

OCT 25 1988

VOLTRIP

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MEMORANDUM FOR: Ronald Ballard, Chief
Geosciences & Systems Performance Branch, HLWM

THROUGH: Phillip Justus, Section Leader
Geology-Geophysics Section
Geoscience & Systems Performance Branch, HLWM

FROM: Charlotte Abrams, Geologist
Geology-Geophysics Section
Geosciences & Systems Performance Branch, HLWM

SUBJECT: TRIP REPORT - ATTENDANCE AT TRAINING COURSE ON VOLCANISM
AND RELATED HYDROTHERMAL MINERALIZATION AND MEETING WITH
NEVADA BUREAU OF MINES AND GEOLOGY INVESTIGATOR

INTRODUCTION AND PURPOSE

From September 18 to 23, 1988, I attended a short course on volcanism and related hydrothermal mineralization presented by the University of Nevada-Reno's Mackay School of Mines and followed that short course with a day long meeting at the Nevada Bureau of Mines and Geology. The purpose for attending the course was to receive additional training related to the volcanism, volcanic stratigraphy and hydrothermally associated mineral resources potential of southern Nevada and the area of the proposed Yucca Mountain HLW repository site. This training should prove to be invaluable in the assessment and identification of volcanic hazards at the proposed site. The purpose of the visit to the offices of the Nevada Bureau of Mines and Geology was to examine recently flown low-sun angle aerial photography of the Yucca Mountain area and to discuss fault-related features identified on those photographs by State of Nevada investigator, Alan Ramelli.

SEPTEMBER 18-23, 1988, ATTENDANCE AT TRAINING COURSE

The short course was held in Tonopah, Nevada. Speakers and instructors included Donald Noble, University of Nevada, Reno; Harold Bonham, Nevada Bureau of Mines and Geology; Jonathan Price, Nevada State Geologist and Head of Nevada Bureau of Mines and Geology; Steve Weiss, University of Nevada, Reno; Eugene Smith, University of Nevada, Las Vegas; and Richard Sillitoe, International consultant and expert on volcanic ore systems. The course included two full and two half classroom days and two half and one full day of instruction and observation in the field.

Topics of discussion included types of volcanic deposits and their recognition, methods of volcanic eruption and transport, compositional variations and features within individual flows, volcanic hazards, and types of mineralization related to volcanic environments. Of particular interest were lectures on the uses of paleomagnetic data and K-Ar age-dating methods in volcanic rocks.

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Because of rapid cooling, paleomagnetic data is useful in the study of volcanic rocks to provide both stratigraphic and tectonic information. Three sites have been selected from drill core at Yucca Mountain for paleomagnetic examination. The presentation by Don Noble on the topic of dating volcanic rocks by K-Ar method described the benefits, problems, and limitations involved with K-Ar dating. While Noble did state that there are difficulties and uncertainties in K-Ar ages in young rocks, he was optimistic about results of K-Ar dating in felsic volcanic rocks.

Field instruction was in the areas of Tonopah and Goldfield, NV, and in Long Valley, CA. In the Tonopah and Goldfield areas course participants observed the relationship of the mineral deposits to the volcanic caldera stratigraphy of the area and examined the various types of post-volcanic eruption alteration associated with the areas visited. In Long Valley the course participants observed very recent volcanics with an emphasis on recognition of flow sheets versus falls, vertical variations in single and multiple cooling units, vapor phase mineralization, and various macroscopic internal features of volcanic rocks.

The course was well organized and lecturers were knowledgeable and varied in their areas of expertise. Lectures and field instruction included both recent information and a good review of volcanic related principles in an excellent outdoor classroom.

SEPTEMBER 26, 1988, VISIT TO NEVADA BUREAU OF MINES AND GEOLOGY OFFICES

Following the short course a day was spent at the offices of the Nevada Bureau of Mines and Geology looking at low sun-angle aerial photography with State of Nevada project investigator, Alan Ramelli. Earlier this year the area surrounding and at Yucca Mountain was flown by a State of Nevada contractor for low sun-angle photography at a scale of 1:12,000 feet. In addition, areas of known faults at the proposed repository site were flown at a scale of 1:6,000 feet. State investigators Alan Ramelli, John Bell, and Craig DePolo have been examining this photography for evidence of recent faulting. A recent abstract of a paper on that work by those authors to be presented at the Geological Society of America in Denver in October, 1988, is attached.

