UTAH DIVISION OF RADIATION CONTROL

URANIUM ONE, INC.

SHOOTARING CANYON URANIUM PROCESSING FACILITY

REQUEST TO RESUME OPERATIONS

INTERROGATORIES – ROUND 3

FEBRUARY, 2008

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ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
BAT	Best Available Technology
CCQAP	Construction Control Quality Assurance Plan
CFR	Code of Federal Regulations
COD	Chemical Oxygen Demand
DOT	US Department of Transportation
DQO	Data Quality Objectives
DRC	Department of Radiation Control (Utah)
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
EPPC	Evaporation and Process Pond Cell
FML	Flexible Membrane Liner
GPD	Gallons per Day
GPM	Gallons per Minute
HDPE	High Density Polyethylene
LCRS	Leachate Collection and Removal System
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mg/l	Milligram per liter
MHGA	Maximum Predicted Horizontal Ground Acceleration
NBS	National Bureau of Standards
pCi/g	Picocurie per gram
PE	Potential Evaporation
PET	Potential Evapotranspiration
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
RMTP	Reduced Moisture Tailings Placement
SARA	Superfund Amendments and Reauthorization Act

SDR	Standard Dimension Ratio
SOP	Standard Operating Procedures
TEDE	Total Effective Dose Equivalent
TMP	Tailings Management Plan
TRDP	Tailings Reclamation and Decommissioning Plan
TSS	Total Suspended Solids
URCR	Utah Radiation Control Rules

SUMMARY OF REQUESTED ITEMS

Please note information that Uranium One (U1) previously submitted to DRC may be provided in U1 responses by reference. However, each reference should be clear and specific or focused, i.e., the reference should include the title, author, date, page, and paragraph that included the information referenced, and how the reference is pertinent. Please refer to the interrogatories for the context of the item requests below:

1. Provide revised and updated TMP.
2. Address comments on the inspection and record maintenance procedures.
3. Provide a revised figure of the entire site showing MARSSIM area classifications.
4. Additional information and clarifications on the milling operations.
5. Address comments on the seismic evaluation for the site.
6. Confirmation of permeability of the clay liner.
7. Additional clarification on the liner design calculations.
8. Clarifications on the drainage layer fabric and sand in the liner system.
9. Evaluation of the anticipated settlement associated with the final cell.
10. Complete cell plans and specifications that are certified by a Professional Engineer in the State of Utah that cover the construction of the cell are needed before the design can be approved and a construction permit issued. They need to be of the quality that can be used for construction.
11. Estimated capacity of the leachate collection and leak detection system, and ensure they function so the maximum head defined for each liner is not exceeded.
12. Additional justification or analysis that demonstrates that the cover will not experience unacceptable degradation through time.
13. Additional information and clarifications on the proposed groundwater monitoring.
14. An evaluation of the potential discharge of tailings solution to groundwater.
15. Expanded design for surface water control during operations.
16. Clarifications on cover parameters used in the radon modeling for the cover.
17. Clarifications and additional information on the proposed post closure erosion controls.
18. Additional information on proposed dust control.
19. Additional information on the basis for cost estimates provided.

Please note that the Division will include specific license conditions that will address the need for complete standard operation procedures that cover operation, maintenance, inspection, and health and safety of the mill and tailings management prior to the start of operations.

INTERROGATORY R313-24-1(3)-02/03: SUMMARY OF REGULATORY REQUIREMENTS

PRELIMINARY FINDING:

Refer to R313-24-1(3: The requirements of Rule R313-24 are in addition to, and not substitution for, the other applicable requirements of Title R313. In particular, the provisions of Rules R313-12, R313-15, R313-18, R313-19, R313-21, R313-22, and R313-70 apply to applicants and licensees subject to Rule R313-24.

INTERROGATORY STATEMENT:

1. *Please provide a revised Tailings Management Plan that includes revisions as presented on Uranium One's response to Round 2 of this Interrogatory.*

BASIS FOR INTERROGATORY:

Section 2 of the Tailings Management Plan appears to be a summary of the regulatory requirements and how the proposed tailings management will meet these regulations. This is a useful summary. Uranium One provided clarifications requested for this section in their response to Round 1 Interrogatory, as well as proposed text in response to Round 2 Interrogatory. The proposed revisions to section 2.1.1 appear to address the concerns expressed in this Interrogatory; however, the proposed revisions have some editorial inconsistencies with other portions of Section 2.1. It is assumed that once the revised TMP is prepared that these inconsistencies will be resolved and appropriate references will be included.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-05/03: DAILY INSPECTIONS OF WASTE TAILINGS

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40.26(c)(2): The documentation of daily inspections of tailing or waste retention systems and the immediate notification of the Executive Secretary, of any failure in a tailing or waste retention system that results in a release of tailings or waste into unrestricted areas, or of any unusual conditions (conditions not contemplated in the design of the retention system) that if not corrected could lead to a failure of the system and result in a release of tailings or waste into unrestricted areas; and any additional requirements the Executive Secretary my by order deem necessary. The licensee shall retain this documentation of each daily inspection as a record for three years after each inspection is documented.

Refer to R313-24-4, 10 CFR 40 Appendix A(8)(a): Daily inspections of tailings or waste retention systems must be conducted by a qualified engineer or scientist and documented. The licensee shall retain the documentation for each daily inspection as a record for three years after the documentation is made. The Executive Secretary, must be immediately notified of any failure in a tailings or waste retention system that results in a release of tailings or waste into unrestricted areas, or of any unusual conditions (conditions not contemplated in the design of the retention system) that is not corrected could indicate the potential or lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

Refer to R317-6-6.3 (O): Unless otherwise determined by the Executive Secretary, applicant for a groundwater discharge permit ...shall include the following information: O. Methods and procedures for inspections of the facility operations and for detecting failure of the system.

INTERROGATORY STATEMENT:

Please provide a revised draft tailings inspection procedure that outlines what inspections, evaluations, and documentation will to be performed, and includes a commitment to finalize and provide to the DRC for review the respective detailed procedure prior to commencement of operations.

Ensure that the inspections address inspections to be performed to include, but not be limited to the integrity and proper function of:

- *Leak detection system*
- *Upper tailings (slime) drain system*
- *Cell solution elevation*
- *Tailings elevation*
- *Slurry transport system inspection*
- *Retention dam inspection*
- *Diversion and storm water channel inspection*
- *Embankment Settlement*

- *Embankment Slope Conditions*
- *Seepage*
- *Slope Protection*
- *Emergency Discharge Facility*
- *Safety and Performance Instrumentation*
- *Operation and Maintenance Features*
- *Postconstruction Changes*
- *Inspections following significant earthquakes, tornadoes, floods, intense rainfalls, or other unusual events.*
- *Groundwater Monitoring systems*
- *Tailings piles*

The procedure needs to also address:

- *Procedure revisions*
- *Conditions under which the Executive Secretary will be notified and if corrective measures are needed, how they will be identified, implemented, and documented*
- *That the inspections and evaluations will be performed by a qualified professional such as a qualified engineer or geologist familiar with the construction, operation and inspection of tailings impoundments*

BASIS FOR INTERROGATORY:

The revised SOP AP-3 (version 2.3) as submitted in the 11/28/07 response to Round 2 of this Interrogatory provides an initial basis for the tailings impoundment inspection procedures. However, lacks specific details on the implementation of the inspections and any follow up corrective measures that may be required. For example, the procedure calls for examination of the decant systems, effluent from underdrain pipes, and sumps for proper function. However, what the examination includes and how the results of the examination are evaluated is not specified. The proper function of these components is critical to the integrity of the cell. The specific cell component to be inspected, how it is to be implemented, and how it is evaluated for proper performance needs to be defined. This will include the evaluation of visual observations as well as data generated by the respective system component (ie, flow rates, solution and tailings characteristics and levels, etc.).

The inspections as well as the evaluations need to be performed by a qualified professional such as an engineer or geologist familiar with the construction, operation and inspection of tailings impoundments.

NRC Regulatory Guides 3.11 and 3.11.1(complete references provided below) provide guidance on the inspection of tailings (embankment) systems and can be provided, upon request, to facilitate resolution of this interrogatory.

Based on recent discussions with Uranium One, it is the DRC's understanding that the tailing cell design has been revised from what has been submitted to date, and the inspection procedure will need to be revised to address the items included in this interrogatory as reflected in the final design. It is also recognized that the development of these procedures is most effective after the design and operation of the tailings cell has been developed and finalized. In addition, the procedures will need to be updated during operations to ensure optimal efficiency and effectiveness. Therefore, to complete the license application a draft procedure needs to be included that outlines what will be done and includes a commitment to finalize the respective procedure and provide the final procedure to the DRC for review prior to commencing operations.

REFERENCES:

NRC. Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills." Washington DC. NRC December 1977.

