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40-8904/SRG/86/12/04/0

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URFO:SRG
Docket No. 40-8904
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Kennecott
ATTN: Gregory H. Boyce, Director
Environmental Affairs
10 East South Temple
P.O. Box 11248
Salt Lake City, Utah 84147

Gentlemen:

The URFO staff has completed its preliminary review of your October 1, 1986 submittal entitled, "L-Bar Uranium Mine and Mill Reclamation and Closure Plan." This preliminary review includes initial comments on the plan that we feel need early attention and would warrant resubmittal of applicable parts of the plan. They concern areas of geotechnology, ground-water hydrology, surface water hydrology, radon attenuation and site cleanup. Although not specifically identified in the staff comments and requested modifications, the licensee should also adjust and provide revised costs estimates to complete the reclamation as appropriate. Additionally, we have considered the initial comments provided to the NRC staff by the New Mexico Radiation Protection Bureau that were transmitted to us and incorporated as appropriate. Two major deficiencies in ground water aspects of the plan were brought to your attention in our letter to you dated October 21, 1986.

It is requested that you submit responses to our comments by January 30, 1987. If you have any questions, please contact either myself or Scott Grace of our staff at (303) 236-2805.

Sincerely,

/s/

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

Enclosure: Preliminary Comments

cc: Michael F. Brown, Radiation Protection Bureau
Lee Anzures, Cebolleta Land Grant
William P. Robinson, Southwest Research and Information Center

OFC	URFO SGrace	URFO EHawkins	URFO HPettengill				
NAME	SGrace/lv	EHawkins	HPettengill				
DATE	87/01/08	1/8/87	1/8/87				

UNITED STATES NUCLEAR REGULATORY COMMISSION

URANIUM RECOVERY FIELD OFFICE

PRELIMINARY COMMENTS ON

"L-BAR URANIUM MINE AND MILL
RECLAMATION AND CLOSURE PLAN"

Radon Attenuation and Site Cleanup

1. On page 6-10, Section 6.3.4, line 9, the statement which describes onsite burning of "combustibles such as wood and other construction/demolition debris," requires further explanation. Note that the only material eligible for onsite burning is material that meets the unrestricted release limits. The text should be modified accordingly.

2. On page 6-25, Section 6.6.1, line 5, add the words... "averaged over areas of 100 square meters."

3. On line 6, were gamma surveys performed in the areas that soil samples were collected? If so, what were the readings?

4. On line 12, please describe the instrumentation used to perform the gamma survey and its calibration.

5. On line 15, please provide the empirical data "from earlier studies" that was used to develop the 20,000 cpm value. Specify what concentration of Ra-226 in land this value corresponds to. In addition, the staff finds, based on review of Table 6-2 and Plate 5, that windblown radioactive material extends beyond the arbitrary 20,000 cpm contour in both the northern and eastern sectors, especially near soil samples R-1 and R-2. Please provide your plans for performing detailed surveys in these areas.

6. On line 21, it states that the surface gamma cpm to Ra-226 pCi/g correlation is to be developed for the site during reclamation activities. We would like to note that our final concurrence in soil cleanup will be based on soil sampling, although gamma surveys can be used to cost effectively determine sampling locations. We therefore request that you provide a proposed procedure for utilizing gamma surveys in conjunction with soil sampling to determine that the cleanup should include a detailed discussion of how the gamma to Ra-226 correlation will be determined and utilized.

7. On page 6-32, line 6, please provide the reference for the technique(s) used to determine the emanating fraction (E). Review of Table 6-4 indicates that the emanating fraction chosen for the waste rock is based on only one sample (E=0.13). More waste rock samples (approximately 10) will need to be collected and tested in order to provide a representative value, or duplicate tests will need to be conducted to assure adequate characterization for the waste rock. Also, the staff notes that most of the measured tailings' emanating fractions were extremely low (0.01 - 0.16) compared to tailings at other sites. In this regard, please provide a reference for the specific procedures used to determine E. As only seven tailings samples were

measured, additional samples will need to be collected and tested in order to adequately represent the tailings emanating fraction. In lieu of more measurements, an emanating fraction of 0.35 may be used for both tailings and waste rock in a revised analysis (reference: NUREG/CR-3457 and "Standard Review Plan for UMTRCA Title I Mill Tailings Remedial Action Plans," USNRC, October 1985).

