional gauges, at least on the conveyor belt dust suppression system. In addition, the effects of ventilation also dry out the rock, and the net effect is probably a negative water budget for the underground. If the underground water budget is of concern, it will be necessary to both install additional gauges to break out the various uses of water, and monitor moisture content and volume of air that goes into and out of the underground.

ESF Mapping

With the installation of the mapping gantry, mapping operations are being conducted in accordance with the procedures which were first applied in the starter tunnel and have been formalized into the Underground Mapping Procedure NWM-USGS-GP-32. I was able to observe operations in the tunnel and later visited with S. Beason (USBR) to review some of the work in progress. Based on these observations and discussions it is my opinion that while conditions are not ideal, the quality of mapping is such that no significant geologic feature will be missed.

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In general, the overall quality of rock within the ESF appears somewhat consistent. In other words, while there are minor faults, slicks, and jointed/fractured rock mass throughout the ESF, the degree of disruption appeared more or less consistent in the area exposed. There were some hints of more extensive shearing at the very forward area I was allowed to examine, but nothing which really stood out. As the actual transition into the Bow Ridge Fault was still covered by the cutter head, this impression may change. It is of interest to note that the USBR mappers do not consider that they are in the Bow Ridge Fault until the actual main fault plane is encountered, whereas I would consider that a secondary zone of faulting extends for some distance outward from the first order fault plane. Their usage of terms is important to understand when considering stand-off, performance, or design for faults in association with DOE recommendations.

Underground mapping is being conducted under Study Plan 8.3.1.4.2.2. This study plan has been subjected to several audits, which were conducted with an NRC observer present. In addition, during many of the NRC/DOE field trips related to structural geology, the mapping in the started tunnel was observed while the work was in progress, and the final maps have been reviewed. In other words, the NRC has been able to review and comment on the procedures and quality of work being produced from both a technical and a quality assurance (QA) standpoint. All NRC observations, to date, on this mapping have been favorable. The only modifications to procedures that have been applied to mapping of the ESF have been the need to conduct the line survey slightly below the spring line and display the location of both the steel sets and lagging on the maps. While the amount of steel sets and lagging precludes most observations of the crown, the mapping procedures appear to be able to capture all major features encountered in the tunnel. From a geologic standpoint, while there has been some unavoidable loss in detail of the 3D fracture network, it is my opinion that no major features are being missed. In addition, the mappers are able to map and collect samples of the material filling fractures and describe the interrelationship of this material to the natural rock; therefore, it would appear that geochemical information is also being obtained. For both geology and geochemistry, the mappers are planning on removing some of the steel sets on an as-needed basis; as a result, in critical areas, means will be available to get more information. What needs to be considered is the possibility that the lagging will preclude observations of very small water inflows from the area of the crown. Substantial inflows would produce discoloration of the lagging and steel sets, whereas small inflows could evaporate behind the lagging preventing direct observation.

While the NRC is planning on performing in-field verification activities, the mapping operations have already been subjected to QA audits and technical review. It would seem that, as the procedures and documentation have been reviewed and documented, little extra could be gained by in-field verification of this activity at this time, and that in-field verification of other DOE activities may be a better expenditure of resources.

Drill Pad UZ-7A

I spent some time walking the area around the drill pad and the pavement area one valley to the north. According to the work of Spengler, et al., the Ghost Dance consists of four separate traces, and two of the main traces are exposed in the cut at the drill pad. The area between the traces is very highly brecciated, and if the conditions persist to depth, it would represent an area which would require extensive support in the underground. This is an exposure which should be viewed by the engineering personnel.

Of interest, is the relatively uncemented nature of the material. On the pavement, there appears to be a relatively extensive surface cementation. In the area of the drill pad, there appears to be some minor surface cementation, however, the cut shows almost no cementation. The general impression that I was left with is that if a similar cut had been made in the area of the pavement studies, the cement would have disappeared right below the surface. This would tend to be supported by observations in the area of the large block test, as the cement appears much less prevalent in the pits than at the surface, and from observations of the ESF tunnel, as the cement and fracture filling appears to be quite restricted.

The degree of cementation with depth provides important clues as to the nature of groundwater movement, and material transport, in the subsurface. It would be extremely informative to see if DOE could open a cut into the area of pavement studies to determine if the pad at UZ-7A is an anomaly or is what should be expected in these areas of faulting.

Pre-meeting on DOE Expert Elicitation Program (Appendix 7)

On the morning of February 9, 1995, C. Connor, B. Hill, and I met with J. Nesbit (DOE) and K. Coppersmith and R. Perman (Geomatrix Consultants, Inc.) to discuss the upcoming DOE exercise on expert elicitation of volcanic probabilities.

I opened the meeting by expressing general NRC concerns, specifically: 1) What procedures are in place to conduct this elicitation; 2) the relationship of this project to other projects, specifically activities such as those described under Study Plan 8.3.1.17.4.12, and; 3) the status of the data base upon which this, or any other decisions regrading volcanism, were to be made.

During the meeting, we got very little information regarding the DOE procedures for expert elicitation, in general, or procedures for this program in particular. I stated that if the results of this exercise were to be used in licensing, it had to be performed under a qualified QA program which necessitated that plans and procedures be in place. At the end of the meeting I announced that we would formally request these procedures.

The question about the relationship of this activity to study plan 8.3.1.17.4.12 was responded to by stating that they had all the preliminary information on tectonic models, and that nothing more was needed for this

exercise. I will point out that this is in conflict with statements contained within Study Plan 8.3.1.17.4.12.

When I questioned the available data base, I was told by J. Nesbit that, "We have agreed to disagree." I pointed out that we have numerous outstanding open items, and that much of the recent work by CNWRA provides specific data which documents that many of the DOE assumptions are erroneous. I stated that I was concerned that without providing the "experts" with a more complete understanding of the limitations of the data base that wrong conclusions could be drawn. I pointed out that it has been shown in many of these types of exercises that the outcome is dependent on both the way the questions are asked and the data that is given the experts. I requested that DOE provide us with a bibliographic listing of the information which was provided to the panel.

Following the opening discussions, K. Coppersmith provided an overview of the proposed program. Based on what was presented, we again questioned the exact procedures, the data which would be provided, and the selection and training of the experts. I again pointed out that if the NRC was to effectively participate, even as an observer, these procedures were necessary so that we could understand and comment on the entire process.

C. Connor then spent about 2 hours describing the various probability models which have been developed by CNWRA. One of the main points stressed was that the nonhomogeneous models show that the site is within the "Crater Flat Cluster", and that it lies in a steep probability gradient suggesting that any decision concerning the site would have a very large uncertainty. He was continuously questioned throughout the discussion by K. Coppersmith so that the assumptions and data needs of the various models could be understood and correctly portrayed to the panel. In addition to this presentation, CNWRA will be making a presentation at the second workshop on data needs and on clarification of model results using the CNWRA's models.

Following the meeting, I talked with Martha Pendelton (M&O) concerning the draft "Principles and Guidance" document on the use of expert judgment which is being prepared by DOE. This document is to be an umbrella document for all expert elicitation exercises that are to be conducted by DOE. While these principles are of a general nature, they do appear to provide a good basic framework and will need review by NRC upon completion. It is also of interest to note that the principles regarding selection of experts may have been violated with the selection of B. Crowe to the panel. In addition, as this is the overview document, it does not appear that the lower tier documents which provide the specifics on the procedures have been completed.

If you have any questions regarding this report, I may be contacted at 415 8063.

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