PATHFINDER
A Cogema Resources Company

August 2, 2000

Mr. Daniel M. Gillen VIA FEDEX
Chief, Uranium Recovery Section
Fuel Cycle Licensing Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, Maryland 20852

Ref: Source Material License No. SUA-672, Docket No. 40-2259

Dear Mr. Gillen:

Pathfinder Mines Corporation submits the enclosed revised pages (five sets) to Addendum I of the Lucky Mc Mine Tailings Reclamation Plan to address concerns expressed to me by your staff in telephone conversations over the past week concerning the revised radon barrier design for the solution ponds area at the Lucky Mc uranium mill site. The enclosed pages replace the existing pages I-19 and I-20 of Addendum I.

The revised pages outline a commitment to accomplish additional source term characterization in the No. 3 Pond after placement of interim cover over the pond and prior to radon barrier placement in the pond. The pond stills holds solution which precluded its inclusion in the earlier characterization program as required by condition 54Q. The additional characterization in Pond 3 will then allow RAECOM modeling to ascertain whether the proposed 13" radon barrier thickness for the balance of the solution ponds is acceptable as a minimal clay cover thickness for Pond 3. In the alternative, the modeling may indicate a need for a thicker barrier over Pond 3.

This submittal also includes a discussion supporting no future characterization of sediments under the temporary No. 4 evaporation pond. This would allow placement of the proposed 13" radon barrier over that area when it becomes available for decommissioning.

Please call me if there are any questions regarding this submittal.

Sincerely,

Tom Hardgrove

T. W. Hardgrove
Operations Manager

Enclosure

cc: B. Spitzberg, USNRC Region IV
D. L. Wichers
J. R. Blaise

NMSS01Public

change in elevation due to erosion by wind will have no impact on drainage or other systems.

I.6 RADON BARRIER DESIGN

The radon barrier will be constructed with Cody Shale. The Cody Shale is a massive unit that is present throughout the solution pond area. Cody Shale has been used in construction of the tailings and solution pond dams and will be used for the radon barrier in the tailings and solution pond area. The properties of the Cody Shale are presented in Section 3.2 and Appendices C and F of the TRP. These properties, along with construction and QA/QC procedures and criteria from the TRP, will be used in constructing the radon barrier for the solution pond area. The NRC-approved reclamation plan included dozing of contaminated materials on the periphery of the ponds to the center to minimize covered area, and dozing of the No. 4 Dam out into the solution pond area to provide general fill. On the periphery of the covered area, the cover thickness was tapered to merge with the surrounding surface.

The NRC-approved reclamation plan requires that a final design be completed after the solution ponds have been contoured and fill material added. In order to fully characterize the source term and fill material, the plan called for taking two feet (61 cm) interval core samples to a depth of 10 feet (305 cm) at 20 equally spaced locations. All samples were to be analyzed for Ra-226 and Th-230. Emanation coefficient measurements on at least twenty samples were also required unless the NRC default value of 0.35 was assumed in the final design.

Since the No. 3 solution pond is still holding water, it could not be included in the 20 sample site program. Once an interim cover (consisting of stockpiled material from the cleanup of windblown tailings) is placed over the No. 3 basin, an additional five locations in the No. 3 basin will be sampled as described above in order to characterize the source term in the No. 3 basin. The area of concern encompasses some twenty acres and includes the outslope of the No. 3 dam and a short portion of the downgradient draw which had not been sampled previously. The area north of the No. 3 dam crest accounts for six of the twenty acres. Because the dam had chronic leaking problems that resulted in obvious contamination immediately downstream, it is advisable to include this outslope area in the characterization. Five locations in the Pond 3 area approximate the same sampling density (one site per 3.8 acres) utilized in the rest of the solution ponds. The existing source term data on Pond 3 will be examined to help in the drilling site selection process. Generally speaking, the sites will be based on the same systematic grid utilized for the balance of the solution ponds. However, care will be taken to assure that areas of anticipated deeper contamination with higher gamma count are represented by at least two of the five holes. These holes will be sampled deeper than ten feet (from twelve to sixteen feet, depending on examination of the samples as drilling progresses) to assure that the deeper contaminated zones are represented.

