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MEMORANDUM FOR:

Malcolm R. Knapp, Chief
WMGT

FROM:

Philip S. Justus, Section Leader
Geology-Geophysics Section, WMGTJose Valdes
Geology-Geophysics Section, WMGTKristin Westbrook
Geology-Geophysics Section, WMGT

SUBJECT:

TRIP REPORT OF THE VISIT TO AMBROSIA LAKE, NEW MEXICO,
TUBA CITY, ARIZONA, MONUMENT VALLEY, ARIZONA, MEXICAN
HAT, UTAH, AND SHIPROCK, NEW MEXICO UMTRAP SITES,
MAY 6-9, 1985.

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The objectives of this trip were: to 1) to visit the four Title I sites for which NRC expects to receive draft environmental assessments and remedial action plans during the fall of 1985, and 2) observe construction activities at the Shiprock, NM site. The four new sites are Ambrosia Lake, NM, Tuba City, AZ, Monument Valley, AZ, and Mexican Hat, UT. DOE has designated these as "accelerated" sites. A list of trip attendees is included as Attachment 1.

May 6, DOE Headquarters, Albuquerque, NM A briefing on the general geologic and hydrologic conditions at the sites to be visited was given at the Albuquerque offices of Jacobs Engineering, DOE Technical Assistance Contractor (TAC). An agenda is included as Attachment 2. A guide book was issued to each attendee. Presentations were made by Dave Betsill, DOE TAC hydrologist and Brian Hobbs, DOE TAC geologist. Kathy Carlson, Deputy DOE UMTRA Project Manager, emphasized the need for active NRC-DOE staff interactions during early site characterization, prior to the preparation and review of Remedial Action Plans and NEPA documents (Environmental Assessments and/or Environmental Impact Statements). The current NRC-DOE site tour provided good opportunities to initiate this process. An important outcome of this briefing was the recognition by DOE (K. Carlson) that early and on-going communication between TAC staff and NRC reviewers would facilitate the review process.

May 6, Ambrosia Lake site, NM The site is located in the Ambrosia Lake Valley approximately 20 mi north of Grants, New Mexico. The valley is bordered on the north by San Mateo Mesa (7,100 ft elevation) and on the southwest by Mesa Montanosa (7,300 ft elevation). The site lies on the pediment/bajada that slopes southwestward from the base of San Mateo Mesa. The underlying Mancos

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Shale bedrock dips gently to the northeast, opposite to the direction of surface drainage. At the May 6 briefing on the Ambrosia Lake site, Mr. Gary Parker mentioned planned seismic monitoring, planned holes and test pits, and plans to get boring logs for nearby mines from mining companies. Many boxes of labelled cores are stored in the abandoned mill buildings and could perhaps be used as additional sources of subsurface information. It was stated by Jacobs that logs of these cores are available for review.

Brian Hobbs, DOE TAC geologist, guided NRC geologic personnel around the pile and answered questions about the geology and status of geologic characterization work at the site. In general, Hobbs indicated that no site-specific geologic work has been undertaken at the Ambrosia Lake site. NRC staff inquired about the potential activity of various normal faults, some with reported displacements of 100 ft or more, occurring within a few miles of the site (N.M. Bureau of Mines and Mineral Resources, Memoir 38, 1980, p. 313-319, 1980). A geologic map compiled by Hobbs also shows a number of concealed normal faults in close proximity to the site. Hobbs indicated that though he suspects these faults are not "active," they have not yet been studied. Inspection of "monthly advance" maps found at the millsite for the mine workings in section 27, T.14N., R.9.W (approximately 1-2 mi east of the site) revealed the presence of normal fault zones, that appear to have been avoided during development of the mine. Such features would need to be considered for long-term stability analysis and groundwater flow analysis.

NRC personnel also inquired about the possibility of subsidence at the site given the presence of abandoned subsurface mine workings. Hobbs stated that, on the basis of the plots of the underground workings that have been compiled up to the present, it appears that only one corner of the pile would have to be moved due to potential subsidence hazards. It appears, however, that the TAC's information about the extent and location of the underground cavities is currently incomplete. A surface depression was evident adjacent to the southwestern corner of the pile that is apparently due to collapse of underground workings.

