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

INTERROGATORIES – ROUND 5

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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.

The following items are ones that have been requested in previous interrogatories and continue to be unresolved:

1. A Radiation Survey Report to demonstrate that the existing subgrade for Cell 4A has radiation and contamination levels that are acceptable. This is currently being addressed under a separate cover.
2. An up to date seismic hazardous analysis that includes recent data and evaluation methods.
3. An evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove the tailings solution in an efficient and timely manner. Also, that it is not beneficial to carry the slime drainpipes and/or sand layer into the remaining portion of the cell bottom (as discussed in the August 2, 2006 conference call between DRC and IUC representatives).

The following are items where responses were provided by IUC that addressed the concern, but questions and clarifications remain. Complete responses to these items need to be provided by IUC prior to issuance of the construction permit:

3. The CQA Plan needs to be clear that modifications or changes to the agency reviewed design and installation requirements reflected in the respective documents must be provided to the agency for review prior to implementation.
4. Include the 3000 psi requirement in item 2.01A.1 of Section 03400 of the technical specifications (for the 28-day compressive strength testing) in Section 13.2.5 of the CQA Plan (or at a minimum, a reference to this requirement in the technical specifications in 13.2.5 of the CQA Plan).
5. Item 2.04 of Section 02220 of the technical specifications addresses the compaction of the anchor trench. It states that the backfill will be placed in lifts that result in a compacted thickness of no greater than 6-inches. Also include that the soil removed from the anchor trench will be placed back into the trench. This must be included in the specifications prepared for construction.
6. Backfill compaction requirements need to be included in either the CQAP, Technical Specifications, or on the Project Drawings regarding soil needed to make the proposed grade for the cell bottom (subgrade). This backfill shall be placed in 6-inch lose lifts and compacted to 95% of maximum dry density per ASTM 698 and within 0 to +3% of optimum moisture content.
7. Included must be means and methods used (prior to operation of Cell 4A) that determine if the hydration of the GCL is adequate. The level of GCL hydration must be comparable to the level used in the referenced acid resistance testing. Details of proposed GCL hydration procedure, field testing, and the respective level of hydration need to be provided to the DRC prior to the start of construction.

8. The requirement that construction loads on the completed liner shall be limited to foot traffic and low pressure ATV type vehicles that produce contact pressures at or lower than that exhibited by foot traffic need be added to the technical specifications.

10. IUC proposes that a cyclone be used to process the tailings slurry. Please note that the details of the tailings processing must be included in the cell operations procedures to be provided by IUC as part of Phase 2. These procedures need to include methods for placement of the tailings as part of the slimes drain layer so that the amount of the coarser sand in maximized, uniform, and the amount of fines minimized. In addition, it should be noted that if tailings are to be placed in the southeast corner, an HDPE splashguard is needed in that area. This must be included on the drawings.

9. There is a discrepancy in the gallon/day/acre ALR values obtained that needs to be clarified. One source (tables provided in 8/28/06 IUC response) has 604.01 gallons/acre/day at 37-feet of head, and another (calculations page 4 of 6) has 587 gallons/acre/day at 37-feet of head.

10. Please note that since the evaluation of the flow in the geonet assumes no adverse impact from uncertainties due to installation, quality control and assurance during installation must be thoroughly implemented and documented in the CQA Report for the liner system.

INTERROGATORY IUC R313-24-4-01/05: 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:

This interrogatory is now being addressed under a separate cover.

BASIS FOR INTERROGATORY:

IUC provided to the DRC a report from SENES Consulting (via a transmittal letter dated September 1, 2006) that addressed the radiation levels in Cell 4A subgrade. DRC comments to this report were provided to IUC in an email from Mr. John Hultquist dated 9/15/06. This issue is now being addressed under a separate cover. However, prior to the start of Cell 4A liner installation a final report must be submitted to, and approved by, the DRC that includes data and a demonstration that the existing cell liner subgrade has radiation and contamination levels that are acceptable.

REFERENCES:

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

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

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

INTERROGATORY IUC R313-24-4-02/05: DOUBLE LINER SYSTEM

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(1): Surface impoundments must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil, ground water, or surface water) during the active life of the facility, provided that impoundment closure includes removal or decontamination of all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate. For impoundments that will be closed with the liner material left in place, the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility.