NRC. Regulatory Guide 3.11.1, "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mills." Washington DC. NRC October 1980.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended April 2007.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Shootaring Canyon Uranium Processing Facility Environmental Report, Source Material License No. UT0900480", Dated January 2006.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-06/03: MAINTAINING RECORDS

PRELIMINARY FINDING:

Refer to R313-12-51 (1); "licensee or registrant shall maintain records showing the receipt, transfer, and disposal of all sources of radiation", and 10 CFR 40.61(a); "Each person who receives source or byproduct material pursuant to a license issued pursuant to the regulations in 10 CFR 40 shall keep records showing the receipt, transfer, and disposal of this source or byproduct material as follows:…".- See requirements under 10 CFR 40.61(a)(1) through (4).

Refer to R313-22; Persons licensed under Rule R313-22 shall keep records of information important to the decommissioning of a facility in an identified location until the site is released for unrestricted use. Before licensed activities are transferred or assigned in accordance with Subsection R313-19-34(2), licensees shall transfer all records described in Subsections R313-22-35(7)(a) through (d) to the new licensee. In this case, the new licensee will be responsible for maintaining these records until the license is terminated. If records important to the decommissioning of a facility are kept for other purposes, reference to these records and their locations may be used.

INTERROGATORY STATEMENT:

Standard Operating Procedure HP-25 (Revision 0.4) identifies a means for recording the amount of by product material generated. However, lacks details on the actual implementation of the procedure and evaluation of the data. As with the inspection procedure discussed in Interrogatory R313-24-4-05/03, a draft of this procedure can be submitted as part of the application with the final being developed and provided to the DRC prior to the start of operations.

Be sure the final procedure developed addresses the following questions identified during the review of HP-25:

1. *Please clarify the sample collection procedure for each process, or reference the applicable procedure. Please clarify how and when composite sampling will be used and performed. Please define the term, "composted," as used in Section 7.4.*
2. *Section 7.2, "Document and Verify the Amount of Yellowcake Produced and Transferred Offsite." Ensure the process for determining yellowcake amount does not include the weight of the container. Ensure the field inventory verification is performed by qualified personnel and documented. Ensure the applicable form reflects changes to the text.*
3. *Section 7.3, "Document and Verify the Amount of Tailings Placed in Tailings Facility." Ensure that the tasks identified in this section describe how a technician will determine the quantity of tailings that any sample represents and the quantity of tailings actually added to the Tailings Facility. Per form U1 25-4, the determination of the flow rate is "From Mill Operator". How is the mill operator going to determine this? This is a critical component in calculating the quantity of tailings the sample represents.*
4. *Please clarify what is done with the forms generated by the procedure following entry into the MBTD, or reference the applicable procedure.*

5. *Please clarify what is entailed in review, modification, and validation of MBTD data entry, report generation, and programming, or reference the applicable procedure.*

BASIS FOR INTERROGATORY:

The regulations require the licensee/registrant to maintain records of all sources of radiation. This implies accuracy and precision of the inventory. The questions identified above reflect the need for accuracy and precision within the inventory system. If applicable, provide additional text in the respective reference document and forms to provide additional explanation of this system. A draft procedure can be submitted with the license application that includes a commitment to develop and provide to the DRC for review, a final procedure prior to the start of operations.

REFERENCES:

Plateau Resources, Ltd., "Shootaring Canyon Uranium Processing Facility Environmental Report, Source Material License No. UT0900480", Dated January 2006.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December 2005.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December 2005.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-12/03: SOIL FINAL STATUS SURVEY FOR SITE DECOMMISSIONING

PRELIMINARY FINDING:

Refer to R313-22-32(2): The Executive Secretary may, after the filing of the original application, and before the expiration of the license, require further statements in order to enable the Executive Secretary to determine whether the application should be granted or denied or whether a license should be modified or revoked.

INTERROGATORY STATEMENT:

Please provide a revised Figure 8-1 that includes the MARSSIM classification of the entire site and reflects the most current proposed design.

BASIS FOR INTERROGATORY:

The Round 2 Interrogatory response from Uranium One provides clarification on the MARSSIM classification of the different areas of the site. Figure 8-1 that was included shows these different areas. However, the figure does not show the entire cell area and needs to reflect any impacts from the revised design.

The TRDP will need to be revised to include the revised text (clarifications) as well as Figure 8-1.

REFERENCES:

Abelquist, E. W. 2002. "Decommissioning Health Physics: A Handbook for MARSSIM Users," ISBN 0750307617.

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Rev. 1, Appendix D.

Pacific Northwest National Laboratory 2006b. Visual Sample Plan Version 4.4. Available at http://dqo.pnl.gov/

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-1-14/03: MILLING OPERATIONS

PRELIMINARY FINDING:

Refer to 313-24-4; 10 CFR 40.31(h); An application for a license to receive, possess, and use source material for uranium or thorium milling or byproduct material, as defined in this part, at sites formerly associated with such milling shall contain proposed written specifications relating to milling operations and the disposition of the byproduct material to achieve the requirements and objectives set forth in appendix A of this part. Each application must clearly demonstrate how the requirements and objectives set forth in appendix A of this part have been addressed. Failure to clearly demonstrate how the requirements and objectives in appendix A have been addressed shall be grounds for refusing to accept an application.

INTERROGATORY STATEMENT:

In order to understand the handling and processing of the waste tailings and slurry, please provide the following information:

1. *A complete material/production flow diagram that including estimated production and material feed rates and the properties of the solids and liquids generated, starting at the ore pile and ending up in the tailings pile, and evaporation pond. The diagram should include the proposed locations and layout of the liquid extraction equipment, tailing placement equipment, secondary containment components, and transfer piping. Include descriptions of the equipment and process.*
2. *Procedures covering the placement of the tailings into the cell so as to minimize the impact on the drainage and liner system and not exceed the maximum head on the upper liner as defined by the respective groundwater permit.*
3. *A demonstration that the head on the upper liner will not exceed the maximum allowable head on this liner as defined by the respective groundwater permit.*

BASIS FOR INTERROGATORY:

A material flow diagram should be provided that includes the production rates and the properties of the product generated, liquids generated, tailings generated, reagents used, losses, etc., starting at the ore pile and ending up in the tailings pile, and evaporation pond. This information is required to demonstrate that the objectives set forth in 10 CFR 40.31(h), Appendix A, have been addressed.

Uranium One's response to Round 2 of this Interrogatory states that the tailings will be placed into the cell as slurry and that dewatering of the tailings will be done through the use of a conventional underdrain system. Also, as a result, there will be free liquid ponded in the cell during operations. Therefore, procedures for alternate tailings solution extraction will not be employed. However, the means by which the tailings will be placed so as to minimize the impact on the underlying drain and liner system and not exceed the maximum head on the upper liner, as defined by the respective groundwater permit, needs to be provided and demonstrated.

REFERENCES:

Plateau Resources, Ltd., "Shootaring Canyon Uranium Processing Facility Environmental Report, Source Material License No. UT0900480", Dated January 2006.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended April 2007.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-16/03: SEISMIC HAZARD CHARACTERIZATION

PRELIMINARY FINDING:

Refer to Criterion 1 of 40 CFR Part 40, Appendix A, Criterion 1"… In the selection of disposal sites, primary emphasis must be given to isolation of tailings or wastes, a matter having long-term impacts, as opposed to consideration only of short-term convenience or benefits, such as minimization of transportation or land acquisition costs. While isolation of tailings will be a function of both site and engineering design, overriding consideration must be given to siting features given the long-term nature of the tailings hazards";

Refer to Criterion 4 of 40 CFR Part 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."