Reports about faults and their closely-spaced normal-slip characteristics described from mines in the area were briefly discussed. NRC questions about the possible relationship of nearby faults to assessment of seismic stability and of groundwater flow were deferred to a latter time when site characterization will be further along. Bruce Kennedy (Jacobs Engr.), who worked as a mining engineer for the last ten years in nearby mines, remembers three large earthquakes in those 10 years that caused underground collapse, but apparently no surface offsets.

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We agree with Mr. Hobbs that these geological matters should continue to be pursued:

- a) subsurface geology and correlations of geophysical data;
- b) extent and age of faulting in the vicinity of the pile.

However, we are not in a position to agree that geomorphic hazards are not of much concern at this site.

The presence of numerous mine vent holes in the area and allegedly under the pile, presence of extensive underground mine workings, evidence of surface subsidence adjacent to the existing pile, reported occurrence of recent seismicity that had some impact on underground openings, and reports of closely-spaced faults in mines in the vicinity of the site, all appear to be appropriate concerns for focusing site characterization plans and activities at the Ambrosia Lake site.

May 7, Tuba City site, AZ. The site is located approximately 5 mi east of Tuba City, Arizona, on a gently sloping area that drains into Moenkopi Wash, 1.5 mi to the south. The tailings are reported to rest on loose sand derived by eolian erosion of the Navajo Sandstone bedrock. The Kayenta Formation (a silty mudstone-sandstone unit) underlies the Navajo Sandstone.

Dave Betsill, DOE TAC hydrologist, guided the NRC geologic staff around the site and surrounding areas. The staff was taken to within a few hundred yards of Greasewood Lake, the candidate source area for radon cover material for the pile. Located approximately one mile northeast of the pile, Greasewood Lake appeared as a dry, closed drainage topographic feature filled with apparently sandy-silty sediments. The origin of the feature was reported to be in doubt, and it may represent a playa lake, sand blowout, or pipe breccia-related depression.

Outcropping of Navajo and Kayenta rocks several miles southeast of the site, near Moenkopi Wash, were visited. A large number of parallel joints at least 15-20 feet long were visible on a flat erosional surface on the Kayenta Formation. The reported Navajo-Kayenta contact trace is characterized by the presence of springs, indicated by vegetation growth.

Locally, Moenkopi Wash and its tributaries are well-incised streams.

May 8, Monument Valley site, AZ. The site is located in Cane Valley, immediately to the east of Monument Valley, approximately 5 mi south of the Arizona-Utah border. Cane Valley is a strike-valley developed on shale members

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of the Chinle Formation. The valley is bordered on the west by cuestras of the Shinarump Member of the Chinle Formation and on the east by Comb Ridge, a hogback of resistant Triassic-Jurassic sandstones associated with the Comb monocline.

Paul Darr, DOE TAC geologist, accompanied the NRC geologic staff around the site and adjacent regions. A source area of Honaker Trail limestone for potential rip-rap use was visited. Given that the exposed limestone joint-blocks were fissile parallel to bedding, the suitability of these rocks for rip-rap was not apparent. The abandoned open pit uranium mines west of the site were also visited. It was suggested by Mr. Darr that these mined areas might provide a suitable site for relocating the tailings. Geomorphic stability problems at the current site include those resulting from the fact that the pile is directly in the path of a channel originating on the western side of the valley.

Discussions between Mr. Darr and NRC staff concerning DOE's approach to geologic site characterization indicated that field geology is not a principal method used nor is field geology apparently integrated with hydrology investigations. The basic approach is to synthesize the site geology from literature searches. NRC observed that photogeologic and ground reconnaissance methodology is apparently not uniformly or systematically applied at UMTRAP sites to look for potentially active faults that may impact on the future seismic stability of a site. NRC also observed that the scope and methods of geomorphic characterization at UMTRAP sites do not appear to be well defined.

May 8, Mexican Hat site, UT. The site is located approximately 1 mi southwest of the town of Mexican Hat, Utah, in a wash area that drains toward the north into the San Juan River. The tailings directly overlie outcrops of the Halgaito siltstone Tongue of the Cutler Formation. These strata dip eastward toward the axis of the Mexican Hat syncline.