Refer to R317-3-1(1.7). 1.7. Construction Supervision. The applicant must demonstrate that adequate and competent inspection will be provided during construction. It is the responsibility of the applicant to provide frequent and comprehensive inspection of the project.

Refer to R317-3-10(4)(E). E. Construction Quality Control and Assurance. A construction quality control and assurance plan showing frequency and type of testing for materials used in construction shall be submitted with the design for review and approval. Results of such testing, gradation, compaction, field permeability, etc., shall be submitted to the executive secretary.

INTERROGATORY STATEMENT:

In review of the response to Round 4 Interrogatories, there remain the following clarifications:

1. *Section 2.11 "Lines of Communication", in the revised CQA Plan provided in the response to round 4 interrogatories states in the third paragraph that:*

   " If a project specification criterion cannot be met, or unusual weather conditions hinder work, then the CQA Engineer will develop and present to the Design Engineer suggested solutions for approval."

   Please note that modifications or changes to the agency reviewed design and installation requirements reflected in the respective documents must be provided to the agency for review prior to implementation.

2. *It would provide clarity if the 3000 psi requirement included in 2.01A.1 of Section 03400 of the technical specifications was included for the 28-day compressive strength testing in Section 13.2.5 of the CQA Plan (or at a minimum, a reference to this requirement in the technical specifications in 13.2.5 of the CQA Plan).*

3. *2.04 of Section 02220 addresses the compaction of the anchor trench. It states that the backfill will be placed in lifts that result in a compacted thickness of no greater than 6-inches. It was also stated in the August 2, 2006 conference call between IUC and DRC representatives that the material excavated for the trench will go back into the trench. However, this was not addressed or included in the revised specifications. This must be included in the specifications prepared for construction.*
4. *The revised specification provided did not address the requirement that any backfill placed to make the proposed subgrade elevation will be compacted and tested. This must be included.*

BASIS FOR INTERROGATORY:

The applicant proposes to use a double liner with leak detection in order to prevent migration of wastes out of the impoundment (Cell 4A Lining System Design Report). The liners will be constructed of 60 mil High-Density Polyethylene (HDPE). The applicant has provided a Design Report (Cell 4A Lining System) that contains an introduction (summary), design drawings, Construction Quality Assurance Plan, Technical Specifications, existing berm (dike) and clay liner construction documentation, and design calculations. The applicant indicates that the double liner with the leak detection system design is the Best Available Technology (BAT).

Construction Quality Assurance Plan (CQAP)

The initial review of the CQAP resulted in a request for clarification in Round 1 Interrogatories on specific issues relating to the lines of communication and protocols for identifying and rectifying deficiencies. These were addressed in both the response to round 2 and round 4 interrogatories. However, it is important to note that included in the revised CQA Plan provided in the response to round 4 interrogatories is Section 2.11 "Lines of Communication", and in this section it states in the third paragraph that:

> *"* If a project specification criterion cannot be met, or unusual weather conditions hinder work, then the CQA Engineer will develop and present to the Design Engineer suggested solutions for approval."

And, modifications or changes to the agency reviewed design and installation requirements reflected in the respective documents must be provided to the agency for review prior to implementation.

Recognizing the above clarification, the response to the concerns over the CQA Plan have been addressed.

Project Technical Specifications

A section on the concrete spillway was also included in the revised plan (Section 13.0). However, this section refers back to the technical specifications and drawings for quality control requirements. In review of the technical specifications and drawings for quality control requirements, the following concerns were identified in round 4 interrogatories:

1. *Section 1.04 of Specification section 03400 (Submittals) requires that the 28-day compressive strength test results be submitted 7 days prior to construction of the spillway. The 28-day compression tests must be derived from samples of the concrete actually provided, and collected from the source (e.g., the truck chute during placement). The frequency should be a minimum of one sample per 150 cubic yards of concrete used. In response, IUC included in the CQA Plan Section 13.2.5:*

   "The Contractor shall facilitate the CQA Site Manager in the collection of samples required for testing. Compression test specimens shall be prepared by the CQA Site Manager by the following method:

   • compression test cylinders from fresh concrete in accordance with ASTM C 172 and C 31.

