November 10, 2003

Mr. Curtis O. Sealy, General Manager
Umetco Minerals Corporation
P.O. Box 1029
Grand Junction, CO 81502

SUBJECT: LICENSE AMENDMENT NO. 52, THE UMETCO MINERALS CORPORATION'S ANNUAL SURETY UPDATE AND FINAL DESIGN FOR POND NO. 2 FOR THE GAS HILLS URANIUM MILL SITE, SUA-648 (TACS L52526 and L52522)

Dear Mr. Sealy:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the annual surety update submitted by Umetco Minerals Corporation's (Umetco) letter dated June 12, 2003. The licensee had requested decreasing the surety amount by $1,433,471, based in large part on the final design for Pond No. 2 that was submitted to the NRC by letter dated May 9, 2003, and revised September 11, 2003. Because there is less contaminated material in the pond than estimated in 1996, the final design involves less radon barrier and minor changes to the erosion protection (rock size and layer thickness) for the pond cover than was assumed in the preliminary design for Pond No. 2. The preliminary design was approved by the NRC staff with the Heap Leach Impoundment design in Amendment No. 38 (May 28, 1998). The staff's technical evaluation report (TER) of Pond No. 2's final design (Enclosure 1) determined that the design was acceptable. Therefore, the NRC staff has approved the decrease in surety amount. Other decommissioning cost estimates were properly increased to reflect the annual change in consumer price index so that the approved surety amount for the NRC portion of the site is $14,845,246. As discussed in Section 5.0 of the TER, Umetco should consider re-baselining its cost estimate for the 2004 surety update.

License Condition 55 has been revised to reflect the new surety amount and License Condition 61 has been revised to include the proposed design for Pond No. 2. The amended license is enclosed (Enclosure 2). An environmental review was not performed since this action is categorically excluded under 10 CFR 51.22(c)(10), as a change to a surety and under 10 CFR 51.22(c)(11) concerning a change in process operations for the minor design changes for Pond No. 2 (discussed at the end of the TER).

If you have any questions concerning this letter or the enclosures, please contact Ms. Elaine Brummett of my staff at (301) 415-6606 or by e-mail at esb@nrc.gov.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No. 40-0299
License No. SUA–648

Enclosures: 1. Technical Evaluation Report for Pond. No. 2
2. License Amendment 52

cc: M. Moxley, DEQ WY
L. Setlow, EPA

November 10, 2003

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Fuel Cycle Facilities Branch
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Docket No. 40-0299
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cc: M. Moxley, DEQ WY
L. Setlow, EPA

(CLOSES TAC L52526 and L52522)

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TECHNICAL EVALUATION REPORT
FOR UMETCO MINERALS CORPORATION'S
FINAL DESIGN FOR POND NO. 2
AT THE GAS HILLS URANIUM MILL SITE

Docket No.: 40-0299 **License No.:** SUA-648

DATE: October 27, 2003

FACILITY: Umetco Minerals Corporation - Gas Hills Uranium Tailings Site, Wyoming

TECHNICAL REVIEWERS: Elaine Brummett, Jill Caverly, Daniel Rom

PROJECT MANAGER: Elaine Brummett

SUMMARY AND CONCLUSIONS:

By letter dated May 9, 2003, Umetco Minerals Corporation (Umetco) submitted the "Final Design and Reclamation Plan for GHP No. 2/Mill Area" (Plan) and requested NRC approval of the Plan by amendment of license SUA-648. The plan addressed the cover radon attenuation design, the geotechnical design for cell and cover stability, and the erosion protection design.

The NRC staff requested additional information by letter dated August 14, 2003, and the Umetco response and revised plan are dated September 11, 2003. The NRC staff used the NUREG-1620 Standard Review Plan (SRP) to evaluate the design against the 10 CFR Part 40, Appendix A, criteria. The staff determined that the proposed plan meets the applicable criteria and protects health, safety, and the environment.