Refer to Criterion 1 of 40 CFR Part 40, Appendix A, Criterion 6(1): …[Uranium mill tailings disposal shall be] "in accordance with a design that provides reasonable assurance of control of radiological hazards to be effective for 1,000 years, to the extent reasonably achievable, but in any case for at least 200 years…" ;

INTERROGATORY STATEMENT:

Please address the following comments on the seismic hazard analysis that was included with Uranium One's response to Round 2 of this Interrogatory:

Significant Comments:

1. *Section 1.2: Which "USGS Peak Acceleration Map?" Please provide a reference. Is it a deterministic or probabilistic map?*
2. *Section 1.2.1: Provide a reference for the LLNL report.*
3. *Section 1.2.1, third paragraph: What "fault splays?"*
4. *Section 1.2.2: If the PGA map is not well documented, an attempt needs to be made to determine its origin and documentation?*
5. *Section 1.2.2: The hazard is not due to "random seismicity of the central and eastern U.S. (CEUS)." The hazard is due to background seismicity within the Colorado Plateau around the site. Please clarify.*
6. *Section 1.2.2: The site is not located within the CEUS. The USGS has assigned the Colorado Plateau to the CEUS for the purposes of assigning attenuation models. Please clarify.*
7. *Section 2.0: This section either needs to refer to other documents or needs to be expanded. As it stands, it is an inadequate discussion of the topic. For example, there is no discussion of the tectonic stress field, which is mentioned later when selecting ground motion attenuation relationships to be used in the seismic hazard analysis. References need to be cited.*

8. *Section 3.1: Replace "repeat occurrences from different reporting stations" which is incorrect, with "duplicate events."*
9. *Section 3.2: No need for this subsection here since it is under the heading of "Seismicity." Move the discussion to Section 4.1.*
10. *Section 4.0, first paragraph: Faults are "not attenuated to the site." Ground motions are attenuated. Same with the MCE. It is not "attenuated to the site." Please clarify.*
11. *Section 4.0, first paragraph: Median plus one sigma ground motions are used in deterministic analysis. The log mean of medians from several attenuation relationships is also used and preferred. Please clarify.*
12. *Section 4.0, second paragraph: The random earthquake is <u>not</u> placed underneath the site in traditional deterministic hazard analysis. The earthquake is generally placed at a horizontal distance of 15 km from the site. Please clarify.*
13. *Section 4.0, third paragraph: "Building codes typically utilize 10% chance of exceedance." This is no longer the case. The International Building Code, which is the prevalent code in the U.S., uses a 2% probability of exceedance in 50 years. Please clarify.*
14. *Section 4.0, third paragraph: Starting with "For the purpose of the seismic hazard evaluation…" Please clarify; are the authors suggesting a 10% exceedance in 1,000 years results in a return period of 10,000 years?*
15. *Section 4.1.1: Expanded justification of why these 7 faults were selected is needed. Just because it may be "conservative" is not an acceptable criterion. For example, it is well known that the Needles fault zone is due to shallow salt tectonics and is not seismogenic. Numerous studies have been done on this fault zone. Similarly, the Shay Graben faults are due to salt tectonics. I refer the authors to the PSHA that was performed for the Atlas Uranium Mill tailings site in Moab by Woodward-Clyde Consultants (1996) (also Wong et al., 1996). Work by Brumbaugh (2005) evaluating the Bright Angel fault system suggesting they are not seismogenic should be cited.*
16. *Section 4.1.1: There needs to be expanded discussion on the selection of seismic source parameters and the associated weights.*
17. *Section 4.1.2: Explain why Gaussian smoothing (Frankel, 1995) was not considered in the PSHA? Background seismicity does not need to be treated as "random."*
18. *Section 4.1.2: How was the recurrence calculated as shown on Figure 4? It appears to be a simple least-squares fit. The maximum likelihood technique using the truncated exponential model is generally used in hazard analysis. A truncated exponential model should have been used since there is a maximum magnitude of **M** 6.3 for the random earthquake. Note the recurrence curve goes out to **M** 6.5.*
19. *The inclusion of the Intermountain Seismic Belt (ISB) events may not lead to more conservative (shorter) recurrence. This needs to be demonstrated.*
20. *Section 4.2: There is no mention of the Pacific Earthquake Engineering Research (PEER) Center Next Generation Attenuation (NGA) relationships, which have been*

released in 2007. For example, the Campbell and Bozorgnia (2003) model used in the study has been replaced by Campbell and Bozorgnia (2007), which was released in May 2007. The latter explicitly includes normal faulting. Abrahamson and Silva (1997) has been replaced by Abrahamson and Silva (2007), but this model was probably not available to the authors at the time they performed the seismic hazard analyses.

21. *Section 4.2: How many ground motion sigmas (aleatory) was the hazard truncated in the PSHA?*
22. *Section 4.3, first paragraph: State the PGA of 0.25 g is an 84th percentile value. Are the PGA values shown in Table 2 lognormal means from the three attenuation relationships?*
23. *Section 4.3, Table 2: It is meaningless to cite MCE magnitudes to a hundredth of a unit. The epistemic uncertainties in rupture length and magnitude and the aleatory uncertainty in the Wells and Coppersmith (1994) relationship results in an uncertainty on the order of 0.3 unit. Please clarify.*
24. *Section 4.3, Table 3: Explain this table as being the hazard contribution to the total mean hazard at a return period of 10,000 years. The table is being portrayed in a deterministic manner as in Table 2, which it is not. Please clarify.*
25. *Section 4.4: It would be useful to see the magnitude and distance deaggregation plots for a 10,000-year return period. What are the modal magnitude and distance value for a return period of 10,000 years?*
26. *Section 5.0: Are vertical ground motions required?*
27. *Figure 1: Showing all the known seismicity in the site region particularly near the site would have been valuable. These data are available from the University of Utah and other organizations. This leads to the question of whether the historical seismicity (**M** < 4) was adequately evaluated in this study.*
28. *Appendix C.1: Calculating the ground motions for faults beyond 100 km is really of no value because they have no engineering relevance. See Comment 23 on magnitudes. The "average" PGA values appear to be an arithmetic average. Ground motions are lognormally distributed so the lognormal mean should be calculated.*
29. *Appendix C.2: See Comment 15. What are the bases of the weights? Why were these weights chosen? MCE magnitudes needed to be rounded (Comment 23).*

Minor Comments:

1. *Section 1: Interestingly only PGA is required for the seismic stability analysis rather than a spectrum. What type of analysis was performed?*
2. *Section 1.1: No figure cited. A small-scale location map with the towns mentioned would be useful.*
3. *Section 1.2.1, first paragraph: "1-sigma" should be replaced with "median plus one sigma."*
4. *Section 3.1: "Aftershocks and foreshocks" are removed to obtain a catalog of independent events since a Poissonian assumption is used in the PSHA.*

5. *Section 3.1: Replace "low intensity" with "small magnitudes." Very few of the events in the catalog were felt and so intensities were not reported.*
6. *Section 3.1: Expand the discussion on the largest event in the site region, a **M** 6.5 near Richfield, and the 1986 earthquake near the site, which is discussed in Wong and Humphrey (1989).*
7. *Section 4.0, third paragraph, first line: What is meant by "characteristic ground motions" in this context?*
8. *Section 4.1.1, fourth paragraph, 14th line: What is this sentence meant to say with the "±0.3" at the end? Sentence needs to be rewritten.*
9. *Section 4.1.2: The Woodward-Clyde Consultants (1996) study used a maximum magnitude of **M** 6.0 ±0.5 for the background seismicity not **M** 6.3.*
10. *Section 4.2: Please cite justification for the use of extensional ground motion attenuation models.*
11. *Figure 3: It would be helpful to label the linear fits(?) by the magnitude bins.*

BASIS FOR INTERROGATORY:

As stated in the June 2006 interrogatory R313-24-4-16/02 request:

> *"Please provide additional information to support the determination of an appropriate and consistent maximum predicted horizontal ground acceleration (MHGA) for the site. Please include sufficient information regarding historical seismicity and deterministic or probabilistic methodologies used to derive the estimated MHGA value, and to demonstrate that the proposed MHGA value reflects the most current information available regarding predicted seismic hazard levels in eastern/southeastern Utah and the area including the site. Seismic stability analyses should be based on this MHGA value."*

The updated deterministic and probabilistic seismic hazard analyses described in Attachment D represents a state-of-the-practice approach to assessing ground shaking hazard at a site. However, the approach taken to the analyses is simplistic and mechanical. Overall the documentation of the analyses is lacking with very little discussion on the justification of the input parameters. The analysts have relied upon the readily available USGS Quaternary fault and fold database and have not attempted to update these data with more current information. Important references have not been evaluated and/or they are not cited. In particular, a study of the seismicity and active faulting in the site area by Wong and Humphrey (1989) and studies across the border into Arizona by Brumbaugh (2005) have not been cited. The analysis by Woodward-Clyde Consultants (1996) for a site near Moab in the same tectonic setting as the Shootaring Canyon site should have been discussed since the inputs and results are quite relevant.

Probabilistic seismic hazard analyses (PSHA) are performed to estimate the mean hazard at a site. If properly done, the mean hazard should not be conservative or unconservative. Conservatism is addressed by selecting a higher hazard fractile or a longer return period. In several instances, the choice of input parameters has been justified because the authors thought

it was conservative (higher hazard). This is not a proper use of PSHA. The SSHAC (1997) guidelines should have been referenced and followed in the performance of this PSHA.

REFERENCES:

Abrahamson, N.A. and Silva, W.J., 1997, Empirical response spectral attenuation relations for shallow crustal earthquakes: Seismological Research Letters, v. 68, p. 94-127.

Abrahamson, N.A. and Silva, W.J., 2007, NGA Ground motion relations for the geometric mean horizontal component of peak and spectra ground motion parameters: Pacific Earthquake Engineering Research Center Report 2007/__ (in review).

Brumbaugh, D.S., 2005, Active faulting and seismicity in a prefractured terrane: Grand Canyon, Arizona: Bulletin of the Seismological Society of America, v. 95, p. 1561-1566.