   Compression testing shall be completed on one cylinder at 7 days, one cylinder at 14 days, and two (2) cylinders at the 28 day strength."

   This revision to the CQA Plan combined with the requirement in 2.01A.1 of Section 03400 that states that the concrete shall have a 3000 psi 28-compresive strength addresses this concern. However, it would provide clarity if the 3000 psi requirement was included for the 28-day compressive strength testing in Section 13.2.5 of the CQA Plan (or at a minimum, a reference to this requirement in the technical specifications).

2. *Part 2 (Products) of Specification section 03400 includes requirements for mix design, concrete, and steel. However, no product requirements for the aggregate to be used are provided. IUC responded by stated that these requirements are included in ASRM C 33, which is specified in Section 03400. This satisfies this concern.*

3. *Section 3.02 of Specification section 03400 (Subgrade Preparation) needs to include subgrade compaction requirements. Also, will the subgrade materials be suitable as a base for the concrete? Concrete pavement and slabs are typically placed on a compacted stone base. Since the berm perimeter access road will traverse this spillway, it will need to function as road pavement and have a stable base/sub-base. IUC responded that the spillway design accounts for the properties and characteristics of the sub-base material under the concrete spillway, and compaction as well as sub-base stone are not required.*

In addition, it was noted that Table 1A is referenced in the text of section 7.2.1 as Table 1. This inconsistency should be corrected. Also, in review of the revised drawings, CQAP, and Technical Specifications, it was noted that there are no compaction requirements for the soil and stone backfill materials to be placed. This includes the drainage aggregate, anchor trench backfill, and any subgrade material that are placed to make the proposed grade as needed. The compaction requirements must include the method of compaction per soil type; lift thickness, frequency of testing, and test methods.

IUC responded to this concern by stating that the aggregate over the liner will not be compacted or tested for compaction, this is not needed for this material. The agency

assumes that the aggregate referred to over the liner is the aggregate being placed around the leachate collection pipes and sump, and the associated with the slimes drain. The agency agrees that with proper placement, this material will not need to be compacted. 3.04 of Section 02220 addresses the compaction of the anchor trench. It states that the backfill will be placed in lifts that result in a compacted thickness of no greater than 6-inches. It was also stated in the August 2, 2006 conference call between IUC and DRC representatives that the material excavated for the trench will go back into the trench. However, this is not included in the revised specifications.

Also not addressed in the revised specification was the requirement that any backfill placed to make the proposed subgrade elevation will be compacted and tested.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

INTERROGATORY IUC R313-24-4-03/05: LINER STRENGTH & COMPATIBILITY

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(2)(a): The liner must be constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

INTERROGATORY STATEMENT:

As requested in Round 2 and 4 Interrogatories, please provide methods to be used to ensure that the GCL will hydrate to the desired level prior to the start of cell operations. This must include assurance through testing that the subgrade soils have sufficient moisture and will facilitate the migration of water from the soil to the GCL in a timely manner.

As stated in Round 2 and 4 Interrogatories, the levels of expected GCL hydration must be compared with the levels of hydration of the GCL specimens used by Ruhl and Daniel as well as GCL specimens that were tested by Kolstad et a.l 2004 for conventional non-prehydrated GCLs tested against acidic liquids (the latter reference source was previously cited in the Round 1 Interrogatories). Are the levels of expected GCL hydration comparable to the levels of GCL hydration of the samples used in the acid resistance testing? The results and conclusions must be presented in a framework that demonstrates that the reported test data (i.e., GCL degree of hydration) are applicable to the range of the expected GCL hydration based on site conditions. Please note that the degree of hydration cited in the above references is in the 100 to 200% range, with values closer to 200% being more optimal.

IUC has proposed conducting field-testing to verify that the GCL has obtained the desired hydration levels. DRC agrees with this proposed approach. Therefore, please provide detailed methodology for such testing.

The requirement that construction loads on the completed liner shall be limited to foot traffic and low pressure ATV type vehicles that produce contact pressures at or lower than that exhibited by foot traffic need be added to the technical specifications.

