



State of Utah

Department of
Environmental Quality

Dianne R. Nielson, Ph.D.
Executive Director

DIVISION OF RADIATION
CONTROL
Dane L. Finerfrock
Director

JON M. HUNTSMAN, JR.
Governor

GARY HERBERT
Lieutenant Governor



June 22, 2006

Mr. Harold Roberts
Vice President – Corporate Development
International Uranium (USA) Corporation
1050 Seventeenth Street, Suite 950
Denver, CO 80265

Re: June 6, 2006 IUC Email Submittal, "Cell 4A Contaminate (sic) Removal Work Plan and Schedule White Mesa Mill Groundwater Quality Discharge Permit No. UGW370004",
DRC Review Findings and Request for Information - Round 3 Interrogatory

Dear Mr. Roberts,

We have reviewed your preliminary Cell 4A soil cleanup plan, submitted by email on June 6, 2006, referenced above. We also acknowledge a conference call on June 20, and a meeting in Salt Lake City on June 21, 2006. Subsequent to these discussions, a Round 3 Interrogatory has been prepared by URS, and is attached for your resolution.

This interrogatory focuses on information needs for the cleanup of soils under the former Cell 4A facility. During the review process, and subsequent calls and meeting there were several issues raised. The most significant of these include, but are not limited to:

1. Soil Characterization – additional effort is needed to fully characterize the contaminated soils beneath the former cell. It was agreed that more emphasis is required across the effected areas found on the cell floor. Additional justification is needed regarding the number of soils samples collected, the depth from which they are collected, and the parameters required for laboratory analysis. In accordance with agreements reached during negotiations for the Ground Water Discharge Permit, uranium analysis of the sub-soils beneath Cell 4A will be required.

As agreed upon during our June 21 meeting, the first round of soil sampling will include a constant 6-inch sample interval that will extend from 0 – 6 and 6 – 12 inches below the surface. Depending on results found, additional depth samples may be required.

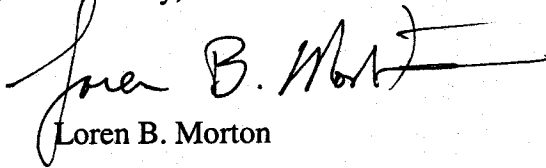
2. Uranium Soil Cleanup Criteria – instead of the dose modeling approach outlined in the June 6 submittal, we suggest you implement a uranium soil cleanup criteria from the 1981 NRC Branch Technical Position, 30 pCi/gm total uranium (10/23/81, 46 FR 52061 – 52063). We believe this approach is appropriate because:
- A. The soil cleanup project is targeted for a restricted release purpose, in that new tailings will be disposed on top of this location,
 - B. The 30 pCi/gm value represents a mid-range concentration, as outlined in the 1981 NRC guidance, and
 - C. Pre-defined soil cleanup criteria will provide a more timely solution to the problem. Dose modeling is highly subjective, and resolution of the modeling assumptions could significantly delay design approval and construction.

With regards to the agreed upon review and permitting schedule, please be aware that the Construction Permit cannot be issued until after submittal and approval of the soil cleanup report.

With regards to the agreed upon review schedule, this Round 3 Interrogatory was never contemplated during negotiation of our Memorandum of Agreement. Further, because this soil cleanup issue is one of long-standing, and because resolution of the Round 2 Interrogatory is currently late, we suggest that a new schedule be negotiated.

If you have any questions or concerns regarding the attached interrogatory, please call me to arrange for a meeting or conference call.

Sincerely,



Loren B. Morton

LBM:lm

cc: Britt Quinby, URS
Dave Frydenlund, IUC

F:/.../Rnd3TransLtr.doc
File: IUC Cell 4A Relining Project

**UTAH DIVISION OF RADIATION CONTROL
CELL 4A LINING SYSTEM
INTERNATIONAL URANIUM (USA) CORPORATION
WHITE MESA MILL
BLANDING, UTAH**

INTERROGATORIES – THIRD ROUND

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Acronyms and Abbreviations	ii
Summary of Requested Items	iii
INTERROGATORY IUC R313-24-4-01/03: RADIATION SURVEY AND RELATED DEMONSTRATIONS	1

Acronyms and Abbreviations

ALARA	As Low As Reasonably Achievable
BAT	Best Available Technology
CFR	Code of Federal Regulations
CQAP	Construction Quality Assurance Plan
DR	Design Report
DRC	Division of Radiation Control (Utah)
FML	Flexible Membrane Liner
GCL	Geosynthetic Clay Liner
HDPE	High Density Polyethylene
LCRS	Leachate Collection and Removal System
SDR	Standard Dimension Ratios
TDS	Total Dissolved Solids
TEDE	Total Effective Dose Equivalent
TMP	Tailings Management Plan
TRDP	Tailings Reclamation and Decommissioning Plan
URCR	Utah Radiation Control Rules

Summary of Requested Items

Please refer to the interrogatories for the context of the item requests.