BACKGROUND:

Gas Hills Pond No. 2 is a 17-acre evaporation pond that covers most of the former mill site. The pond was used for the ground water corrective action program (pump and evaporate), so it contains byproduct material. It was built on natural mineralization and mill-related uranium and will be covered in place to avoid trying to distinguish natural from licensed material during excavation. The pond is located adjacent to the west side of the completed Heap-Leach and Above-Grade cells. Pond No. 1 was on the north side of Pond No. 2, but has been excavated according to an approved plan.

The proposed final design differs somewhat from the preliminary design submitted September 25, 1996, and approved by NRC with the Heap Leach Impoundment design in amendment No. 38 (May 28, 1998). Because significantly less contaminated material will be placed in the pond, the radon barrier can be reduced from 18 to 12 inches. Also, the erosion protection layer thickness for the side slope was increased by one inch and the diameter of the rock increased in the final plan.

The key components of the Plan are: solidify the remaining liquids, remove the pond lining system, and place the cover. Pumping of the ground water into Pond No. 2 ceased on March 29, 2002, although liquid was still received from portions of the A-9 disposal cell (e.g., runoff). When the pond liquid decreases to a level of 1.5 million gallon or less, local mine spoils (overburden) soil will be mixed with the solution and the shredded synthetic liner materials so that the material can be compacted to 95 percent standard Proctor density.

Umetco already has NRC approval for the soil decommissioning plan and for the health and safety program. Also, the surety update currently under review by staff addresses the changes to reclamation costs proposed in the final design.

TECHNICAL EVALUATION:

1.0 Radon Attenuation

The limit for the average (over at least a year) long-term release of radon-222 (Rn-222) from uranium byproduct materials to the atmosphere is 20 $pCi/m^2/s$ from the surface of the tailings cell for 1000 years, to the extent reasonably achievable, but at least 200 years, as stated in Criterion 6(1) of 10 CFR Part 40, Appendix A. Rn-222 is the decay product of radium-226, is a gas, has a short half-life, and decays to a solid particle. The long-term Rn-222 flux rate can be estimated from the physical and radiological characteristics of the contaminated and barrier materials that would affect movement and concentration of the gas, using a series of calculations or a computer code.

Umetco proposed a radon barrier composed of a 12-inch-thick clayey soil layer and a 54-inch-thick layer of silty-clayey sand for the frost protection. Together, these two layers should retard the radon movement until it decays so that the flux limit is met. These materials have been evaluated with the approved cover design for the Heap-Leach cell. The staff's review included evaluation of the pertinent design criteria and also evaluated Umetco's use of the RADON computer code (NRC, 1989), including parameter input values used to calculate the radon flux limit. Finally, the staff performed an independent analysis of the design using the RADON code.

Radon Flux Model Parameters:

The staff evaluated the input into the RADON computer code to ensure that the values are either based on site-specific testing or are conservative estimates. The staff also evaluated the justification and assumptions made in choosing these values and confirmed that each input value was representative of the proposed material, consistent with anticipated construction specifications, and based on long-term conditions. For all three materials, the diffusion coefficient was calculated by the RADON code which, for many soil types, is conservative.

The licensee's flux model used a contaminated material thickness of 500 cm (16.4 feet), which is conservative. The average Ra-226 activity level of 62 picocuries per gram (pCi/g) was derived from 20 average (over 3-foot intervals) values estimated from 6-inch intervals of borehole gamma logs. Umetco commits (Page 7 of the submittal) to measure the Ra-226 activity concentration over 500 cm in composite samples from 3-foot intervals of each borehole specimen (at least one borehole for each acre) before cover placement. This will allow modeling by layers to reflect any influence of higher radium content in the upper layers.

The contaminated material density value of 1.75 g/cm^3 was based on test results and used to calculate a porosity of 0.34. The emanation coefficient input to the code was 0.26, based on the previously approved value for the frost protection soil and its similarity to the material that will be used to solidify the pond liquid. The diffusion coefficient was the code calculated value. The long-term moisture content of the contaminated material was a conservative estimate of 6 percent.