BASIS FOR INTERROGATORY:

Hydration of GCL

Due to the significance of hydration on the ability of the GCL to sustain a low hydraulic conductivity, Round 2 Interrogatories requested that IUC must provide data (e.g., a plot) indicating approximate predicted levels of hydration of the GCL expected to occur over time based on the GCL being in direct contact with the subgrade materials present at the

site (based on their estimated moisture content and subgrade material type). IUC provided in their June 30, 2006 response a plot on the expected level of hydration that the GCL would likely achieve in the field prior to active usage of Cell 4A, IUC provided additional data on the extent of rate of hydration of bentonite (in this case the granular bentonite component adhered to one side of a geomembrane) when placed in direct contact with sand having various moisture contents ranging from 1% to 17%. The data indicate that the bentonite moisture content would increase to about 140% after 15 days and would increase further to the range of 150% to 200% after about 45 days if the bentonite side of the GCL were placed in contact with sand at 10% or greater moisture content. On-site dike soil and compacted clay liner soil moisture contents are reported to be in the range of 13% to about 18.6 %.

Although data furnished for the bentonite component of a GCL are for a GCL (Gundseal®-type) that is not the same type of GCL that is specified for use in Cell 4A, analogous data (Daniel 1994) are available for the same general type of GCL (two Claymax® GCLs, having thin and thick geotextile backings) that would be used in Cell 4A. Those data indicate lower moisture contents for bentonite in the GCL (in the range of 50% to 80%) after 15 days of contact with sands in the same moisture content range as that addressed by the IUC data (about 10% to 15%), but moisture contents in same range to slightly higher than those reported above for the Gundseal-type GCL after about 42 days for contact with the same sand materials. This information suggests that if at least 42 to 45 days are allowed to transpire between GCL placement in the Cell 4A liner system and placement of the cell into active service, the GCL should hydrate to about 150 % to 200 % or more if the subgrade materials in contact with the GCL exhibit in-situ moisture contents of at about 10% or greater.

Based on the above information, IUC must be able to demonstrate the GCL will hydrate to the desired amount prior to operation. Since the hydration is dependent on the moisture content of the underlying subgrade soils, this includes assurance that there is sufficient moisture available in the soil prior to GCL placement, and that the soil type will facilitate the transfer of the moisture to the GCL (i.e., clay, silts, or silty-sands; not gravel) prior to the operation of the cell. Note that the operation of the cell will be dependent on establishing the integrity of the liner system, which includes the proper hydration of the GCL so it will be resistant to acidic solutions.

Round 2 Interrogatory also requested the following:

> *"…The(se) levels of expected [field] GCL hydration should be compared with the levels of hydration of the GCL specimens used by Ruhl and Daniel as well as compared to the levels of hydration (moistening) of the GCL specimens that were tested by Kolstad et al. 2004 for conventional non-prehydrated GCLs tested against acidic liquids (the latter reference source was previously cited in the Round 1 Interrogatories). The results and conclusions should then be presented in a framework that demonstrates that the reported test data are applicable to the range of the expected site conditions."*

This request is repeated here; IUC must specifically compare the ranges of expected GCL hydration levels (that are described above) to the level(s) of GCL (pre-) hydration

that were established for those GCL specimens that were tested in laboratory to assess the effects of aggressive acidic leachates on GCL hydraulic conductivity (for which the GCLs were not significantly adversely affected), relative to laboratory tests that were performed that exposed these aggressive chemicals to non- pre-hydrated GCL specimens (for which the GCL specimens were significantly negatively affected). This comparison is important for assessing the comparability of the expected GCL field hydration levels to those tested that applied to those GCL specimens tested in the laboratory that were not adversely affected by the acidic leachate. This comparative information needs to be provided.

IUC proposed the performance of a field test to demonstrate that the GCL has hydrated to the desired level. This is a good idea, and a detailed procedure must be submitted for agency review prior to conducting such tests.