Campbell, K.W. and Bozorgnia, Y., 2003, Updated near-source ground motion (attenuation) relations for the horizontal and vertical components of peak ground acceleration and acceleration response spectra: Bulletin of Seismological Society of America, v. 93, p. 314-331.

Campbell, K.W. and Bozorgnia, Y., 2007, NGA Ground motion relations for the geometric mean horizontal component of peak and spectra ground motion parameters: Pacific Earthquake Engineering Research Center Report 2007/02, 246 p.

Frankel, A., 1995, Mapping seismic hazard in the central and eastern United States, Seismological Research Letters, v. 66, p. 8-21.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended April, 2007.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Senior Seismic Hazard Analysis Committee (SSHAC), 1997, Recommendations for probabilistic seismic hazard analysis-guidance on uncertainty and use of experts: U.S. Nuclear Regulatory Commission NUREG/CR-6327, variously paginated.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

Wells, D.L. and Coppersmith, K.J., 1994, New empirical relationships among magnitude, rupture length, rupture width, rupture area, and surface displacement: Bulletin of the Seismological Society of America, v. 84, p. 974-1002.

Wong, I.G. and Humphrey, J.R., 1989, Contemporary seismicity, faulting, and the state of stress in the Colorado Plateau: Geological Society of America Bulletin, v. 101, p. 1127-1146.

Wong, I.G., Olig, S.S., and Bott, J.D.J., 1996, Earthquake potential and seismic hazards in the Paradox Basin, southeastern Utah, in Geology and Resources of the Paradox Basin, 1996 Special Symposium, A.C. Huffman, W.R. Lund, and L.H. Godwin (eds.), Utah Geological Association and Four Corners Geological Society Guidebook 25, p. 241-250.

Woodward-Clyde Federal Services, 1996, Evaluation of potential seismic and salt dissolution hazards at the Atlas Uranium Mill Tailings site, Moab, Utah: unpublished report prepared for Smith Environmental Technologies and Atlas Corporation.

INTERROGATORY R313-24-4-19/03: DOUBLE LINER SYSTEM CQAP PLAN AND SPECIFICATIONS

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(5)(a)(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:

Please revise the CQAP:

- *To include testing to demonstrate that the clay used for the bottom liner meets the $1x10^{-7}$ cm/s **field** hydraulic conductivity requirement. This can be done by using the following test method (or an approved variation):*
    - *ASTM D5093-02 Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring*

  If a variation of this method or an alternate method is proposed (such as a single-ring infiltrometer), it needs to be submitted to the DRC for review and concurrence.

BASIS FOR INTERROGATORY:

As stated in Round 1 and 2 Interrogatories, the applicant proposes to use a double liner with leak detection in order to prevent migration of wastes out of the impoundment (sections 4 & 5, TMP). The applicant indicates that the double liner with the leak detection system design is the Best Available Technology (BAT) and comparable to similar facilities in the industry. However, there is insufficient information provided in the Construction Control Quality Assurance Plan (CCQAP) and only limited detailed plans and specifications are provided for the construction of

Cell 1 and 2. The deficiencies in the CCQAP are addressed in this interrogatory, while the deficiencies in the plans and specifications are addressed in a separate interrogatory.

*As presented in Round 2 of this Interrogatory, the requirement for the hydraulic conductivity of the clay liner is an in-place **field** hydraulic conductivity of $1x10^{-7}$ cm/s or less. This is considered BAT for liner systems. Uranium One needs to provide a demonstration that the clay used for the bottom liner meets this requirement. In the response to this interrogatory in round 1, Uranium One stated that field permeability testing would prove too difficult, and preliminary laboratory testing indicated permeability's in the 10^{-8} cm/sec range. Further justification is needed as to why field permeability testing has not been successfully completed, and as to the difficulty is performance of the testing.*

According to "Assessment and Recommendations for Improving the Performance of Waste Containment Systems" (see reference for Bonaparte, Daniel, and Koerner, 2002 below), the most effective means of testing permeability of a soil layer such as a clay liner is in-place with a sealed double-ring infiltrometer. Another method used is a single-ring infiltrometer (see reference for Amoozegar and Warrick, 1989 below). However, since the single-ring infiltrometer is not as widely used or accepted as the double-ring method, the specific methods and procedure for the single-ring infiltrometer will need to be provided for DRC review and concurrence prior to its use. Of particular concern is the ability to test a large enough surface area of the clay liner that will provide reasonable results that represent the actual permeability of the clay layer. Field testing is used because is has been found that laboratory test methods are applied to a small and limited sample size(or area) that is not typically representative of the soil layer being evaluated. Extensive reviews of laboratory tests results (typically involving 75-mm-diameter samples of compacted clay materials) have shown a strong tendency to report smaller saturated conductivities for clay liners than are actually achieved in the field (Benson, Hardianto, and Motan 1994; Bonaparte, Daniel, and Koerner, 2002). For this reason the Division prefers the use of the field methods stated in the interrogatory.

The DRC believes that successful field permeability testing of the clay liner can be performed using "ASTM D5093-02 Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring. Another method can be used (such as a single-walled infiltrometer) provided the specific methods and procedures are provided for DRC review and concurrence.

REFERENCES:

Amoozegar, A, and A.W. Warrick. 1986. Hydraulic conductivity of saturated soils: field methods. American Society of Agronomy.

Bonaparte, Rudolph, David E. Daniel, and Robert M. Koerner, December 2002. Assessment and Recommendations for Improving the Performance of Waste Containment Systems. EPA/600/R-02/099.

Benson CH; Hardianto FS; and Motan ES, "Representative Specimen Size for Hydraulic Conductivity Assessment of Compacted Soil Liners," ASTM Specialty Technical Publication 23883S, January 1994.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-20/03: LINER STRENGTH & COMPATIBILITY

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(5)(a)(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;

Refer to R317-6-1 (1.3): "Best Available Technology (BAT)" 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 R317-6-6 (6.4): ["ISSUANCE OF DISCHARGE PERMIT - 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: ...(A.3) the applicant is best available technology to minimize the discharge of any pollutant…";

INTERROGATORY STATEMENT:

The proposed design needs to include a concise and well-defined design basis that is then demonstrated to meet the respective criteria through technical evaluation, data, and calculations. Based on the information provided to date in support of the proposed tailings cell design the following need to be included:

1. *An evaluation of the impact of stress imposed by equipment, tailings, and liquid during all scenarios and phases of construction, operations and tailings placement on the liner system that could result in movement and degradation of the liner system. Please include an evaluation of the steepest slope where the liner will be subject to the highest stresses during all scenarios and phases of construction, operations and tailings placement. Explain what is meant (specifically) when stating that the slopes will be" relatively mild". In addition, please note that since the tailings will be placed in the cell via slurry, the statement that there will be no significant ponding of liquids against the exposed liner is not correct. Consider slurry and free liquids in the cell in the design and evaluating the stability of the liner system.*
2. *An evaluation of the impacts of wind uplift forces and ballasting for wind uplift on the liner system while exposed to these forces.*
3. *The following Clarifications are needed on the anchor trench design calculations provided in the 11/28/07 response to item #3 in Round 2 of this interrogatory*

   3.1. How will the use of sand fill material that has an internal friction angle of 32º or greater be assured in the construction of the liner anchor system?

   3.2. Proposed cell liner drawings showing the geometry of the cell slopes and layout of the drainage layer need to be provided. They need to include where the drainage

layer will be placed (i.e., only on the cell floor, or on the floor and up the side slopes). This will be helpful in understanding the critical stress areas and the proposed anchor trench design.

3.3. It appears that the anchor trench calculations have used an angle of shearing resistance for soil to HDPE for the liner upper and lower surface. This is appropriate for the liner upper surface, but the lower (under) surface of the upper liner is in contact with the geonet. Typically, the angle of shearing resistance between HDPE and geonet is less than the one between soil and HDPE. It appears that it would be appropriate to use the angle of shearing resistance between soil and HDPE for the upper surface, and between the HDPE and the geonet for the lower surface. This will increase the run out lengths and anchor trench depths.

