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James R. Anderson, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87115

Dear Mr. Anderson:

Enclosed are NRC Staff comments on the Draft Remedial Action Plan and Site Conceptual Design for Stabilization of the Inactive Uranium Mill Tailings Site at Spook, Wyoming. No fatal flaws were identified at this stage, however, clarification is needed as to the interface between the AML and UMTRCA program designs to assure that the UMTRCA requirements will be met.

The staff were unable to comment on the ground-water aspects of the draft RAP prior to review of the draft Environmental Assessment, which is scheduled for review in November. Ground-water comments on the draft RAP will therefore be transmitted with staff comments on the draft EA.

Please contact Susan Bilhorn at FTS 427-4145 if you have any questions regarding the Staff's comments.

Sincerely,

Paul H. Lohaus, Acting Chief
Operations Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

Enclosure:
As stated

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NRC STAFF COMMENTS ON THE
DRAFT REMEDIAL ACTION PLAN FOR SPOOK, WYOMING

GENERAL

Comment: GEN/1 - Integration of UMTRCA and AML Activities

NRC Staff are concerned regarding the affect AML program activities may have on the ability of proposed remedial action for Spook to meet UMTRA requirements. While the draft RAP refers to the AML design, it is not clear what aspects of the AML design will be relied on to meet UMTRA requirements, or that adverse impacts have been evaluated and considered in DOE's design.

DOE needs to describe the relationship between the UMTRCA and AML program designs and address the following questions:

- QA/QC. How does DOE plan to assure that the AML activities are conducted as specified in the design, and not adversely impact the stabilized tailings pile?

- Low- and high-permeability layers. How will the interface between the low- and high-permeability layers be constructed to ensure that there is a path for water collected in the high-permeability layer will flow away from the tailings? How will DOE assure that placement of the high-permeability layer does not adversely affect the stabilized pile or low-permeability layer? What advantage does DOE plan to derive from the high-permeability layer, if any?

- Backfill of mine tunnels. Which program is responsible for backfilling the mine tunnels and what impacts (positive or negative) could that action have on long-term stability of the tailings pile and ground-water protection?

- Overburden material. What benefit does DOE plan to derive from the proposed AML backfill cover (i.e. radon diffusion and/or erosion protection)? Since AML is responsible for conducting this activity, how does DOE plan to assure that the backfill cover will be placed as designed? Has the concentration of radium in the cover material been considered in calculating the radon flux for design of the radon barrier?

GEOLOGY

Comment: GS/1 - Site Erosion By Tributary Headcutting, pages D-36 and D-37

This section of the draft RAP and Figure D.3.11 depict headcutting by tributaries which would lead to erosion of the stabilized tailings. The staff agree that lateral erosion and headcutting by tributaries of Dry Fork appear to be the only significant geomorphic hazards associated with the pit-disposal option. In the staff's opinion, however, DOE's predictions of future erosion do not appear to be based on conservative assumptions and analyses.

Figure D.3.11 shows a model of future channel headcutting into the disposal area from the site's main wash. The analysis assumes that the channel will naturally adopt a slope similar to that of the soil-bedrock contact, approximately 0.076. As a result, it shows that erosion in the main wash would need to exceed 50 feet to expose the tailings. In addition, DOE states that resistance of the Wasatch Formation is likely to prevent erosion beyond a 35 to 40 foot depth.

The slope gradient of 0.076 is extremely steep for a channel and no justification has been provided to show that it is reasonable. Staff analysis indicates that a more shallow slope, such as 0.030, would expose the tailings with only 21 feet of downcutting in the main wash. Lateral and vertical erosion will occure entirely in backfill, will not be controlled by bedrock, and will likely result in release of the tailings earlier than anticipated from DOE's analysis.

DOE should revise the erosion protection analysis for this site using more conservative assumptions, or should justify the adequacy of the current analysis.

SURFACE WATER HYDROLOGY

Comment: SW/1 - Stabilization of Abandoned Mined Lands Cover

The intent of the remedial action and AML design, as presented in the draft RAP (pages 60-67), is to promote positive drainage from the cover in order to prevent ponding and limit the amount of infiltration into the tailings. The cover design, as presented in "Report of Investigation, Abandoned Mined Lands Program 15-3" (Hydro-Engineering, 1987), includes a vegetated earth cover surrounded by diversion ditches. The staff does not consider the proposed cover adequate to minimize erosion, ponding, and infiltration. Furthermore, we conclude that DOE has not demonstrated the effectiveness of the design for 1000 years with respect to stability and ground-water quality.

First, the ditches for diversion of flood flows around the pit are designed for 2.4 inches of precipitation in one hour, which is purported to be a 1000-year event. This value is apparently based on extrapolation of the precipitation data base for Wyoming, however, it is extremely doubtful that this data base is sufficient to perform the extrapolations necessary to determine a meaningful 1000-year event. In addition, it appears unlikely that the estimate actually represent a 1000-year event, based on comparison of the one-hour, 1000-year rainfall (2.4 inches) to the one-hour probable maximum precipitation (PMP), which is approximately 14 inches (see Hydrometeorological Report (HMR) 55, Plate 16). Therefore, it appears that a value much larger than 2.4 inches should be adopted as the design rainfall.

Second, the proposed soil cover is to be protected only by vegetation. Since a vegetative cover is unlikely to be self-sustaining in the arid climate of Wyoming, the staff questions whether such a cover can prevent gullying due to concentration of runoff during major precipitation events. The sheet flow assumption used in this design is likely to be invalid if flow concentration occurs. Gullying will likely disrupt the cover, possibly allowing ponding, erosion, and increased infiltration in areas directly above the tailings.