Freeze/Thaw Action on GCLs

*Requested in Round 1, 2, and 4 Interrogatories was an evaluation of the GCL and its ability to perform under all anticipated conditions (**Particularly where it is exposed to freeze/thaw without cover or confining pressure**). All evaluations provided to date in support of the GCL's resistance to freeze/thaw have the GCL under a soil or liquid cover. Alternatives to providing this evaluation are presented in the Basis for Interrogatory below. IUC responded with reference to testing recently completed and documented by Prodgornery and Bennett (Podgornery 2006) where samples of GCLs were subjected to freeze/thaw with no confining pressure. Then they were tested under 20 kPa (simulating a cover) and 60 kPa (simulating a liner). The results indicate no appreciable increases in hydraulic conductivity. Based on this information, this concern has been addressed.*

Stresses Imposed on the Liner System

In IUC's May 8, 2006 response to Round 1 Interrogatories it was stated that no construction loads would be placed on the side slope liner system components. However in the June 30, 2006 response to Round 2 Interrogatories IUC stared that traffic into the cell (on the liner) will be restricted to foot traffic and low ground pressure vehicles, such as one-person ATVs. If ATV's are to be used on the liner system, please provide assurance and/or a demonstration that they will not adversely impact the integrity of the liner. This is particularly critical on the cell side slopes.

IUC responded in with an evaluation that demonstrated how low-pressure type ATVs have lower contact pressure that a typical human foot. This satisfies this concern. However, the requirement that construction loads on the completed liner shall be limited to foot traffic and low pressure ATV type vehicles that produce contact pressures at or lower than that exhibited by foot traffic should be added to the technical specifications.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

IUC, March 7, 2005 Request to Amend Radioactive Material License, White Mesa Mill and Environmental Report.

IUC May 1999, Groundwater Information Report for White Mesa Uranium Mill.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

Ruhl, J., and Daniel, D. 1997. "Geosynthetic Clay Liners Permeated with Chemical Solutions and Leachates", Journal of Geotechnical and Geoenvironmental Engineering, Vol. 123, No. 4, pp. 369-381.

State of Utah Ground Water Discharge Permit No. UGW370004.

Smith R.D.1987, U.S. Nuclear Regulatory Commission, Sampling of Uranium Mill Tailings Impoundments for Hazardous Constituents, Memorandum, Februarey9, 1987, Division of Waste Management.

U.S. Nuclear Regulatory Commission, Standard Review Plan for Review of DOE Plans for Achieving Regulatory Compliance at Sites With Contaminated Ground Water Under Title I of the Uranium Mill Tailings Radiation Control Act, Draft Report for Comment, NUREG-1724, June 2000.

INTERROGATORY IUC R313-24-4-04/05: LINER SETTLEMENT

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5 A(2)(b): The liner must be placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift.

INTERROGATORY STATEMENT:

This request has been satisfied.

BASIS FOR INTERROGATORY:

This request has been satisfied.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

INTERROGATORY IUC R313-24-4-05/05: DIKE INTEGRITY

PRELIMINARY FINDING:

Refer to R313-24-4, R317-6-1.13 and 1.14: Best Available Technology means the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs. Best Available Technology Standard means a performance standard or pollutant concentration achievable through the application of best available technology.

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(5): When dikes are used to form the surface impoundment, the dikes must be designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the impoundment.

10 CFR 40 Appendix A, Criterion 4(E): The impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III(g) of Appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.

INTERROGATORY STATEMENT:

As previously stated in Round 2 and 4 Interrogatories, the seismic loading used (0.10g) is based on an evaluation of seismic activity and impacts from the 1970s and 1980s and is based on a dated evaluation. A more recent evaluation based on current data and methods needs to be performed. See the Basis For Interrogatory for more detailed explanation of this request.

BASIS FOR INTERROGATORY:

Appendix D of the design report presents documents from the original construction of the dike on the west and south sides of Cell 4A. However, this information is inadequate to conduct a detailed review of the license and to meet the regulatory requirements. Information is needed as to how the dike has been maintained or will be re-constructed to meet the requirements for structural integrity during the active life of the impoundment. However, a copy of IUC's 2005 Annual Technical Evaluation was provided to URS on August 3, 2006 in response to this concern. Review of the information in this document found that the dike inspection information needed to satisfy this request is included in this report.