The No. 3 basin will then be modeled by RAECOM to determine the required radon barrier thickness in that area. A minimum radon barrier thickness for Pond 3 consistent with the barrier design elsewhere in the solution ponds area is assumed. If the Pond 3 source term indicates a need for a thicker barrier in order to realize the same radon flux as modeled for the balance of the solution ponds, then the barrier will be adjusted accordingly. The sampling data and results of the RAECOM modeling for Pond 3 will be submitted to the NRC for approval prior to construction of the barrier in that area.

The other portion of the solution ponds area that has not been characterized for radon source term due to standing water is the No. 4 temporary evaporation pond located in the No. 4 basin. Since this temporary pond is a clay lined structure located within the confines of the original No. 4 Pond, and holds the same solution historically stored in that area, there is no reason to believe that the source term from the evaporation pond will differ significantly from what is characterized in the adjacent basin. The clay liner under this pond serves to provide at least a partial barrier for the contaminated materials underlying the evaporation pond. The pond was constructed in 1998 and will contain solution for about five years. Since the adjacent basin held solution (with the attendant deposition of precipitates) for almost forty years, the concentration of contaminants in the new pond over its relatively short life span should be less than the adjacent area. When the new pond is decommissioned, the clay in the surrounding compacted dikes will be dozed over the pond area to provide an interim cover. This clay should be relatively clean due to the limited seepage that will have occurred into it, providing an additional source term buffer prior to installation of any radon barrier.

The new pond covers slightly under twelve acres compared to the balance of the solution ponds covering over 96 acres. As such, even an under-estimate of the source term in the new pond would not have a great impact on the overall modeled radon flux for the entire solution ponds basin. As a result of all the above points, it is concluded that there is no need to do any characterization of the new No. 4 evaporation pond source term prior to installation of its radon barrier which will be consistent with that designed for adjacent areas.

I.6.1 Characterization of Source Term and Fill Material

The 20 sampling locations (SPS-1 through SPS-20) shown in Figure I-6 were selected to be representative of the entire solution pond area.

Twenty-four inch split-spoon samplers were driven within a hollow-stem auger down to a total depth of ten feet (305 cm). The samples were submitted to Energy Laboratories, Inc. for Ra-226 and Th-230 analysis. The data are presented in Table I-8a and are grouped in two feet layers. The average moisture and radionuclide concentrations are presented for each two feet layer. The concentration profile with depth indicates that the depth of the fill varies significantly from one location to another. At some locations, the elevated activity representative of the sediments appears in the uppermost layers while at other locations, there is little measured activity at any sample depth.

The Ra-226 concentration deeper than ten feet from the surface does not significantly affect the radon flux. However, in order to be conservative, the Ra-226 source term estimated from samples taken earlier near the edge of Solution Pond No. 3 was used as the source term deeper than the coring depth of ten feet. The mean and standard deviation for the set of samples associated with Solution Pond No. 3 were 65 pCi/g ± 149 pCi/g for Ra-226 and 145 pCi/g ± 136 pCi/g for Th-230. Using the mean plus one standard deviation as a reasonable estimate for the Ra-226 and Th-230 concentrations for the deeper sediments, the Ra-226 concentration at 1,000 years was calculated to be 238 pCi/g with an average thickness of five feet (152 cm).

Because of the high average ratio of Th-230 to Ra-226 activity in the contamination zones, the maximum Ra-226 activity will occur at the end of the 1,000-year design life. Using the Bateman equations, the activity at the end of the 1,000-year period is obtained by multiplying the current activity by 0.648. In addition, the Ra-226 in-growth from the decay of Th-230 will equal 0.35 times the current Th-230 activity. The sum of these two terms was used for calculating the maximum radon flux over the next 1,000 years.