Most radon barrier parameter values were derived from measurements of five samples. The 95 percent of maximum density value was 1.59 g/cm^3 and the calculated porosity 0.4. The average Ra-226 value was 2 pCi/g, the measured emanation coefficient 0.17 (based on nine samples). Umetco also used another model with the more conservative emanation coefficient of 0.20 and the code calculated diffusion coefficient. The previously approved long-term moisture content for this material was 12 percent. This is a conservative value for clay soil (95 percent of the material passes a 200 sieve).

The frost protection material density value of 1.75 g/cm^3 was based on 95 percent of the average measured maximum density and the calculated porosity of 0.34. The average Ra-226 value was assumed to be the site-wide background value of 10 pCi/g, but Umetco indicated that it would scan the material before placement to keep the maximum value at or below 10 pCi/g. This complies with Appendix A, Criterion 6(5) that states "...near surface cover must be essentially the same, as far as radioactivity is concerned, as that of surrounding surface soils." To be conservative, Umetco used the cover Ra-226 values in the model, although it is not required (the standard applies only to the radon emissions from byproduct material). The average measured emanation coefficient of 0.26, and a conservative estimated moisture value of 6 percent were used in the model.

Modeling Results:

Umetco used the RADON computer code to calculate the long-term radon flux (NRC Regulatory Guide 3.64, 1989). The Umetco conservative flux model (emanation coefficient of 0.20) results indicate that the proposed 12-inch radon barrier and 54-inch frost protection layer will result in an estimated radon flux of 19.4 pCi/m^2/s. The other model resulted in a flux of 14.3 pCi/m^2/s. The NRC staff also performed modeling using higher Ra-226 levels and the radon flux level met the limit.

Cover Integrity:

To protect the clay radon barrier from freeze-thaw effects and to assist with radon attenuation, the same material and thickness previously approved for the Heap-Leach and Above Grade Cells is proposed. Biointrusion has also been addressed in these previous designs/plans.

Conclusions:

The NRC staff determined that the radon flux was calculated appropriately. However, since the Ra-226 level of the contaminated material can only be roughly estimated at this time, Umetco committed to measure the Ra-226 in at least 17 locations and for at least three (3-foot) layers after the pond sludge is solidified. The Ra-226 data must be submitted to NRC, before radon barrier placement begins, to justify that the Ra-226 values used in the radon flux model are representative. If the measured Ra-226 values are significantly higher than the estimated

values, Umetco will provide a revised model to estimate the long-term radon flux and demonstrate that the long-term radon flux from the cover should meet the limit in Criterion 6(1).

2.0 Cover Gamma Attenuation and Radioactivity Content

Umetco indicated that gamma measurements would be made on the completed radon barrier to demonstrate that the cover reduces the gamma exposure rate to background levels, as required by Part 40, Appendix A, Criterion 6(1). The radioactivity content of the cover materials will be measured to assure that it is within the range of background soil, as was done under previously approved cover designs at the site. The cover materials are from the surrounding area and do not contain waste or ore with elevated Ra-226 content. Therefore, the cover design ensures that surface radon exhalation is not significantly above background because of the cover material, as required by Criterion 6(5).

3.0 Geotechnical Design

The licensee provided information regarding the geometric design of the GHP No. 2 area, and indicated that the embankments will be constructed with 5H:1V exterior slopes. Representative soil tests provided design parameters for determination of embankment stability. Static and pseudo-static slope stability analyses were performed to confirm that the long-term stability would be satisfactory.

A horizontal seismic coefficient of 0.2 g was assumed in the pseudo-static slope stability analyses, and a safety factor in excess of unity was calculated using the SLOPE/W, Version 5, Software Package. Similarly, short-term and static analyses yielded safety factors in excess of required minimum values.

Settlement of the embankments is expected to be minimal, and to occur rapidly. Much of the foundation is relatively incompressible, and the thin silt lenses are dry. The stabilized soils will be well-compacted at a moisture content near optimum. Since settlement will be controlled, cover cracking is unlikely to occur. Since ground water is quite deep, the foundation soils would not be expected to become saturated and collapse. The frost protection design is based on the previously approved model for the Heap Leach, Above-Grade, and A-9 disposal cells.