IUC's May 8, 2006 response to URS Completeness Review did provide an evaluation of the stability of the original Cell 4A dikes. This evaluation considered two slopes and used a seismic loading of 0.10g. The indication was that the slopes evaluated were 3H:1V, and they are the highest. However, the design report as submitted at that time indicated the presence of a 2H:1V slope on the west side of Cell 4A. Due to the presence of the 2H:1V slope, it is uncertain if the slopes evaluated are the most critical. This was clarified in IUC's August 28, 2006 response. The 2H:1V slope on the west side of Cell 4A was not correct. This is a 3H:1V slope, the respective calculation has been revised to reflect this condition, and the slope evaluated has been identified as the critical slope.

The stability analysis received from IUC (June 9, 2006), included the basis for the 0.10g seismic loading. The slope stability analysis evaluated the southern Cell 4A berm, and defined it with a 2H:1V interior slope and a 3H:1V exterior (outside) slope. It identified the critical slope as the interior 2H:1V slope under both static and dynamic conditions. It also evaluated the lined and unlined conditions, and due to the installation of a double liner and drain system discounted the unlined condition.

However, the concern over the seismic loading has yet to be addressed satisfactorily. As presented in Round 4 Interrogatories, the seismic loading used (0.10g) is based on an evaluation of seismic activity and impacts from the 1970s and 1980s and is dated. A more recent evaluation based on current data and evaluation methods was requested by the DRC.

IUC provided in their June 30, 2006 response to Round 2 Interrogatories a discussion of how the 1996 seismic hazardous analyses (Wong 1996) supported the use of 0.10g and the outdated analysis. IUC also presented in the August 28, 2006 response to Round 4 Interrogatories a 1994 seismic evaluation performed by Lawrence Livermore National Laboratory (LLNL) for the US Nuclear Regulatory Commission (NRC) that supports seismic loading of 0.05 to 0.12. Based on the 1996 (Wong) and 1994 (LLNL) reports IUC states that that there appears to be nothing to suggest that the 0.10g value used for the White Mesa design is not appropriate, and further study is not warranted.

However, there are two components that go into a seismic hazard analysis: (1) a seismic source model that characterizes the active faults and background (random) seismicity around a site and (2) ground motion attenuation relationships. The latter are used to estimate ground motions given, in general, magnitude, distance, and site condition. Based on a preliminary review, URS does not believe there is any new information on active faults that would impact the hazard at White Mesa. For the latter however, the attenuation relationships that have been used in practice date back to 1997.

These include relationships developed by three teams: Abrahamson and Silva, Sadigh et al., and Boore et al. (USGS). All these relationships have been updated and preliminary versions have been posted on the website for the Pacific Earthquake Engineering Research Center (PEER), a NSF-sponsored center that supported updating of the relationships. URS has all of the new relationships but have evaluated only one to date; Abrahamson and Silva, which is the most accepted and used relationship in the U.S.

In this new relationship, the peak horizontal acceleration for M 5 to 5.5 earthquakes increases by a factor of two. The probabilistic hazard in the Colorado Plateau where both the Atlas Moab and White Mesa sites are located is controlled by earthquakes in the M 5 to 6 range. Therefore, it is difficult to say what the impact may be on probabilistic hazard at White Mesa or any other site in the Colorado Plateau without running the calculations using the current methods, but they could go up. The other new relationships which would also be used in a probabilistic seismic hazard analysis would need to be looked at to see whether the levels of ground motions go up or go down compared to the ones in 1997.

As stated in the previous interrogatories, an updated evaluation of the seismic hazards for the site that will result in the estimation of the seismic loading (proposed ground acceleration) using the most current data and methods needs to be performed.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

Wong, Ivan G., Olig, Susan S., and Bott, Jacqueline D.J. 1996. Earthquake Potential and Seismic Hazards in the Paradox Basin, Southeastern Utah. 1996 Utah Geological Association Guidebook, pages 241 to 250.

Wong Ivan G., Olig, Susan S., Hassinger, Bruce W., Blubaugh, Richard E. 1997. Earthquake Hazards in the Intermountain US: Issues relevant to uranium mill tailings disposal. Tailings and Mine Waste 1997, pages 203 to 212.

