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NUCLEAR SYSTEMS SAFETY PROGRAM

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Mr. Michael E. Blackford
Project Officer, MS-623ss
Geotechnical Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJECT: Monthly Management Letter Report No. 15
Progress for the Month of June 1984
NRC FIN A0294
Technical Assistance in Seismo-Tectonic Impacts in Repositories

Dear Mr. Blackford:

1. PROGRAM OBJECTIVES AND DESCRIPTION

The description of the program objectives and specific tasks is henceforth deleted from the Monthly Management Letter Report at the direction of the NRC project management.

2. PROGRESS - JUNE 1984

BWIP

Robert A. Whitney participated in a weekend-long field trip to the BWIP site and its vicinity in March 1984. A draft field trip report was submitted for NRC comments on April 18, 1984. Incorporating the NRC comment, we submitted the final field trip report to NRC on June 25, 1984.

NNWSI

The Neogene and Quaternary volcanism and tectonism in the area surrounding the NNWSI site is of immediate interest. In our evaluation, we have come to the following conclusions:

The volcanism during the last eight to ten million years (MY) was predominantly basaltic and occurred in two general cycles: (1) older basalts spatially related to silicic volcanic centers and generally erupted during the waning stages of silicic volcanism (termed basalts of the silicic cycle), and (2) younger basalts postdating the silicic volcanic cycle and spatially unrelated to silicic volcanic centers (termed rift basalts).

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Eruption of the rift basalts has been the only type of volcanic activity recognized within the Site Vicinity during the last 6 to 8 MY. Such basalts have a number of distinctive characteristics. Their rates of activity (measured in cone counts for a specified area and time period) have been consistently low. Eruptive centers are scattered at a number of sites and were active during discrete pulses that were short in duration. Volumes of erupted material were small, and the centers were monogenetic and short-lived. There was a hiatus in basaltic activity during the period 6 to 4 MY ago. There has been no volcanic activity in the Candidate Area for the last 200,000 to 300,000 years (Crowe and Carr, 1980; Sinnock and Esterling, 1983).

The predominant type of basalt center in the Candidate Area consists of small scoria cones flanked by flows. Scoria fall sheets that may have originally surrounded and extended downwind of the cones are inferred to have been removed by erosion. The eruptive style, by analogy to modern eruptions, was Strombolian and the activity typically followed distinct sequences through the duration of an eruption. Phreatomagmatic activity (pyroclastic surge), recorded in the pyroclastic deposits of three centers, is unlikely to occur at the Site due to a combination of deep groundwater, steep drainage, and low flow rates of water in the unsaturated zone.

Basaltic volcanism became the dominant type of volcanic activity in the Great Basin approximately 8 to 10 MY ago. The regional distribution of basaltic rocks younger than 10 MY old within the southern Great Basin of Nevada and California defines two volcanic belts or subprovinces: (1) a zone of Quaternary basalt and local silicic centers concentrated along the southwestern margin of the Great Basin; and (2) a somewhat diffuse but generally continuous belt of Pliocene and younger volcanic activity extending from southern Death Valley north-northeastward through the Candidate Area to central Nevada (Crowe, et al., 1980). The second subprovince is referred to as the Death Valley-Pancake Range belt.

Rates of basaltic activity in the Death Valley-Pancake Range belt have remained constant but generally low. This is illustrated by the distribution of areas of activity within the belt during specified periods of late Cenozoic time. For example, sites of Quaternary activity (less than 2.0 MY old) include the basalt of southern Death Valley, scattered basalt centers in southern Nye County (basalts of Crater Flat and Sleeping Butte), and the basalt of the Lunar Crater volcanic field within the Pancake Range. Areas active during the period 2 to 4 MY ago include the northern part of the Greenwater Range, the older cycle of the basalt of Crater Flat, the basalt of Buckboard Mesa, and the southern part of the Lunar Crater volcanic field. This pattern of diffuse and infrequent volcanic activity is consistent for the complete history of the Death Valley-Pancake Range belt. Thus, the belt is a distinct volcano-tectonic feature within the southern Great Basin characterized by continued basaltic volcanism at low rates along its length during late Cenozoic time.

The tectonic setting of major volcanic fields in the southern Great Basin and the detailed setting of eruptive centers within individual fields have been examined to determine the structural controls of volcanism. Several structural associations can be made on a regional basis, but their exact relation to the origins of the volcanic subprovinces is not known.

First, many of the zones of volcanic activity in the southern Great Basin are associated with combined extensional right-slip faulting within the Walker Lane structural belt.

Second, the Death Valley-Pancake Range belt is elongated in a north-northeast direction which is perpendicular to the least principal horizontal compressive stress axis in the southern Great Basin. The belt parallels one of the major sets of Basin and Range faults at the Site.

Third, the volcanic belt is adjacent and subparallel to an axis of symmetry in the long-wavelength anomalies of the regional Bouger gravity field (Figure 3-26), a major geophysical feature of the southern Great Basin. The favored interpretation of this feature is that it signifies the rise and divergent flow of hot asthenospheric mantle (Eaton, et al., 1978). The symmetry axis of the gravity field is interrupted near the middle of the Candidate Area by an east-trending gravity gradient.

Finally, the belt is parallel to, but located east of, the western boundary of Precambrian crystalline rocks in western North America. The western boundary of Precambrian crystalline rocks is inferred on the basis of exposures of Precambrian rocks and strontium isotopic studies of younger granitic rocks (Kistler and Peterman, 1978). More recent work using combined neodymium and strontium isotope data suggests that the basement edge may be located farther east, in central Nevada. These limited data suggest an association between the location of the volcanic belt and the western edge of crystalline basement rocks. Thus, there may be an association between volcanism in the Death Valley-Pancake Range belt and upper mantle and plate tectonic processes of the western margin of the North American plate.

Our evaluation of the Neogene and Quaternary volcanism and tectonism in the area surrounding the NNWSI site is a very important subject to be continued in future months. We have established close working relationships with scientists working in this area, particularly with a team headed by Dr. Bruce M. Crowe and Dr. Wil J. Carr (of the U. S. Geological Survey).

SALT

During this reporting period, we have received several different "draft" versions of Environmental Assessment (EA) reports on various salt sites. From these draft EA's, we noted for our future work the following chapters:

Chapter 3: General Site Description

Chapter 4: Site Characterization Activities and Effects of Such Activities

Chapter 5: Environmental Effects of the Repository

Chapter 6: Suitability of the Site Against the Guidelines.

THe NRC project management has not given us task orders to perform our evaluation of these draft EA's.

3. PLANS FOR NEXT MONTH

The NRC project management informed us that there has been a change of the NRC Project Manager (PM). Effective 18 June 1984, Mr. Michael Blackford, Seismologist, was named the NRC/PM. The NRC/PM called for a project coordination meeting at Silver Spring, MD. This meeting has been scheduled for Friday, July 6th, at 0900 hours. "Draft EA" reports on various salt sites as well as the NNWSI site are now on hand. In future months, we will study these reports and our evaluation of these reports will be sumitted to the NRC.

4. ESTIMATED PROJECT FINANCIAL STATUS

To be submitted separately.

5. LIST OF CONSULTANTS/SUBCONTRACTORS

D. Burton Slemmons, Consulting Geologist (Subcontractor).

For the reporting period, no direct contributions were made by Dr. Slemmons and his assistants.

6. PROJECT CONCERNS

None.

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Project Manager

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