A satisfactory Construction Specification for the material handling and placement operations was also provided. Test methods and intervals were specified, and are in accordance with standard practice. The staff also reviewed the calculations, analyses, and construction specifications and concludes that these are acceptable.

Conclusions:

Based on review of the information submitted by the licensee, the NRC staff concludes that the licensee has provided an adequate design to assure that tailings and contaminated material will not be released during the post-operational period. Based on review of stability calculations for the pond embankments, the staff concludes that the requirements of 10 CFR 40 Appendix A, Criterion 5, have been met regarding the geotechnical engineering design.

4.0 Surface Water Hydrology and Erosion Protection

Criterion 1 of 10 CFR Part 40, Appendix A, addresses the general goals of siting and designing facilities to provide for permanent isolation of tailings and minimizing the potential for dispersion by natural forces without the need for active maintenance. The reclamation plan for the Umetco Gas Hills Wyoming uranium mill site addresses these criteria by providing drainage and erosion protection which will control dispersion of the radiological material by both wind and water.

This review addresses the design changes proposed with submittals provided by Umetco under letters dated May 9, 2003, and September 11, 2003. This review was performed using NRC staff guidance of NUREG -1620, Rev 1, "Standard Review Plan for the Review of Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978."

Scope of Changes Concerning Surface Water Hydrology and Erosion Protection:

The submittal for design of reclamation for the Pond No. 2 area includes the 17-acre evaporation pond constructed in the former mill process and stockpile area of the facility. The reclamation cover was designed to meet the criteria in 10 CFR Part 40, Appendix A. The tailings located in the pond area will be stabilized in place with an engineered cover. A diversion channel will be constructed to route runoff from the neighboring heap leach pile away from the tailings in the Pond No. 2 area.

Hydrologic Characterization and Flooding Determinations:

The hydrologic basis for the erosion protection of the Pond No. 2 area is the probable maximum precipitation (PMP) event which is the maximum precipitation that can be expected to occur at this location. The design flood was developed using the PMP and methods developed by the National Weather Service in Hydrometeorological Report 55A. This method calculates the maximum flood flow that may occur during the 1000-year design period as required in Part 40. This has been previously reviewed and accepted by the NRC under Amendment 38 to Source Materials License SUA-648

The design for the area of the pond includes a regrading of the area to allow for drainage from the top of the reclaimed area. Pond No. 2 will be regraded to have a gradual slope on the tops of the newly created impoundment and steeper slopes on the side. A channel on the upstream side of the impoundment drainage will redirect runoff from the reclaimed heap leach area. The heap leach reclamation design has already been accepted by the NRC.

Acceptable methods were used to determine the unit flow associated with the impoundment slopes. The runoff coefficient, time of concentration and rainfall intensity were accurately and conservatively calculated. The staff has completed its review of the hydrologic characterization and flooding determination of the Pond No. 2 reclamation plan and concludes that the characterization, general surface water hydrology, and flooding calculations are reasonable and comply with the requirements of 10 CFR Part 40, Appendix A.

Water Surface Profiles, Channel Velocities and Shear Stresses:

The dimensions of the channel, including depth and width, were accurately determined using Manning's equation which is a standard hydraulic engineering equation to determine the channel dimensions for uniform flow. Manning's roughness coefficient used in the design provided a reasonable amount of conservatism. Additionally, shear stress computations were performed in accordance with NRC guidance. On the basis of the information submitted, the staff concludes that the design meets the requirements of 10 CFR Part 40, Appendix A, which requires that the design include the long-term stability of the site without requiring maintenance.

Design of Erosion Protection:

Erosion protection was designed for the Pond No. 2 impoundment along the flatter top slopes and the steeper side slopes. The velocity of the flow in the channel that redirects flow from the heap leach away from the pond impoundment area was analyzed and determined to require erosion protection. The design requires rock riprap to be placed on all surfaces of the reclaimed Pond No. 2 area. The Stephenson method for calculating riprap size was used on the impoundment area, while the Safety Factors Method was used to determine rock size along the channel. Both of these methods have been described in NRC guidance, Design of Erosion for Long-Term Stabilization (NUREG-1623).