INTERROGATORY IUC R313-24-4-06/05: BEST AVAILABLE TECHNOLOGY

PRELIMINARY FINDING:

*Refer to R313-24-4, R317-6-1.13: **Best Available Technology** means the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs.*

*Refer to R313-24-4, R317-6-6.4(A)(3/112): The Executive Secretary may issue a ground water discharge permit for a new facility if the Executive Secretary determines, after reviewing the information provided under R317-6-6.3, that: 1.the applicant demonstrates that the applicable class TDS limits, ground water quality standards protection levels, and permit limits established under R317-6-6.4E will be met; 2. the monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;3. the applicant is using **best available technology** to minimize the discharge of any pollutant; and 4. there is no impairment of present and future beneficial uses of the ground water.*

INTERROGATORY STATEMENT:

IUC proposes that a cyclone be used to process the tailings slurry. The cyclone will separate out the coarser sand fraction of the slurry, which will then be placed over the slimes drain as a drainage blanket. Please note that the details of the tailings processing must be included in the cell operations procedures to be provided by IUC as part of Phase 2. These procedures need to include methods for placement of the tailings as part of the slimes drain layer so that the amount of the coarser sand in maximized, uniform, and the amount of fines minimized. In addition, it should be noted that if tailings are to be placed in the southeast corner, an HDPE splashguard is needed in this area. This must be included on the drawings to be submitted prior to the start of work.

In addition, please provide an evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove tailings solution in an efficient and timely manner and more drain pipes and/or sand layer carried into the remaining portion of the cell are not beneficial (as discussed in the August 2, 2006 conference call between DRC and IUC representatives).

There seems to be a discrepancy between the ALR value given (in gallons/acre/day) between the calculated value included in the ALR calculation provided in the calculation dated May 23, 2006 (provided by IUC in their May 24, 2006 response to the Completeness Review) and the values in the tables provided with IUC's August 28, 2006 response letter. The table lists the ALR for 37 feet of head as 604.01 gallons/acre/day, whereas the calculations (page 4 of 6) state the ALR for 37 feet of head as 587 gallons/acre/day. This discrepancy needs to be clarified and corrected as appropriate.

Please note that since the evaluation of the flow in the geonet assumes no adverse impact from uncertainties due to installation, quality control and assurance during installation must be thoroughly implemented and documented in the CQA Report for the liner system.

BASIS FOR INTERROGATORY:

For waste cell liner systems as proposed for Cell 4A, the State of Utah considers BAT to be a double liner with leachate collection/detection systems. For Cell 4A, this was defined in Round 1 Interrogatory. Round 1, 2, and 4 Interrogatories expressed concerns about different aspects of the liner system. Specifically ones concerning the GCL, the ability of the slimes drain to remove tailing solution in a timely manner, the ALR, and some miscellaneous design calculations.

Slimes Drain Layer

Round 2 and 4 Interrogatories included the following request:

> *"Please provide a Leachate Monitoring, Operations, Maintenance, and Reporting Plan that includes an estimate of the anticipated flow rates and maximum capacity in the leachate collection system (slimes collection layer). This estimate must include a calculation that:*
>
> - *Estimates the flow rate of the tailings cell solution through the tailings and into the collection pipes.*
> - *A demonstration that the sand fraction will settle out and provide an adequate slimes drainage layer, this sand drainage layer is properly designed so that tailings fines will not filter into it and result in the clogging of the sand layer (restricting flow in this drainage layer), and that the proposed collection pipe layout is adequate to collect and remove the leachate solution."*

IUC proposed in their August 25, 2006 response to this request that a cyclone be used to process the tailings slurry. The cyclone will separate out the coarser sand fraction of the slurry, which will then be placed over the slimes drain as a drainage blanket. The placement of this coarser sand fraction would start in the southwest corner, and then move to the north. The finer fraction of the tailings would be placed in Cell 3 or in Cell 4A along the north or east sides. This approach should provide for a drainage blanket over the slimes drain thus facilitating the timely removal of solution from the tailings through the slimes drain.

As a follow-up to this, DRC feels the method and movement of the piping depositing the sand from the cyclone, could have a significant influence on the gradation and stratification of the sand and fines in the drainage layer. Thus, the method of depositing the material will need to be defined, for the sand drainage layer to perform at optimum. DRC encourages this method to be defined now.