3.4. Please include the basis (references) for the following:

- *Allowable stress of 2100 psi*
- *Thickness of 0.06 inches*
- *Unit weight of soil of 100 lb/ft3*

4. *"Response 5"to Round 2 of this Interrogatory provided by Uranium One mentioned the use of rub sheets and splash guards in areas where the tailings will be discharged to the cell. Here again, design drawings need to show where these features are needed. Also, please note that if the tailings are to be discharged to the cell so that they flow down the side slope on the liner, the resultant load on the liner needs to be evaluated to ensure that the liner system will not be compromised.*
5. *Figure K-2 shows the anchor systems where side slopes do or do not have a drainage layer. Drawings clarifying where the drainage layer is being placed needed to be included.*

BASIS FOR INTERROGATORY:

As stated in Round 1 Interrogatories, the Applicant's submission does not include sufficient information to allow a complete review of adequacy of the lining system design for meeting the requirements of 10 CFR 40, Appendix A, Criterion 5 A(2) which addresses cell liner requirements, or for meeting the criteria identified in R317-6-1, 1.3 for BAT, for double liner systems. Lacking is a complete evaluation of the stresses on the liner system under maximum loading conditions. These maximum loading conditions need to be defined as the design basis, then calculations need to be developed and provided that demonstrate the liner system is capable of maintaining the design integrity, configuration, and performance. Reference is made to the RMTP as being an important basis of the design. However, the revised plan, responses to Round 1 Interrogatories, and subsequent discussions with Uranium One indicate the tailings will be placed as slurry, and it is inferred that the RMTP will be used when and if developed. A concise and well-defined design basis needs to be included that is then demonstrated to meet the respective criteria through technical evaluation, data, and calculations.

REFERENCES:

Giroud, J.P., Gleason, M.H., and Zornberg, J.G., 1999. Design of Geomembrane Anchorage Against Wind Action", in Geosynthetics International, Vol. 6, No. 6, 1999, pp. 481-507.

Hsuan, Y.G., Lord, A.E., and Koerner, R.M., 1991. "Effects of Outdoor Exposure on a High Density Polyethylene Geomembrane", in Geosynthetics ' 91, Atlanta, GA, pp. 287-302.

Koerner, R.M. , Hsuan, Y.G., and Koerner, G.R., 2005. "Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions", Geosynthetic Institute White Paper #6, June 7, 2005.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

Valero, S.N., and Austin, D.N., 1999. "Simplified Design Charts for Geomembrane Cushions", in Geosynthetics '99, Boston, Mass. Available at:
http://www.sedimentremediation.com/TechRef/Dredge/GPD-SM-116.pdf

INTERROGATORY R313-24-4-21/03: LINER SETTLEMENT

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(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:

Please indicate the extent of settlement, differential settlement, and distortion in the cover that are allowed at the time of final closure. Demonstrate that allowable settlement, differential settlement, and distortion resulting tailings consolidation with time will not damage the final liner system. Justify the respective design criteria and tailings material properties used.

BASIS FOR INTERROGATORY:

Uranium One's response to Round 2 of this Interrogatory stated that a response will be provided in the next submittal.

In response to Round 1 Interrogatory Uranium One explained that the liner subgrade will be the Entrata Sandstone, and therefore settlement of the soil (rock) under the cells is not of concern. In addition, the clay and sand layers placed at part of the liner system will be compacted and also will not pose a concern with settlement. However, not provided is an evaluation and demonstration of the potential settlement of the tailings themselves after cover placement. This is now of particular concern considering that the tailings will be placed in a slurry with high liquid content. Will any anticipated settlement from dewatering of the tailings via the leachate collection system (including differential settlement) impact the integrity of the cover system? How long before dewatering is complete and consolidation of the tailings is no longer of concern? What are the settlement tolerances of the cover system? The moisture content, and other physical properties of the tailings after cover placement, and their potential for consolidation, thereby impacting the cover needs to be considered in this evaluation.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-22/03: LEACHATE COLLECTION AND DETECTION SYSTEM DESIGN

PRELIMINARY FINDINGS:

Refer to R313-24-4(2)(J)(ii): Clarifications or Exceptions. "Utah Administrative Code, Rule R317-6, Ground Water Quality Protection" for ground water standards in "Environmental Protection Agency in 40 CFR part 192, subparts D and E" as found in the Introduction, paragraph 4; or "Environmental Protection Agency in 40 CFR part 192, subparts D and E (48 FR 45926; October 7, 1983)" as found in Criterion 5;

Refer to R317-6-1 (1.3): "Best Available Technology (BAT)" 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 R317-6-6 (6.4): ["ISSUANCE OF DISCHARGE PERMIT - 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: ...(A.3) the applicant is best available technology to minimize the discharge of any pollutant…".

Refer to Refer to 10 CFR Part 40 Appendix A, Criterion 5 (A)(4): …" a surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations, overfilling, wind and wave actions, rainfall, or run-on; from malfunctions of level controllers, alarms, and other equipment; and from human error…"

INTERROGATORY STATEMENT:

Please provide confirmation as to the adequacy of the geofabric for permeability (permittivity) as well as for filtration. There needs to be confirmation that the geofabric will not restrict water flow or allow for the infiltration of the surrounding sand into the stone bedding.

Please clarify the use of a perforated pipe with a sock where the pipe extends up slopes. Typically a solid pipe is used for the collection sump piping.

BASIS FOR INTERROGATORY:

BAT requires that leachate collection and detection systems be designed to resist clogging during the active life and post-closure period. The proper design of the Sand/Tailings interface is a critical point where, under the current design, clogging potential is viewed as the highest.

Uranium Ones 11/28/07 response to Round 2 of this interrogatory included revised text for Section 5.1.4.2 "Piping Structural Design" of the TMP. Review of this section identified the following concerns:

- *There is no confirmation as to the adequacy of the geofabric for permeability (permittivity) and for filtration. There needs to be confirmation that the geofabric will not restrict water flow or allow for the infiltration of the surrounding sand into the stone bedding.*

- *The text states that where the pipe extends up slopes that are greater than 4H:1V and beyond the drainage layers, a filter sock will be placed around the pipe. Isn't the function of piping above the drainage layer to allow for sump access and liquid transfer via a pump? Why use a perforated pipe with a sock? Why not a solid pipe?*

REFERENCES:

Koerner, G.R, Koerner, R.M., and Martin, J.P. 1993. "Field Performance of Leachate Collection Systems and Design Implications". Solid Waste Association of North America: 31st Annual International Solid Waste Exposition, pp. 365-380.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007.

Reinhart, D.R. et al. 1998. Assessment of Leachate Collection System Clogging at Florida Municipal Landfills. Report # 98-5. Florida Center for Solid and Hazardous Waste Management, Gainesville, FL. October 30, 1998.

Rowe, R.K. 2005. Long Term Performance of Containment Barrier Systems, Geotechnique, 55, No. 9, pp. 631-678.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-23/03: DIKE INTEGRITY

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(5)(a)(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.

INTERROGATORY STATEMENT:

Please confirm that all slopes and friction failure surfaces--including the proposed liner interfaces--have been evaluated or are represented by the evaluation of the most critical slopes and surfaces. All scenarios and phases of construction, operations, and tailings placement must be considered. Provide such analyses for the Division's review. These analyses must include and/or consider the dikes between Cell 1 and Cell 2 and between Cell 1 and the Evaporation and Process Pond Cell (EPPC) and the conditions where the liner is assumed to have failed (e.g., worst case scenario).

Please provide a slope and seismic stability evaluation for Shootaring Canyon Dam, the Cross Valley Berm, the area between the Cell 1 and the EPPC, and any other dams/berms using a failed liner condition under a worst case scenario or similar.

Provide conclusive calculations, models, and statements demonstrating the applicability and adequacy of the existing or new slope stability analysis. Ensure that such calculations, models, and statements address all special conditions that would affect dike and liner system integrity that may exist between Cell 1 and Cell 2 and between Cell 1 and the EPPC.

BASIS FOR INTERROGATORY:

The operating elevations of the tailings on each side of the dikes are important, since the effect of such operations have some failure potential. Therefore, proposed configurations of the dikes must be evaluated as part of the design criteria. The criteria must include the critical loading and elevation scenarios on both sides of the dikes. Later, these critical scenarios may also be used to propose the limited operating conditions by which the ponds on each side of the dikes may be operated.

In general, the response and revised text in Section 3 address part of the interrogatory statement from Round 1. Another analysis of seismic stability was conducted by Inberg-Miller Engineers [IME] (dated January 2007) with a Safety Factor of 1.18. However, this did not constitute a worst case scenario with a failed liner and leakage as required by Utah Administrative Code and URCR. The new analysis from IME 'assumed no phreatic surface will develop through the earthen dam.' The UDRC rule reads, 'In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the impoundment' R313-24-4.

Seismic and slope stability analyses were conducted by the applicant for the Shootaring Canyon Dam and the Cross Valley Berm (section 3 & Appendix A, TMP). The reference documents within the application do not address piping, however this may not be wholly applicable since the cells have double layers (liners) technology. The documents do contain a slope stability analysis for the Cross Valley Berm.

The information requested is needed to demonstrate the long-term stability of the final cover, especially in consideration of the cited passage of URCR on the presumption of leakage of the liner system during the active life of the impoundment.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility," Dated December 2005, Revised April 2007.