Interstitial flow velocities for the submitted design of the channel were evaluated in accordance with the above cited guidance. A rock bedding layer will be placed below the erosion protection in the channel. The submittal commits Umetco to test rock durability according to the guidance stated in NUREG-1623 and that rock used for erosion protection will have a durability score of no less than 80. Additionally, the rock gradation proposed is acceptable.

Conclusions:

The staff has completed its review of the design of erosion protection for the design of Pond No. 2. On the basis of the information submitted, the review concluded that the erosion protections designs are acceptable and meet the criteria of 10 CFR Part 40, Appendix A which requires uranium mill tailings be stabilized for a period of 1000 years, to the extent reasonably achievable, without active maintenance.

5.0 Decommissioning Cost Estimates

Table 2 of the June 12, 2003, submittal summarizes the changes in radon barrier and erosion protection costs associated with the final reclamation design for the Pond No. 2. The staff reviewed both the unit costs and quantities associated with this action and finds that the estimated costs and quantities are acceptable. However, it should be noted that the review is based on drawings provided by the licensee and not a field inspection.

The last update was approved by NRC by letter of August 23, 2002. The staff determined that the inflation adjustment for the 2003 surety update was properly calculated by the increase in consumer price index, based primarily on cost estimates submitted on December 2, 2000. For the 2004 update, Umetco should consider re-baselining the cost estimates.

The proposed amount of $14,845,246 for the NRC portion of the financial surety, reflecting the changes for the final reclamation of Pond No. 2 and inflation, is acceptable.

ENVIRONMENTAL IMPACT EVALUATION:

The requested changes to the approved preliminary reclamation plan for Pond No. 2 are minor and are encompassed by the environmental assessment and by the Finding of no Significant Impact for the reclamation plan published in the **Federal Register** on May 6, 1998. Because there is less contaminated material and the cover design meets regulatory criteria, there should be no change in type, or increase in the amounts of effluents that may be released offsite, no significant increase in occupational exposure, and no increase in potential for radiological accidents due to the requested action. Also, no significant construction impact is expected from the requested changes, somewhat less construction activity will occur because of a thinner radon barrier and shorter side slopes, i.e., less cover material to place. Therefore, in accordance with the categorical exclusion contained in Paragraph (c)(11) of 10 CFR 51.22, concerning a change in process operations, an environmental assessment is not required for this licensing action, and submittal of an environmental report is not necessary.

PROPOSED LICENSE CONDITION CHANGES:

License Condition 55 should be revised to reflect the change in surety amount to $14,845,246.

License Condition 61 should have the following paragraph added:

The reclamation of Pond No. 2 will be performed according to the final plan submitted on September 11, 2003. In addition, the Ra-226 data for the solidified pond sludge shall be submitted to the NRC, before radon barrier placement begins, to justify that the Ra-226 values used in the radon flux model are representative. If the measured values are significantly higher than the estimated values, Umetco will provide a revised radon flux model to demonstrate that the long-term radon flux from the cover should meet the limit in Part 40, Appendix A, Criterion 6(1).

REFERENCES:

Lawrence Livermore National Laboratory, 1994. "Seismic Hazard Potential of Title II Reclamation Plans," for the U.S. Nuclear Regulatory Commission, Washington, D.C.

Umetco Minerals Corporation, "Final Design and Reclamation Plan for GHP No. 2/Mill Area." Submittal to the NRC by letter dated May 9, 2003.

U.S. Department of Energy (DOE), 1989. "Technical Approach Document: Revision II," Uranium Mill Tailings Remedial Action Project.

U.S. Nuclear Regulatory Commission, 1977. "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills," Regulatory Guide 3.11, Washington, D.C.

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U.S. Nuclear Regulatory Commission, 2003. “Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act.” NUREG-1620, Rev. 1., Washington , D.C.