1. A Radiation Survey Report to demonstrate that the existing subgrade for Cell 4A has radiation and contamination levels that are acceptable.

INTERROGATORY IUC R313-24-4-01/03: RADIATION SURVEY AND RELATED DEMONSTRATIONS

PRELIMINARY FINDING:

Refer to R313-24-1(3), R313-24-4, R313-15-501, R313-15-406, and 10 CFR 40 Appendix A, Criterion 5A(1); DRC rules require that a radiation survey be performed to demonstrate that the requirements of R313-15 are met, including the magnitude and extent of radiation levels and concentrations or quantities of radioactive material (see R313-15-501). DRC rules also require IUC to describe "... how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment,..." (see R313-15-406). R313-24-4 and 10 CFR 40 Appendix A, Criterion 5A(1) require that for uranium tailings impoundments where wastes have migrated into the liner during the active life of the facility, that closure of said impoundment must include "...removal or decontamination of all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate."

Refer to R317-6-6.3(Q); "Unless otherwise determined by the Executive Secretary, the application for a permit to discharge wastes or pollutants to ground water shall include the following complete information:... Q. Other information required by the Executive Secretary."

Also refer to R317-6-6.4(A); IUC must provide information that allows the Executive Secretary to determine:... "3. the applicant is using best available technology to minimize the discharge of any pollutant;..."

INTERROGATORY STATEMENT:

Please provide a revised plan/report that:

- 1. Includes site characterization data that defines the nature and extent of the U-nat, Th-230, and Ra-226 contamination in Cell 4A. This is to include survey and sample results, their respective locations (marked on a drawing), the sample depths, and operational information that supports the identification of areas as potentially contaminated (or not impacted).*
- 2. In place of the modeling effort to derive the clean up levels for uranium and thorium, the use of 30 pCi/g levels as the clean up criteria for natural uranium. This criteria would be combined with 5 pCi/g for Ra-226 averaged over in the upper 15 cm (6-inches) of soil, and 15 pCi/g averaged over a 15 cm thick layer of soils more than 15 cm below the surface. This is consistent with the approach recommended in the USNRC Branch Technical Position Paper "Guidelines for Residual Concentrations of Thorium and Uranium Waste in Soil" (USNRC 1981). In addition, the uranium can be used as an indicator for other metals that may have an impact on groundwater, which is consistent with item number 43 on page 48 of the Draft December 1, 2004 Statement of Basis for the Ground Water Quality Discharge Permit for the site.*

3. *Complete set of background data results, analytical methods used, sample locations shown on a map, sample depths, and an evaluation that justifies, demonstrates, and establishes the background levels to be used.*
4. *A revised methodology to identify elevated levels of contamination (above the clean up criteria) and confirm that it has been removed to the respective clean up levels. This includes means for justifying that sufficient samples have been collected at appropriate locations and they are representative of the area to be evaluated (i.e., released). This would include radiation measurement surveys of the soil surface and soil sampling at discrete depths and locations to define the vertical profile of the contamination (i.e., soil samples from 0 to 15 cm and from 15-cm and below) by location. These results would be used to support the basis for identifying areas as contaminated (impacted), or not impacted and in support of a sampling and survey strategy to be implemented during remediation and for the final confirmation survey and sampling to demonstrate that the contamination has been removed to levels consistent with the clean up criteria. Typically, the amount of sampling required for the areas not impacted is less than needed for the contaminated areas. Also, the sample analysis performed needs to be defined. For the characterization portion there is flexibility in the methods to be used. However, the laboratory used for the final status survey/sampling will be approved by the State of Utah for the respective analytical methods. In addition, the DRC must be notified at least 30 days in advance of performing the final status survey so as to allow for a representative to be onsite and collect split samples if so desired. The MARSSIM guide referenced in the "Basis for Interrogatory" provides one means for designing characterization, remedial, and final status survey/sampling.*

BASIS FOR INTERROGATORY:

It is clear that the former liner system in Cell 4A did not meet the requirements of 10 CFR 40 Appendix A, Criterion 5A(1), in that it did not "...prevent wastes from migrating into the liner during the active life of the facility." It is also clear that both waste residues in Cell 4A, the liner, contaminated subsoils, and structures and equipment contaminated with waste and leachate need to be removed (ibid.). Prior to the installation of the new liner system, IUC needs to demonstrate that the existing subgrade has radiation levels that are acceptable. IUC had previously submitted the results of a preliminary radiation survey, and on June 6, 2006, provided a (Draft) "Cell 4A Contaminate Removal Work Plan Schedule" for informal DRC review. This plan presented the proposed clean up criteria in soil for Ra-226, U-238, and Th-230, and the methodology to be used to confirm that the respective clean up criteria are met in the cell subgrade prior to the initiation of Cell 4A liner construction.

The plan states that the clean up criteria for the impacted Cell 4A subgrade soils (averaged over any area of 1,000 square feet) are as follows (above background levels):

- *5 pCi/g Ra-226 averaged over the first 15cm of soils below the surface*

- 15 pCi/g Ra-226 averaged over a 15 cm thick layer of soils more than 15cm below the surface
- 76.6 pCi/g U-238 in the top 15 cm layer of soil
- 270 pCi/g for Th-230 in the top 15 cm layer of soil
- Where more than one radionuclide is present at concentrations above background, the sum of fractions rule (or unity rule) will apply

These criteria are based on 10 CFR Part 40, Appendix A, Criterion 6 (6). The radium criteria are stated as 5 and 15 pCi/g, and the uranium and thorium criteria were estimated through an evaluation that calculated the total effective dose equivalent (TEDE) resulting from radium at 15 pCi/g concentrations, then back-calculating the resultant uranium and thorium levels in soil in the area of concern that would result in the respective TEDE for the radium. This evaluation was done using the RESRAD code and assumed site-specific input parameters to model contaminate transport. However, the resultant concentrations of uranium and thorium developed are based on modeling that uses input parameters with little to no justification. The use of case 3 (lowest effective porosity) was used because it was the one that provided a TEDE from 15 pCi/g within a 1000-year time frame; no other justification for the use of this effective porosity was given. The other cases were discounted because they didn't result in any TEDE until well after 1000 years, and "equivalent" concentrations of the uranium and thorium can not be back-calculated at a TEDE of zero. However, it is important to note that this approach may not be appropriate for all tailings situations, and Criterion 6(6) also states that the resultant "equivalent" soil levels developed need to be as low as reasonable achievable (ALARA). In the scenario presented by IUSA, the equivalent concentration approach does not appear to be practical, and an ALARA analysis may be more appropriate to better determine what levels of uranium and thorium can be removed and what residual contamination may remain.

Criterion 6(6) is the federal criterion for licensing termination at uranium mill sites that uses 100 mrem/yr or less as the acceptable TEDE. However, the Utah regulations in R313-15-402 require a 25 mrem/yr TEDE or less. In addition, R313-24-1(3) states that the requirements of R313-24 (which reference 10 CFR 40 and Appendix A), are in addition to, and not a substitution for the other applicable requirements of R313-15. Therefore, per the State of Utah regulations, the 25 mrem/yr TEDE is applicable over the 100 mrem/yr referenced value from the federal regulations.

All input parameters used in the model need to be justified based on site-specific information or values that apply (e.g., actual site-specific data or information taken from literature). The input and output from RESRAD need to be provided, along with the justification and source of the input and modeling parameters.

In consideration of the concerns with developing clean up levels for uranium and thorium using the TEDE equivalent method discussed above, an alternative approach would be to establish a soil clean up level based on existing and related guidance previously developed. Since radium and uranium are the contaminants of primary concern, one such approach would be to use the clean up level in soil for radium of 5 and 15 pCi/g,

and for natural uranium use what is recommended in the USNRC Branch Technical Position Paper "Guidelines for Residual Concentrations of Thorium and Uranium Waste in Soil" (USNRC 1981). This position paper recommends a clean up level of 10 pCi/g in surface soils. However, since the existing cell subgrade will be under the proposed tailings Cell 4A, a 30 pCi/g level is proposed that considers the restricted use of the property and that the contamination will be more than 4-feet below the surface. In addition, the uranium can be used as an indicator for other metals that may have an impact on groundwater. This is consistent with item number 43 on page 48 of the Draft December 1, 2004 Statement of Basis for the Ground Water Quality Discharge Permit for the site. Specifically, item number 43 states:

"During Permit preparation, it was agreed that IUC will perform a radiologic survey and/or uranium laboratory analysis of the clay sub-liner and if necessary any underlying soils found under Tailings Cell 4A to determine the total extent of any clay sub-liner or subsoil contamination. This approach is justified, in that under oxidizing or acidic conditions uranium is expected to be highly mobile in soils. Consequently, the Executive Secretary believes that uranium soil concentrations can be used as a tracer to estimate the vertical penetration of contaminants in the raffines and salts once stored in Cell 4A."