DOE should provide a revised cover design and should justify that the design meets the EPA criteria established in 40 CFR 192. Factors that DOE needs to thoroughly address include the impacts of extreme flood events on the cover and ditches; the potential for flooding, if ditches fail; the impacts of gully growth on the integrity of the tailings pile; and the impacts of increased infiltration on ground water. A rock cover and rock-protected diversion channels, designed in accordance with past UMTRA practice, may provide an acceptable approach.

REFERENCE CITED

Hydro-Engineering, 1987. Report of Investigation for Abandoned Mine Land Program 15-3, Spook Site, prepared by Hydro-Engineering, Casper, Wyoming for the State of Wyoming, Department of Environmental Quality.

GEOTECHNICAL ENGINEERING

Comment: GT/1 - Constructability of Low-Permeability Cover, pages 70 -73

In the draft RAP, DOE proposes to stabilize the tailings in a pile approximately 30 to 50 feet high with a side slope of 50 percent gradient (2 horizontal to 1 vertical). This pile will be covered with a 1.5 feet thick layer of low-permeability material. In order to achieve the desired permeability, DOE proposes to compact this cover material to a minimum dry density 95 percent of the maximum dry density determined using the ASTM D 698 test method. NRC staff is concerned regarding constructability of the proposed low-permeability layer.

DOE should evaluate the potential problems associated with placing the material in 6 or 8 inches thick layer, operating the compaction equipment on a 50 percent slope, and compacting the material to attain the coefficient of permeability value assumed in the design.

Comment: GT/2 - Low-Permeability Cover Material, page 73

This section of the draft RAP states that the alluvial soil (clayey Sand) available in the overburden piles at the site will be used for the low-permeability cover. There is very little data, other than sieve analysis data, to support the draft RAP statements on the expected coefficient of permeability for this material. In addition, the draft RAP states that the low-permeability cover over the stabilized pile will have a maximum coefficient of permeability of 1E-7 cm/sec. However, the Hydro-Engineering report on work proposed by AML indicates that the low-permeability cover material is expected to have a coefficient of permeability of 1E-6 cm/sec (Hydro-Engineering, page 5-12)

DOE needs to determine the actual coefficient of permeability for this material, based on appropriate laboratory and field testing, and justify the assumptions used for the design of the low-permeability cover.

Comment: GT/3 - Slope Stability Evaluation, Pages 68 and 69

For the evaluation of slope stability, most design parameters were assigned, and conservatism of these values demonstrated, using a parametric analysis. This was noted in #SPK-06-87-03-01-00 (page 1 - 3) of the calculations provided by DOE in support of the draft RAP. Although this approach is acceptable at the draft RAP phase, these design parameters will need to be supported by test data to assure that they are adequate when used in the preliminary design.

Comment: GT/4 - Seismic Stability, pages 64 and 65

The draft RAP states that the seismic coefficient of 0.09 was assumed in evaluation of seismic slope stability, performed using the pseudo static method of analysis. However, a minimum seismic coefficient of 0.1 is recommended in the TAD (DOE, 1986, page 67). In addition, the seismic coefficient of 0.09 was calculated based on a maximum peak horizontal acceleration (PHA) of 0.16g (draft RAP, Vol. 2, pg. D-42), while the calculations provided in support of the draft RAP assume a seismic coefficient of 0.105 based on a PHA of 0.21g (stability calculations, page 2 of 16).

DOE should explain why a seismic coefficient has been assumed that is less conservative then that recommended in the TAD. Also the discrepancy between the PHA and seismic stability values presented in the draft RAP and supporting calculations needs to be resolved.

Comment: GT/5 Stability of the East Pit Wall, Figure 4.2, pages 70 and 81

The draft RAP does not address the sequence of moving the tailings material from the east wall of the Spook pit. The stability of the pit wall should be evaluated, especially if DOE plans to remove the tailings from the foot of the wall (i.e. material inside the pit adjoining the east wall) while the tailings remain on the top of the east wall bank.

Comment: GT/6 Extent of the Buffer Zone, page 25

The draft RAP recommends acquiring a 100 foot wide buffer zone around the edges of the Spook pit to protect the stabilized pile against intrusion during future mining activities. The Hydro-Engineering report for the AML program recommends the use of benches in the pit wall (Hydro-Engineering, Figure 9-19) for placing the fill material. DOE should consider the effect this may have on the width of the buffer zone.

A statement on page D-38 of the draft RAP indicates that the proposed 100 foot buffer zone will be around the tailings impoundment rather than around the Spook pit. This discrepancy should also be clarified.

Comment: GT/7 - Water Table Relative to Tailings, Figure 4.2, page 56

The draft RAP (page 36) states that the bottom of the stabilized tailings will be 30 feet above the water table. Figures 3.7, 3.10, and 3.11 show the water table to be between elevations 4980.0 and 5000.0 feet and Figure 4.2 shows the bottom of the stabilized tailings at 5025.0 feet, but does not show the water table. In contrast, Figure D.3.6 shows the water table to be approximately 10 feet below the existing pit bottom. This inconsistancy needs to be resolved. In addition, the water table should be included in Figure 4.2 to show the elevation of the stabilized tailings in relation to the ground-water level.

Comment: GT/8 - Geotechnical Data, Figure 3.6, page 28

Figure 3.6 presents a cross section of the tailings stratigraphy but does not show the geotechnical data points (test pits and borings) used in it's development. This figure should be revised to show these data points, and also to include the ground-water level for reference.

REFERENCES CITED

DOE (U.S. Department of Energy), 1986a. Technical Approach Document, UMTRA-DOE/AL-050425.0000, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque, Operations Office, Albuquerque, New Mexico.

Hydro-Engineering, 1987. Report of Investigation for Abandoned Mine Land Program 15-3, Spook Site, prepared by Hydro-Engineering, Casper, Wyoming for the State of Wyoming, Department of Environmental Quality.