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-24/03: BEST AVAILABLE TECHNOLOGY

PRELIMINARY FINDING:

Refer to R313-24-4, R317-6-1 (1.3): "Best Available Technology (BAT)" 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 R317-6-6 (6.4): ["ISSUANCE OF DISCHARGE PERMIT - 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: ...(A.3) the applicant is best available technology to minimize the discharge of any pollutant…".

INTERROGATORY STATEMENT:

Please provide the following:

1. *Estimation of anticipated leachate flow rates and maximum capacity in the leachate collection systems.*
2. *A demonstration that the leak detection system design in the final cell(s) will result in no more than 1-foot of head on the bottom liner at any time, and that the system is designed to handle the resultant flow.*
3. *Complete Liner system design and construction drawings (plans), as well as material and performance specifications. They are to be certified by a Professional Engineer licensed in the State of Utah, and shall include, but not be limited to, cell liner, leachate collection, leak detection, dewatering operations, tailings transfer and management, and storm water control layouts, cross sections, details, and profiles. They must include proposed elevations and horizontal coordinates at all key locations. The specifications must cover (but not limited to) all proposed components and materials, their respective material and equipment and installation requirements.*
4. *An estimate of volumes and capacities of the cells as well as cut and fill quantities.*
5. *Review of Uranium One's 11/28/07 response to Round 2 Interrogatories identified the following concerns"*
    - *Material properties specific to the pipe material and soil bedding are included in the demonstration. However, the source of these values is not included. It is typical with these types of demonstrations (calculations) to include a copy of the specific data basis such as material spec sheets, test results, references from literature, etc. This is important in order to fully understand what is being presented, in what context, and to document the basis.*
    - *The pipe and soil material properties need to be carried through to the project QAP and technical specifications to ensure that what is installed and constructed meets or exceeds the performance as presented in the respective demonstration.*

BASIS FOR INTERROGATORY:

Review of the responses to Round 1 and 2 of this Interrogatory found that the following concerns remain:

1. *Estimation of anticipated leachate flow rates and maximum capacity in the leachate collection systems has not been identified in the submittal and must be provided. Estimation of the anticipated flows will enable the leachate management system to be properly designed to accommodate the full flow conditions and will ensure that the tailings are dewatered in a reasonable timeframe. This estimation should then also be included as part of the Leachate Monitoring, Operations, Maintenance, and Reporting Plan.*
2. *The leak detection system for the final cell configuration and design will function so that the head on the lower liner never exceeds 1-foot.*
3. *The liner system design and construction drawings and material and performance specifications need to be developed. These items are currently only addressed for the cover system, but are not included for the liner system. Provide drawings (plans) and specifications in sufficient detail so they could essentially be used for bidding and construction. They are to be certified by a Professional Engineer licensed in the State of Utah. The drawings shall include, but not be limited to, cell liner, leachate collection, leak detection, dewatering operations, tailings transfer and management, and storm water control layouts, cross sections, details, and profiles. They shall include proposed elevations and horizontal coordinates at all key locations. The specifications shall cover (but not limited to) all proposed components and materials, their respective material and equipment and installation requirements*

   In addition, design exercises such as estimating volumes and capacities and creating filling and grading plans in advance of waste generation are critical to a successful project since these exercises help to ensure that estimated volumes are considered and that adequate storage space is planned (even if the storage is temporary). It is common practice to prepare for the estimated contaminated soil volume with a contingency volume included (contingency amount would be based on the confidence in the primary volume estimate). If the contingency volume is not used, then clean or lower level contaminated material can be placed as general fill. These concepts would all be blended into the detailed design drawings and specifications.
4. *Uranium One included in Appendix J of the 11/28/07 response to Round 2 Interrogatories an evaluation demonstrating the adequacy of the buried HDPE pipe to withstand the load imposed due to its burial depth. A review of this demonstration resulted in the identification of some concerns that need clarification. They are:*

   a. *Material properties specific to the pipe material and soil bedding are included in the demonstration. However, the source of these values is not included. It is typical with these types of demonstrations (calculations) to include a copy of the specific data basis such as material spec sheets, test results, references from literature, etc. This is important in order to fully understand what is being presented, in what context, and to document the basis.*

b. *The pipe and soil material properties need to be carried through to the project QAP and technical specifications to ensure that what is installed and constructed meets or exceeds the performance as presented in the respective demonstration.*

REFERENCES:

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Shootaring Canyon Uranium Processing Facility Environmental Report, Source Material License No. UT0900480", Dated January 2006.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-26/03: INFILTRATION AND CONTAMINANT TRANSPORT MODELING

PRELIMINARY FINDINGS:

Refer to R313-24-4(2)(J)(ii): Clarifications or Exceptions. "Utah Administrative Code, Rule R317-6, Ground Water Quality Protection" for ground water standards in "Environmental Protection Agency in 40 CFR part 192, subparts D and E" as found in the Introduction, paragraph 4; or "Environmental Protection Agency in 40 CFR part 192, subparts D and E (48 FR 45926; October 7, 1983)" as found in Criterion 5;

Refer to R317-6-1 (1.3): "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 R317-6-6.3: ["APPLICATION REQUIREMENTS FOR A GROUND WATER DISCHARGE PERMIT - 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: (G) Information which shows that the discharge can be controlled and will not migrate into or adversely affect the quality of any other waters of the state, including the applicable surface water quality standards, that the discharge is compatible with the receiving ground water, and that the discharge will comply with the applicable class TDS limits, ground water quality standards, class protection levels or an alternate concentration limit proposed by the facility".

Refer to 10 CFR, Part 40, Appendix A, Criterion 6(1), which requires that the impoundment design "provide reasonable assurance of control of radiological hazards to be effective for 1,000 years to the extent reasonably achievable, and in any case, for at least 200 years".

INTERROGATORY STATEMENT:

Please provide sufficient information to demonstrate that the cover system will not experience some potential long-term degradation through one or more processes (as discussed below in the Basis For Interrogatory), when active institutional control is no longer in effect to maintain the cover system.

Provide additional information to identify and evaluate the potential effects of long-term degradation processes on the components of the final cover system.

Conduct and report additional (infiltration sensitivity) analyses to assess the potential affects of such cover system component degradation on long –term infiltration rates through the cover during the cover's design life.

BASIS FOR INTERROGATORY*:*

The response provided to date (Response to Round 1) does not provide sufficient information to support the contention that the compacted clay layer in the cover system (and/or other layers in the cover system as well) would not experience some potential long-term degradation through one or more processes, under the scenario where there the active institutional controls period is

no longer in effect to maintain the cover system. Additional information should be provided to identify and evaluate the potential effects of long-term degradation processes on the compacted clay layer and on other components of the final cover system. Additional (infiltration sensitivity) analyses should be conducted and modeling results from such analyses provided to assess the potential affects of such cover system component degradation on long –term infiltration rates through the cover during the cover's design life. Specific information that should be considered includes the following:

- *Additional information demonstrating that analyses of the closed facility's future performance have considered reasonably foreseeable degraded conditions that could occur within the final cover system after closure (e.g., up to several hundred years following closure) if the closed site were not actively maintained. For example, in the HELP Modeling simulations described in the December 2006 Tailings Reclamation Plan, it is not clear that the HELP Model simulations provided incorporate any reduction in the value of saturated hydraulic conductivity for either the fine sand layer or for the rock mulch capping layer to reflect potential (e.g., partial) clogging of these layers with windblown fines (rock mulch layer) or fines (sand drainage layer) that could invade these layers over time through ecological succession, or an increased value of saturated hydraulic conductivity of the radon barrier layer due to the effects of (e.g., moderately deep or possibly deeper-rooted) plant species. Other cover system physical parameters that could be affected over the long term due to environmental processes, such as porosity, field capacity, and wilting point of various cover layers, should be considered and incorporated as appropriate, into the infiltration analysis.*
- *A biointrusion assessment/analysis, including information regarding the potential for shallow and/or possibly deeper-rooted plant species to become established on the final cover system and an analysis to evaluate the effects of such vegetation on long-term infiltration rates. For example, it has not been demonstrated whether or not it is possible that native vegetation, including one or more deep-rooted species (such as black greasewood in particular, or other deeper-rooted species that might be present in Shootaring Canyon area) might become established on areas of the cover after the 100-year period of institutional control.*
- *If the information compiled above indicates that establishment of moderately deep to deeper-rooted vegetation on the final cover system appears possible, please provide a sensitivity analysis in the HELP model to evaluate the effect of such deeper-rooted species becoming established on the final cover during the performance period on long-term infiltration rates through the cover. Phenomena to consider include a network of taproot/possible root decay –induced defects in the radon barrier layer and their effect on hydraulic conductivity of the radon barrier layer.*
- *A revised infiltration analysis that considers the potential for partial degradation of the 40-mil HDPE geomembrane, as a result of puncturing damage or other construction-related or post-construction static loading-related damage, if considered possible, as well as long-term deterioration of the HDPE geomembrane liner due to antioxidant depletion, oxidative induction (with resulting HDPE embrittlement and chain*

scission and environmental stress cracking), and other possible factors (e.g., biological agents).