The report also presents the proposed background level to be used for radium, but not the actual results (or those for uranium and thorium), and the proposed methodology to be used to demonstrate that the levels of contaminants remaining in the soil in the cell subgrade meet the clean up criteria. The complete set of analytical results as well as the locations on a drawing, and respective depths, for background samples were not provided. The basis for establishing the site-specific background concentrations used also needs to be provided with the results.

The proposed methodology to determine if the cell subgrade meets the respective clean up criteria includes direct soil surface measurements for dose rate (uR/hr), followed by a limited soil sampling and analysis. A correlation was included between dose rate (uR/hr) and activity (pCi/g) for Ra-226. This included a conclusion that areas with 40 uR/hr readings or below will be classified as unaffected, and not require any remediation. However, the only basis for this 40 uR/hr criterion provided is two charts that present this respective correlation, and a limited discussion. In addition, the chart that presented the correlation of the Ra-226 in pCi/g to the dose rate in uR/hr has an inconsistent scale for the x-axis. In consideration of the inconsistent x-axis scale, what this chart is supposed to represent is not clear.

The specific soil sample locations and depths, analytical methods and results, the respective dose rate measurements, the basis for only 30% survey coverage, and the basis for establishing the 40 uR/hr dose rate as being representative of background, plus the 5 pCi/g contributed from Ra-226, needs to be provided. In addition, without this data it is not known if the entire range (or levels) of contamination have been identified and bounded. It has been URS's experience that dose rate measurements (or gamma measurements) of surface soil are not reliable or sensitive enough to consistently identify areas with 5 to 15 pCi/g activities. These types of surveys are effective in identifying

areas with levels that are significantly above the criteria, but not for identifying and confirming that areas are at or below 5 to 15pCi/g.

The plan also states that limited soil sampling will be done to confirm that the contamination remaining is at or below the criteria. The plan proposes samples from 5% of the total number of cells will be sampled. There is no justification as to why 5% are to be sampled. Included should be adequate characterization of the horizontal and vertical extent of the contamination as developed from a characterization investigation. This would include radiation measurement surveys of the soil surface and soil sampling at discrete depths and locations to define the vertical profile of the contamination (i.e., soil samples from 0-6-inches and from 6-inches and below) by location. These results would be used to support the basis for identifying areas as contaminated (impacted), or not impacted and in support of a sampling and survey strategy to be implemented during remediation and for the final confirmation survey and sampling to demonstrate that the contamination has been removed to levels consistent with the clean up criteria. Typically, the amount of sampling required for the not impacted areas is less than needed for the contaminated areas. Also, please note that the sample analysis performed needs to be defined, and for the characterization portion there is flexibility in the methods to be used. However, for the final status survey used to demonstrate that the contamination levels meet the clean up criteria, a laboratory that is approved by the State of Utah for the respective methods must be used. In addition, the DRC must be notified at least 30 days in advance of performing the final status survey so as to allow for a representative to be onsite and collect split samples if so desired.

One method to use in the design and implementation of contamination survey and sampling during characterization, remediation, and to confirm that the desired clean up criteria are met is included in the Multi-Agency Radiation Site Survey Manual (MARISSM), which can be obtained from the USEPA at their web site.

REFERENCES:

IUSA, Draft Cell 4A Contaminate Removal Work Plan and Schedule, White Mesa Mill, Groundwater Quality Discharge Permit No. UGW370004, (no date – transmitted in a 6/6/06 email from IUSA to UDRC).

IUC Letter to UDRC dated May 8, 2006; Re: Cell 4A Lining System Design Report, Response to URS Completeness Review.

UDRC letter dated October 18, 2005 to IUC (request for additional information).

USNRC Branch Technical Position Paper, Guidelines for Residual Concentrations of Thorium and Uranium Waste in Soil, 1981.

Utah Division of Radiation Control, Ground Water Quality Discharge Permit Statement of Basis For a Uranium Milling Facility At White Mesa, South of Blanding, Utah, Draft December 1, 2004.

www.epa.gov/radiation/marssim/index.html