Paul Darr accompanied the NRC geologic staff to the site. The unnamed wash originating near the northeastern part of the lower tailings pile presents significant geomorphic stability problems for the site. Outcroppings of the Halgaito along the bottom of this wash downgradient from the site reveal the presence of extensive jointing in this unit. David Betsill, hydrologist, inferred that fracture flow of groundwater is important at this site based on preliminary observation of higher water recovery occurring in zones of high fracture density. He indicated that there are artesian systems at depths of 100 and 200 feet. Oil and hydrogen sulfide were discovered in a lower elevation well. He indicated that geologic understanding of the site is in an early phase.

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May 9, Shiprock site, NM. The Shiprock site is located approximately 1 mi south of the town of Shiprock, New Mexico. The tailings and millsite are situated on a stream terrace adjacent to the southwest bank of the San Juan River. Terrace alluvium as much as 10 ft thick overlies the Mancos Shale, which forms the base of the terrace. Remedial action activities underway at Shiprock were observed. An exploration trench in the terrace alluvium several hundred yards from the pile was observed. Gravel and cobble layers near the base of the trench, about 12 feet below the surface, had been sampled and tested and found suitable for the proposed erosion-protection cover. However, apparently it was not clear what environmental or physical impact on the site, if any, quarrying of the terrace gravels and cobbles might have. The lateral and vertical extent and depth of the target layers was not indicated.

Open issues relating to the seismotectonic stability of the site were discussed with Leon Stepp, DOE TAC Project Manager for Shiprock. T.R. Wathen, of the DOE Remedial Action Contractor (RAC), had earlier provided the NRC geologic personnel with discussion documents presenting the RAC's view on the seismic issues at Shiprock and also of the RAC's preliminary position on generic seismic characterization at UMTRAP sites. Follow-up discussions on the subjects of seismotectonic stability and seismic hazard analysis in the near future are anticipated.

At this last site, P. Justus summarized the open items in geology that developed on the trip and reviewed them with D. Dubois who had been designated by DOE to record such items:

- a) What is DOE's seismic hazard analysis approach?
- b) What is the role of geology in DOE's site characterization program?
- c) What mechanism for early identification of geological issues and site information needs, such as those developed on this trip, is appropriate?

SUMMARY OF OBSERVATIONS/OPEN ITEMS

In addition to the open items above, generic and site-specific geological concerns were raised by NRC staff on this trip, as follows:

- a) Decisions were being made by DOE to locate monitoring wells and to develop stabilization plans and pile configurations when, in our opinion, the level of understanding of the subsurface geology and long-term tectonic and geomorphic hazards was admitted to be poor because site characterization was in a very early state. DOE and NRC need to discuss how characterization, monitoring and design activities should be coordinated.

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- b) At least two different seismic hazard analysis approaches appear to be under development within the DOE program. DOE should explain its present approach or approaches to SHA to NRC for thorough reviews.
- c) NRC observed that site-specific geologic field investigations are apparently not routinely or systematically conducted. DOE should clarify its generic program of geologic site characterization.
- d) Stratigraphic analysis, geomorphic hazard analysis, active fault identification, seismic hazard analysis and hydrogeologic analysis of sites are conducted by different teams in the DOE organization and the logic and nature of their sequencing and integration were not readily apparent.
- e) Lists or bibliographies of available site data such as core logs, mine reports and mine maps, aerial photograph indices of the sites, and contractor reports on geologic investigations are not compiled.
- f) It was not clear how the level of geologic detail being investigated would later be used to demonstrate compliance with the EPA standard on long-term stability, as needed, in part, to obtain a license.

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Attachment 1

CUMULATIVE LIST OF ATTENDEES

NRC-DOE UMTRAP SITE TOUR

MAY 6-9, 1985

<u>NRC</u>	<u>DOE</u>	<u>TAC</u>	<u>RAC</u>
Gillen	Bosiljevac	Betsill	Oldtham
Haisfield	Carlson	Darr	Wathen
Larson	Evans	Dubois	
Jagganath	Garcia	Kennedy	
Johnson		Mason	
Justus		Mulford	
Smykowski		Parker	
Valdes		Reis	
Weber		Stepp	
Westbrook			

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NRC UMTRA SITE BRIEFING

MAY 6, 1985

8:30am Introductions - Carlson

8:45am Health and Safety - Schoenfelder

Site Characterization (Geology and Hydrology)

9:15 AMB (Ambrosia Lake)

9:30 TUB (Tuba City)

9:45 HAT (Mexican Hat)

10:00 MON (Monument Valley)

10:15 SHP (Shiprock)

10:30 Leave for Ambrosia Lake Site -