- *The possibility of stress cracking with the HDPE geomembrane has not been addressed in the HELP model. Information addressing the issue of potential stress cracking in the geomembrane and its effects on cover infiltration needs to be provided.*
- *A frost depth analysis should be performed to determine the maximum projected frost penetration depth within the final cover.*

REFERENCES:

Badu-Tweneboah, K., Tisinger, L.G., Giroud, J.P., and Smith, B.S., 1999, "Assessment of the Long-Term Performance of Polyethylene Geomembrane and Containers in a Low-Level Radioactive Waste Disposal Landfill," in Proceedings, Geosynthetics '99, Boston, Massachusetts, April 28-30, 1999.

DOE 2001. Disposal Cell Cover Moisture Content and Hydraulic Conductivity, Long-Term Surveillance and Maintenance Program Shiprock, New Mexico, Site, Grand Junction, Colorado. May 2001.

EPA 2002a. "Simulating Radionuclide Fate and Transport in the Unsaturated Zone: Evaluation and Sensitivity Analyses of Select Computer Models". EPA/600/R-02/082. 2002.

EPA 2002b. U.S. Environmental Protection Agency 2002. Assessment and Recommendations for Improving the Performance of Waste Containment Systems. EPA/600/R-02/099. Cincinnati, Ohio. December 2002.

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Hydro-Engineering, L.L.C. 2006. Ground-Water Monitoring of Shootaring Canyon Tailings Site - 2005.

Koerner et al. 2005. Koerner, R, Hsuan, Y.G., and Koerner, G. 2005. GRI White Paper #6 - on -Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions. Geosynthetic Institute, *Folsom, Pennsylvania. June 7, 2005.*

National Committee on Radiation Protection, National Bureau of Standards(NBS) Handbook 69 (1959), "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," Superintendent of Documents, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C., June 5, 1959.

Plateau Resources, Ltd., "Revised Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December 2006.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R317-6-2.1-27/03: GROUNDWATER MONITORING

PRELIMINARY FINDING:

Refer to R317-6-2.1: "The following Ground Water Quality Standards (GWQSs) as listed in Table 1 are adopted for protection of ground water quality (refer to Table 1in the standard, however, this list is not required for analysis per the current January 2004 GWQDP)."

Refer to R317-6-6.3.I: [APPLICATION REQUIREMENTS FOR A GROUND WATER DISCHARGE PERMIT] – "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: (I) A proposed sampling and analysis monitoring plan which conforms to EPA Guidance for Quality Assurance Project Plans, EPA QA (EPA/600/R-98/018, February 1998) and includes the following…1. ground-water monitoring to determine ground water flow direction and gradient, background quality at the site, and the quality of groundwater at the compliance monitoring point…"

Refer to R317-6.9 [PERMIT COMPLIANCE MONITORING] – "A. Ground Water Monitoring" - The Executive Secretary may include in a ground water discharge permit requirements for ground water monitoring, and may specify compliance monitoring points where the applicable class TDS limits, ground water quality standards, protection levels or other permit limits are to be met.

The Executive Secretary will determine the location of the compliance monitoring point based upon the hydrology, type of pollutants, and other factors that may affect the ground water quality. The distance to the compliance monitoring points must be as close as practicable to the point of discharge. The compliance monitoring point shall not be beyond the property boundaries of the permitted facility without written agreement of the affected property owners and approval by the Executive Secretary.

B. Performance Monitoring - The Executive Secretary may include in a ground water discharge permit requirements for monitoring performance of best available technology standards…"

Refer to R317-6.10 [BACKGROUND WATER QUALITY DETERMINATION] – "A. Background water quality contaminant concentrations shall be determined and specified in the ground water discharge permit. The determination of background concentration shall take into account any degradation.

B. Background water quality contaminant concentrations may be determined from existing information or from data collected by the permit applicant. Existing information shall be used, if the permit applicant demonstrates that the quality of the information and its means of collection are adequate to determine background water quality. If existing information is not adequate to determine background water quality, the permit applicant shall submit a plan to determine background water quality to the Executive Secretary for approval prior to data collection. One or more up-gradient, lateral hydraulically equivalent point, or other monitoring wells as approved by the Executive Secretary may be required for each potential discharge site.

C. After a permit has been issued, permittee shall continue to monitor background water quality contaminant concentrations in order to determine natural fluctuations in concentrations. Applicable up-gradient, and on-site ground water monitoring data shall be included in the ground water quality permit monitoring report."

Refer to R317-6.16 [6.16 OUT-OF-COMPLIANCE STATUS] – "A. Accelerated Monitoring for Probable Out-of-Compliance Status. If the value of a single analysis of any compliance parameter in any compliance monitoring sample exceeds an applicable permit limit, the facility shall:

1. Notify the Executive Secretary in writing within 30 days of receipt of data;

2. Immediately initiate monthly sampling if the value exceeds both the background concentration of the pollutant by two standard deviations and an applicable permit limit, unless the Executive Secretary determines that other periodic sampling is appropriate, for a period of two months or until the compliance status of the facility can be determined.

B. Violation of Permit Limits

Out-of-compliance status exists when:

1. The value for two consecutive samples from a compliance monitoring point exceeds:

a. one or more permit limits; and

b. the background concentration for that pollutant by two standard deviations (the standard deviation and background (mean) being calculated using values for the ground water pollutant at that compliance monitoring point) unless the existing permit limit was derived from the background pollutant concentration plus two standard deviations; or

2. the concentration value of any pollutant in two or more consecutive samples is statistically significantly higher than the applicable permit limit. The statistical significance shall be determined using the statistical methods described in Statistical Methods for Evaluating Ground Water Monitoring Data from Hazardous Waste Facilities, Vol. 53, No. 196 of the Federal Register, Oct. 11, 1988 and supplemental guidance in Guidance For Data Quality Assessment (EPA/600/R-96/084 January 1998)."

INTERROGATORY STATEMENT:

Per discussions between Uranium One and the DRC and in accordance with the application requirements of the Utah Administrative Code R317-6, Uranium One needs to provide adequate documentation, justification, evaluation procedures, and modeling results that includee a sound basis for the groundwater monitoring for the site. This includes a complete presentation and description of the existing hydrogeologic conditions, means of establishing background, and the evaluation of results as they compare to the respective limits. Based on the review of the information submitted to date, the following items need to be addressed by Uranium One:

1. ***BAT Monitoring Plan for Seepage Rate Monitoring and Verification**: Please provide a BAT monitoring plan which includes: (a) Justification or basis for the plan; (b) Best Available Technology and seepage control monitoring for the tailings impoundments; and (c)*

Information to verify that Engineering Controls are sufficient and will limit seepage to specified levels. It is recommended that Uranium One prepare a separate document (from the respective Groundwater Monitoring Plan) reflecting specific monitoring devices and types, monitoring frequency, and validation procedures to comply with laws, regulations and guidance.

2. ***Hydrogeologic Modeling and Groundwater Monitoring Well Designs and Network:*** *Please provide additional information, including groundwater modeling, information regarding estimated horizontal and vertical dispersion, groundwater-surface water interaction (relationship of groundwater flow systems to existing springs present in the area), and information adequately describing flow direction, gradient and spatial variability of groundwater flow, to ensure that potential contaminant flow paths and potential plume shape are described. Please provide information indicating how this information supports design of the monitoring well network including well locations, screen length and depth(s) of monitoring. Modeling needs to consider flow paths in the vadose zone, the perched aquifer and the main (lower) Entrada aquifer. It has been noted, for example, based on past monitoring and modeling at the facility that a low-permeability zone exists at the top of the main (lower) Entrada aquifer in the area near the main Tailings Dam. The impact of this condition on flow paths for potential releases from the tailings containment cells needs to be carefully examined and clarified.*

   Additionally, a review of the horizontal groundwater contour information on Figure 1, Proposed Ground Water Monitoring Locations, of the Draft Groundwater Monitoring Plan suggests that potential releases from the containment cells might flow to an area southwest of the proposed monitoring locations and therefore be missed by the monitoring network. In preparing the additional information requested in this interrogatory, Uranium One needs to demonstrate that the modeling assumptions that are used are conservative and/or are representative of field conditions.