Due to time limitations I examined in a cursory fashion only a small portion of the total 1,200+ photographs. With Alan Ramelli's guidance to photographs with significant features I concentrated predominantly on photographs of the Solitario Canyon/Windy Wash/Fatigue Wash fault zone area, the area of the Stagecoach Road fault, and the Exile Hill area. In the Solitario Canyon/Windy Wash/Fatigue Wash area (eastern Crater Flat) photographs showed what appeared to be segmented, young fault scarps along an area of known faults. To the south in Crater Flat 3 my basalt flows appear to be dissected by faults. Of particular interest was an impressive abrupt vegetation change along a portion of the Stagecoach Road fault which may define a younger scarp. This scarp

must be checked in the field or "ground truthed" before any conclusion as to whether it represents a fault can or cannot be made. In western Jackass Flats photographs show two areas of possible ponding that may result due to ponding adjacent to a scarp.

After detailed examination of the photographs by State of Nevada project investigators many areas will have to be field checked by project investigators to verify the presence or absence of fault-related features. Field checks are already planned by state of NV investigators. Some recommendations may later be made to trench in some locations to verify or study possible recent faults. State of Nevada project investigators may make such recommendations to the DOE. In addition, the State has supplied USGS project investigators with copies of the photography which will enable those USGS geologists to make their own assessments of the site and surroundings based on low sun-angle photography.

ADDITIONAL INFORMATION AND RECOMMENDATIONS

Project investigators from both the State of Nevada and DOE contractors participated in the short course. Discussions with Steven Beason, Bureau of Reclamation, and Jonathan Price, State Geologist of Nevada were of particular interest. Steven Beason has worked on the prototype wall mapping project in G tunnel and was anxious to discuss the positive results his group has obtained with respect to the photographing and mapping system designed to be employed in the exploratory shaft. Jonathan Price has recently been made head of the Nevada Bureau of Mines and Geology and stated to me that in that role he wishes to see that agency take a more proactive role in the repository process. Tom Cardone, on a recent trip to the site, has followed-up on discussions with Beason (see Cardone Trip Report, October 18, 1988). NRC technical staff should endeavor to remain aware of the site related activities of Price and his staff by maintaining contact with State of NV technical investigators through field interactions, meetings (site specific and professional), and telephone conversations.

Information on particular photographs to "key in" upon has been transmitted to Larry McKague, LLNL, one of several persons now examining the low-sun angle photography for this agency. A report of the results of their examination of the photographs is forthcoming. Copies of their report should be sent to Alan Ramelli of the State of Nevada, the DOE project office, and John Whitney of the U.S. Geological Survey.


Charlotte Abrams, Geologist
Geology-Geophysic Section
Geosciences & Systems Performance Branch, HLWM

Enclosure: as stated

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ABSTRACT FORM FOR ALL GSA MEETINGS IN 1988

Complete sections 1 through 7 below

1 TYPE ABSTRACT within blue lines — they're absolute! Mail flat, reinforced.

No 27231

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EVIDENCE FOR DISTRIBUTIVE FAULTING AT YUCCA MOUNTAIN, NEVADA

RAMELLI, Alan R., BELL, John W., and DEPOLO, Craig M.;

Nevada Bureau Mines & Geol., Univ. of Nevada-Reno, 89557 Yucca Mt. is the sole site being considered for underground storage of the nation's high-level nuclear waste. Low-sun-angle aerial photography indicates more widespread recent faulting than previously believed and suggests similar histories for the principal faults. Differing offsets of surfaces along the Solitario Canyon fault indicate multiple late Quaternary events; small vertical displacement (about 20 cm) of the youngest faulted surface suggests Holocene activity, similar to age-estimates from the Windy Wash fault (Whitney and others, 1986). Morphology of the Windy Wash scarp as defined on low-sun-angle photography supports the interpretation of a small Holocene displacement superimposed on a compound Quaternary scarp. Scarps along the Bow Ridge fault and at Busted Butte indicate more extensive and recent faulting than previous interpretations (e.g. Swadley and others, 1984). Morphology of the Fatigue Wash fault, which has received relatively little attention, indicates activity similar to the other principal faults in this area.

Complex seismic events involving several faults may be more characteristic of faulting at Yucca Mt. than simple, single-fault ruptures. Close spacing (<2 km) of Quaternary faults with similar morphology and the presence of basaltic ash from a local source in narrow fault fractures suggest the possibility of complex, large magnitude events. Such events would involve rifting and dike intrusion in the lower- to mid-crust and distributive rupture across several faults in the upper-crust and at the surface. Evidence of Holocene or latest-most Pleistocene ages of faulting and basaltic volcanism suggest such an event may be reasonably possible over the next 10,000 years.

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- 1 Diagenesis of lacustrine rocks
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6 SPEAKER'S IDENTITY AND MAILING ADDRESS

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