8. On page 6-33, line 2, review of the discussion regarding the moisture content for the cover material (Mancos Shale) indicates that the long-term moisture content estimate (13.86%) is based on the average of the in-situ moisture content of 10 samples collected from test pits ("T"-series) excavated by backhoe to a depth of 3 to 10 feet. Our review of the data provided shows that the in-situ moisture contents ranged from 9.2 to 18.1 percent for the "T"-series samples. Table 6-4 presented the grain size distribution for four Mancos shale samples identified as S-2, S-3, S-4 and S-5. Utilizing equation No. 16 of NUREG/CR-3533 to estimate the long-term moisture content for the radon barrier material, one calculates a range from about 8.47 to 10.6 percent for the "T" and "S" series samples. Therefore, a value of 10 percent was selected by the staff as representing a reasonably conservative long-term moisture content value. The 10 percent value approximates the upper range for the moisture content for the material since the material will be overlain by a gravel mulch which would tend to keep the moisture contents in the upper range. Accordingly, the associated diffusion coefficient which corresponds to this moisture content is 1.45 E-2 cm^2/s, based on 95 percent of the average maximum dry density (1.63 g/cm^3) and the average specific gravity (2.6) for the "S" series samples. Therefore, please recalculate the required radon barrier thickness based on these values, an average waste rock thickness, and a revised E value for waste rock and tailings if necessary (see Comment No. 7).

Surface Water Hydrology

1. On pages 6-37 and 6-44, you state that the south diversion channel encompasses a drainage area of about 295 acres. The estimated PMF peak flow from this area is 2550 cfs. You do not provide the rainfall intensity value (I) that you used in the rational formula; however, by using your values of discharge, runoff coefficient and drainage area and solving the rational formula for I results in a value of 12.3 inches per hour. This is the 1-hour PMP.

   In using the rational method, the rainfall intensity must correspond to the time of concentration (Tc). Your estimated Tc is 33 minutes. The PMP for 33 minutes is about 10.6 inches. Therefore, the intensity for a 33-minute Tc is about 19.3 inches per hour (10.6 X 60/33). The peak flow is thus 3980 cfs (0.7 x 19.3 x 295)

instead of 2550 cfs. You should therefore recompute the PMF discharges using rainfall intensity values that correspond to each time of concentration.

2. In the north diversion channel, the flow is subcritical in Reach D and supercritical in Reach E. In the area between these two reaches where critical depth occurs, the flow will be unstable and excessive wave action or undulations of the water surface may occur. Discuss how this flow instability was considered in designing the channel and provide assurance that the channel has sufficient freeboard to confine the expected waves.

3. In Table 6-13 you present hydraulic parameters for the diversion channels. For Reach B, the estimated velocity and depth are 5.17 ft/sec and 10.5 ft, respectively. Using Manning's equation with a roughness coefficient of 0.045, a bottom width of 10 ft, a slope of 0.035 and a discharge of 432 cfs, we calculated a velocity of 3.8 ft/sec and a depth of 12.6 ft. Please check and verify your calculations.

4. Subdrainage area III delineated on plate 6 is only for the area south of highway 279. Please discuss why the drainage area north of the highway will not contribute runoff to the north diversion channel. If you have assumed that the highway embankment will divert flows away from the channel, additional information should be provided to demonstrate that there is sufficient channel capacity on the north side of the highway to divert the PMF. Include the PMF peak discharge, channel capacity and flood depths.

5. Additional information is needed regarding the proposed design for the rock riprap and filter layers. In your design, you assumed a specific gravity of 2.65 for the rock. Provide the results of any tests conducted to determine this specific gravity. Also, information of rock durability should be provided. Routine petrographic analysis and durability tests using ASTM or equivalent standard procedures should be used to evaluate the suitability of the rock.

6. Page 6-46. The south diversion channel has been designed with a very flat bottom slope (1/1000) in order to maintain velocities below erosive values so that erosion protection will not be necessary. However, the resultant low velocities may not be sufficient to keep sediment suspended in flood flows and sediment deposition may occur. This is particularly true where side-discharges with much steeper gradients enter the diversion channel. You should provide assurance that the flood carrying capacity of the channel will not be adversely affected by sediment

deposition. Alternately, you may want to consider redesigning the channel to prevent excessive sediment deposition.