However, the details of tailings processing, at latest, must be included in the cell operations procedures to be provided by IUC as part of Phase 2.

In addition, it should noted that if tailings are to be placed in the southeast corner, a splashguard will be needed in this area. This must be included on the drawings.

Also, as discussed in the August 2, 2006 conference call between DRC representatives and IUC, IUC was to provide an evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove tailings solution in an efficient and timely manner.

ALR

The Action Leakage Rate, which is defined as the maximum design flow rate that the leak detection system can rapidly remove without the fluid head on the liner exceeding one (1) foot, needs to be determined. IUC provided the calculation of the Action Leakage Rate in their May 24, 2006 response. However, the review of this calculation revealed the following concerns:

1. *It is our understanding that during some periods of cell operation, the volume of process liquids stored in Cell 4A will be less than 37 feet in height. During such time periods, the flow (leakage) rates to the leak detection system will be less than when the full 37 feet of liquid head would be present. In other words, the calculated action leakage rate is a function of fluid head, and a fluid head less than 37 feet will have a lower action leakage rate. Therefore, since the action leakage rate is a function of the fluid head, and the head on the liner in the cell will vary with time and facilities operations, a correlation of fluid head to action leakage rate needs to be developed and used so that the appropriate action leakage rate is used and the function of the liner properly monitored.*

   IUC's June 30, 2006 response to Round 2 Interrogatories included a plot of the ALR verses the head above the primary geomembrane. However, the corresponding calculations and listing of the data generated/used as the basis of the plot must be provided. IUC's August 28, 2006 response to Round 4 Interrogatories included tables outlining the respective ALR calculation and a listing the ALR with the corresponding head above the liner. However, there seems to be a discrepancy between the ALR value given (in gallons/acre/day) in the table with the calculated value included in the ALR calculation provided in the calculation dated May 23, 2006 provided by IUC in their May 24, 2006 response to the Completeness Review. The table lists the ALR for 37 feet of head as 604.01 gallons/acre/day, whereas the calculations (page 4 of 6) state the rate for 37 feet of head as 587 gallons/acre/day. This discrepancy needs to be clarified and corrected as appropriate.

2. *Round 2, and 4 Interrogatory requested that the Specifications and Construction Quality Assurance Plan must be revised as needed to reflect appropriate procedures for installing and adjoining geonet panels and geonet pieces based on the final selected geonet type to ensure constancy with design assumptions, particularly the assumption that that the assumed partial factor of safety that addresses uncertainty and damage as a result of installation is 1.0 (indicating that there will not be any damage to the geonet that would impact it's function).*

This was further discussed in the August 2, 2006 conference call between DRC representatives and IUC.

Revisions have been included in Section 02773 of the technical specification provided with IUC's August 28, 2006 response. These include the addition of item 3.01.B; "Geonet shall be placed with the machine direction perpendicular to the contour intervals (direction of flow", and the requirement (in a footnote to Table 02770-1) that the geonet transmissivity be measured with the geonet between smooth HDPE liners (under the respective load). Proper quality control and assurance of the geonet installation requirements will satisfy this concern. However, please note that the proper installation of the geonet must be thoroughly documented in the final CQA Report on the liner system.

Inconsistencies in Project Calculations

Further review revealed some inconsistencies in the project calculations. These were requested in Round 2 and 4 Interrogatories with the corresponding revised calculations sheets and clarifications provided with IUC's August 28, 2006 response letter. The information provided satisfies this request.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

GSE. Technical Note: "Installation of Geosynthetic Drainage Products". Undated. Available at:

http://www.gseworld.com/Literature/TechnicalNotes/PDF/TN025installationgeo.pdf

Koerner, R.M. 1997. Designing with Geosynthetics, Fourth Edition.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

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Richardson, G.N., and Zhao, A. 1999. Design Manual for Lateral Drainage Systems for Landfills

Thiel, R., Criley, K., and Bryk 2005. "Practical Guidelines for Specifying GCL Overlaps", Geotechnical Fabrics Report, October/November 2005. St. Paul, MN.

40 CFR 264.301.