7. Page 6-47. Riprap has been sized for a straight channel. However, the bend in the north diversion channel will result in higher velocities on the outside radius of the bend than on the inside. A D-50 of 27 inches does not appear to be sufficiently conservative for the outside bend. You should therefore increase the size of the riprap to assure its stability during a PMF event. Also, the effects of the numerous bends in the south diversion channel should be evaluated to assure that the velocities on the outside bends will not result in velocities that will cause excessive erosion. Alternately, the channel may be redesigned to minimize the number of bends.

8. Page 6-53. You have identified several areas where headcutting is presently occurring in the vicinity of the tailings impoundment area. One of these areas is where the south diversion channel will empty into an existing arroyo, and several other areas are in close proximity to the toe of the dam. You propose to stabilize these areas by reducing the slope of the head walls and covering the slopes with riprap. This may not be sufficient to stabilize the headcuts for 1,000 years. An analysis of the maximum depth of headcutting should be done and the dam protected to this depth.

9. Figure 1.4 indicates, just to the southeast of the mill area, that the diversion channel flow converges at this point with no outlet. There appears to be an error in the flow direction at this point that should be clarified.

Ground Water Hydrology

1. In Section 4.5 and Appendix D, the following comments are directed at the use of the ground-water chemistry and equilibrium calculations using the aqueous speciation code PHREEQE:

   A. Your rationale for the use of the code, that unsaturation with respect to gypsum indicates background water chemistry and supersaturation or approaching supersaturation indicates influence of pond seepage, is not supported by the results of the PHREEQE code runs. For example, the PHREEQE gypsum saturation indices for Well MW-1a show undersaturation in 1984 and the water quality analysis in Appendix C shows that the pond seepage reached this well in 1979. Accordingly, justify your use of PHREEQE as an indicator of background water chemistry.

B. We have noted that modifications were made in the PHREEQE code used in Appendix D. For example, the element index numbers have been changed from the original code. Other parts of the code have also been modified. As a result of modifications to the original code, it is requested that a copy of the modified code be provided to NRC. The copy of the modified code should include full documentation of all changes and reasons why changes were made.

C. On page 4-12, Section 4.5.2 and Appendix D, the use of a fixed pE of zero in the PHREEQE runs may not be realistic. According to Garrels and Christ, 1965, Solutions, Minerals and Equilibria, the equilibrium distribution of sulfur species shows that at low pH and Eh of zero, the stability field for sulfate is exceeded. Please do some baseline studies to see if this has influence on the presented results and saturation indices and submit them for our review.

D. The summary tables at the beginning of Appendix D show two runs for the tailings pond water. However, no printouts for the PHREEQE runs are included in Appendix D. It is requested that PHREEQE runs for the tailings pond water be submitted.

2. In Appendix B, the well construction details contradict the lithologic logs presented for monitoring wells 5, 6, 7 and 8. The details of well construction perforated intervals do not correlate with the details of the lithology for these wells. This information should be clarified.

3. The information in Appendix B indicates that the upper Tres Hermanos Sandstones may not be fully penetrated by the monitoring wells 1A, 2A, 3A and 4A. It is also questioned whether or not other monitoring wells fully penetrate the upper Tres Hermanos Sandstone. Clarification as to whether or not the monitoring wells fully penetrate the upper Tres Hermanos Sandstone should be provided. In addition, an isopach map and structural contour map for the upper Tres Hermanos Sandstone should be provided that includes as large an area as possible in all directions from the tailings pond.

4. Appendix B does not include drill logs and well completion data for all wells. Lithologic logs are included for wells 1 through 17 (with no distinction between wells 10 or 10A and wells 12 and 12A). Table B-2 gives information on wells 1 through 20 (and also does not distinguish between wells 10, 10A and 12, 12A) but no additional wells. There are several wells where no information is available. A compilation of data from all monitoring wells should be provided that includes the "screened" and cased intervals.

5. In Appendix C, it is noted that on June 3, 1980, several sample analyses are reported for several different wells (1A, 2A, 4A, 5, 7 and 8) and that the analysis for a given well varied significantly. Please explain the differences in analyses for the same parameters in the same well for the same day.

6. On page 6-19, it is stated that the lined salts trench for disposal of scraped-up salts will be sealed with a hypalon cap. The cap is a good idea; but if it leaks or deteriorates, a bathtub effect over the bottom liner could be created. Please modify your proposal design accordingly. Also, discuss the expected life of the buried liner and provide your basis. Specify the depth of the trench. If salts do dissolve away, differential settlement and cover disruption could occur. Discuss how the trench is designed to minimize settlement. Additionally, the locations and designs of the lined salts disposal trench and lined evaporation pond should be provided, including details of the liner placement.

7. On page 6-19, Section 6.5.2, Well MW-5 or any other monitoring well, is not shown on Figure 4.34. Please locate the monitoring wells on this figure.

8. On page 6-23, last sentence of Section 6.5.5, after construction of the infiltration gallery, hopefully concentrations at the site boundary will be less than the standards. Please present drawings of the gallery and details of its connection to the diversion channel.

9. On page 6-23, Section 6.5.6, it is stated that the pumpback system will be operated until "current tailings pore water is displaced by infiltration and until the monitor wells show only residual sulfate concentrations." State whether the pore water, referenced here, is ground water. If this pore water is in the tailings, it may take decades for the displacement to occur. Please address long-term infiltration into the tailings and the continuous leaching of salts from the tailings to ground water on long-term water quality, after operation of the pumpback system has ceased.

Geotechnical

1. It is stated on page 6-16 that settlement monuments and piezometers will be used to monitor the consolidation of the tailings and determine when 90 percent of the expected consolidation has occurred. Although these general statements are acceptable, a specific program for monitoring consolidation must be provided. The proposed program should include monitoring locations and frequencies and their bases. The consolidation analysis provided should contain

sufficient information for the reviewer to independently verify the results.

2. The proposed plan should include a program for interim stabilization of tailings to prevent blowing and recharge of the pond as the tailings dry. The program should include the placement of an interim soil cover as soon as practicable, recontouring of the tailings to prevent ponding of water following removal of the surface pool, and a plan to place soil surcharges on slimes areas to accelerate consolidation. Provide a proposed interim stabilization program along with a tentative schedule for implementation. We would anticipate that this program would begin as soon as possible.

3. The boundary of the area scheduled for title transfer is shown on Figure 6.1. The area does not appear to include the entire tailings dam, the seepage recovery trench or diversion ditches, which are required to be included. Please provide a discussion of the proposed title transfer area and its adequacy for assuring the long term integrity of the reclaimed tailings.

4. Construction specifications, including a quality control program, must be provided for cover placement as well as placement of riprap.

5. The recent tailings dam piezometer readings should be submitted to verify the current stability of the tailings dam. If the phreatic levels within the dam do not correspond with the D'Appolonia stability model, the acceptable stability of the existing structure's conditions will need to be verified. Figures 3.5 and 6 are missing from the December 1980, D'Appolonia report, therefore, please submit copies of these missing figures.

6. Describe how the horizontal drain system is going to be maintained during the consolidation phase of the project. The report indicates that the downstream slope of the starter dam is to be flattened to 5:1 (H:V). State in what phase of the project this will occur.

7. There is some confusion as to when and if the saddle dam is to be removed. Page 6-52 of the report states that "The saddle dam will be removed during excavation of the tailings impoundment area." However, other references in the text along with several figures indicate that the saddle dam will be left intact with a crest elevation of 6200 feet. Correct the text to state clearly your intentions.

8. Accurate cross sections through the tailings area should be provided on drawings of adequate scale which indicate the existing and proposed structure's elevations and material types. These sections

should clarify cut and fill areas to assist in defining required material volumes.

9. The extent of the available cover material was "estimated from site visits, aerial photos and topography maps." The given volumes of cover material are therefore, at best, a rough guess. To more accurately project cost estimates, an exploration program should be established to determine the availability of acceptable cover material. Results of this program and your proposed cover material will need to be submitted to NRC for review and approval.