3. ***Background Monitoring Plan for New POC Wells:*** *Please confirm the location of the POC monitoring wells and provide additional information concerning the approach for developing interim and final intrawell Groundwater Compliance Limits (GWCLs) for the POC monitoring wells. Please provide information to justify the duration of background sample collection and analysis, proposed sampling frequency, and procedures to be used for controlling or correcting for such seasonal and/or temporal correlation in the data, if necessary. Please clarify the ultimate use of the current (ongoing) background evaluation. For example, indicate whether the evaluation is being conducted to provide interim limits for downgradient operational POC wells based on two standard deviations above background as listed in R317-6-6.16 until specific intrawell background can be established. In order to conform to GWCL criteria previously established for this facility and GWCLs that have been established for other similar (licensed) facilities in Utah, final GWCLs should be determined as follows: (a) for constituents detected as a background concentration, the GWCL should not exceed the mean concentration in that well plus two standard deviations or 1.1 times the background (mean) concentration, whichever value is greater; and (b) for a contaminant not present in a detectable amount as a background concentration, the GWCL should not exceed*

1.1 times the value of the groundwater quality standard Maximum Contaminant level (MCL)or the limit of detection, whichever value is greater.

4. ***Statistical Analysis of Groundwater Data**: Please provide the following with respect to the Draft Groundwater Monitoring Plan (Plan) dated 11/30/07 and the Shootaring Background Water Quality document (December 12, 2007):*

   a. *Additional information to further substantiate/verify the degree of homogeneity (lack of spatial variability) of groundwater quality within groups of groundwater monitoring wells. The Piper diagrams in the current statistical approach use only a limited list of ions. Additional information, including the distribution of trace elements detected in groundwater at the site, should also be considered, and a discussion of how those trace element concentrations relate to site subsurface (e.g., aquifer matrix geochemical) conditions should be provided, along with evidence to confirm that the background groundwater data are suitable for comparison to the site groundwater data. Parameters such as arsenic (previously detected at apparently elevated levels in wells RM-8 and RM-20), selenium (previously detected at apparently elevated levels in well RM20) and fluoride (previously detected at apparently elevated levels in wells RM8 and RM20) are examples of parameters (Plateau Resources, Ltd. 2006) that require further analysis. Uranium One may wish to consider other types of data analysis, for example, multivariate statistical techniques such as cluster analysis and/or Principal Component Analysis, wherein the distributions of additional parameters (possibly including, but not limited to, arsenic, uranium, molybdenum, barium, manganese, chromium, and nickel) in the site monitoring wells are analyzed. Uranium One may also wish to consider developing stiff diagrams as an additional means of deciphering patterns in groundwater quality at the site.*

   b. *Please provide a revised Plan that employs consistent terminology with respect to the different groundwater-bearing units present beneath the site.*

   c. *Please add carbonate + bicarbonate, calcium, and nitrate + nitrite to the monitoring parameters list (Table 1 of Plan), or, alternatively, provide justification for not including these parameters in the Plan.*

   d. *Please provide information indicating the relevance of the 2007 Final Rule (EPA 2007) that amends relevant previous EPA Final Rules that specify acceptable analytical methods for some monitoring parameters included in Table 1, including Ra-226, chloride, fluoride, nitrate, nitrite, and sulfate, to the Plan. Please revise the text on page 4 of the Plan and in Appendix 1, as necessary, to conform to the EPA 2007 Final Rule. This information should be included as an element of the Facility Quality Assurance Plan (QAP) and Groundwater Monitoring QAP.*

   e. *Please include a description of the missing Appendices 1 through 3, and provide a copy of any missing Appendices.*

f. Please revise the text of the Plan to reflect the correct ordering of the tables in the document. On Page 5 – "Test of Normality", 2nd paragraph: in the first sentence the order of the two tables as identified in the text is reversed.

g. Please provide an expanded discussion within the Plan (in reference to the discussion presented on p. 10 of the current Draft Groundwater Monitoring Plan entitled "Trend Analysis"), to include the following elements:

i) Identification of any seasonal variability as well as any temporal correlation in the data, and procedures for controlling or correcting for such seasonal and/or temporal correlation in the data, if necessary,

ii) Completing background sampling on a schedule that will ensure sample independence,

iii) Criteria for selecting statistical analysis methods for each parameter of interest in each well,

iv) Specific criteria, including data characteristics such as normality or lack of normality, for selecting the statistical analysis method(s) for analyzing accrued data and criteria and timetables for updating background groundwater quality statistics/concentrations as new data are obtained, and

v) Identification of any spatial variability of data when an inter-well data analysis method is used.

h. Please revise page 11 – "Frequency": 1st paragraph, second sentence, to change the word "down" to "downgradient". Please revise the text to reflect the correct term.

i. Please provide an expanded discussion within the Plan following the discussion presented on p. 11 of the current Draft Plan entitled "Frequency", under a heading entitled "Actions Taken if Monitoring Data Are Out of Control" or some other similar heading, of the specific timetable within which a verification (confirmation) sampling/analysis episode would occur following determination of initial evidence of an exceedance or evidence of a statistically significant trend in one or more parameter concentrations within a well.

j. Please revise the text in the first paragraph of the Plan to refer to ASTM D6312-98 instead of ASTM D6313-98.

k. Please provide additional information to evaluate the impact, if any, that the indicated lack of a normal or lognormal distribution of at least four of five monitoring parameters identified as process-related parameters, (i.e., K, Na, Unat, and $SO4^{-2}$) – see Tables 1 and 2 of the Plan – has on the selection and application of statistical analysis method(s) for these parameters, including the compilation of time-series plots/future intrawell statistic analysis. Please also provide information to assess whether the highest concentrations of several parameters (e.g., Na, Unat, Cl^-, Fl^-, NO3 + NO2, $SO4^{-2}$, TDS,

Mg), as shown on the Probablility Plots in Figure 3 of the Shootaring Background Water Quality document, might represent different water quality populations.

l. Please provide additional information regarding the values of "n" shown in Tables 1 and 2. It appears that "n" represents the number of samples in each parameter data set; however, this information is not explicitly stated. The values of "n" given for the various parameters, assuming that "n" represents the number of samples, also seem to be very large.

5. ***Proposed Groundwater Monitoring Approach**: Please provide responses to the following concerns regarding the proposed groundwater monitoring approach presented to date. These concerns were expressed in Round 2 of this Interrogatory, and Uranium One stated that responses will be provided in the next submittal.*

   a. Please provide a proposed sampling and analysis plan for monitoring of the seep (or spring) located south of the mill site near Ant Knolls (as shown on Figure 1-1 of the revised Tailings Management Plan). Please also provide information to indicate whether sampling and analysis of springs or seeps located northwest of the mill site and proposed Cells 1 and 2 and the spring or seep located northeast of proposed Cells 1 and 2 (e.g. Lost Spring) would be conducted, for example, for comparison purposes. Alternatively, please provide justification for not monitoring these seep/spring locations.

   b. Please provide rationale for selecting parameters for groundwater sampling and analysis as listed in Section 7 and in Appendix D of the Revised Tailings Management Plan (Plateau Resources, Ltd. And Hydro-Engineering, LLC 2007), including parameters to be used as key indicators of performance. Please provide additional information/rationale to support not specifying requirements for analysis of any parameters (e.g., Radium-228 and gross alpha) identified in R317-6-2.1, as applicable parameters for sampling and analysis.

BASIS FOR INTERROGATORY:

A teleconference was held on December 19, 2007, amongst Uranium One, the Utah Division of Radiation Control, and URS Corporation. Three "Draft" Documents prepared by Uranium One were discussed during the teleconference; (1) A Conceptual Tailings Storage Facility Design; (2) A document entitled "Draft Shootaring Groundwater Monitoring Plan" (November 30, 2007); and (3) A document entitled "Shootaring Background Water Quality (December 12, 2007)." During the teleconference, it was discussed and agreed that the groundwater monitoring plan will be based on a two-part strategy. The first line of groundwater compliance will be based on Best Available Technology and seepage control monitoring from the tailings impoundments. As discussed during the teleconference, Uranium One will develop a monitoring strategy to verify that seepage onto the leak detection layer is limited to 200 gallons per day per acre (allowable design leakage rate) as referenced the March 17, 1999 Ground Water Quality Discharge Permit for the facility. It will also include the limitation of 3-feet of head on the upper primary liner as specified in the December 28, 1998 DRC and DWQ Statement of Basis for the permit. The second line of groundwater compliance will encompass the use of a monitoring well

network designed for early detection of contamination that could be potentially released from the tailings impoundments.

Based on the discussed strategy and application requirements of Utah Administrative Code R317-6, this interrogatory is intended to ensure that Uranium One plans and prepares adequate documentation, evaluation procedures and modeling regarding BAT monitoring, hydrogeologic flow descriptios for the site, and statistical background and downgradient analysis of groundwater data in compliance with applicable laws, regulations, and guidance.

The proposed statistical analysis method provided in the Draft Groundwater Monitoring Plan includes the construction and use of control charts and intra-well data analysis for determining statistically significant trends in groundwater quality. The use of control charts (Shewart-CUSUM approach), is not a preferred methodology of the DRC for final compliance determinations. As set forth in the Utah Administrative Code R-317-6-6.16.b.2, control charts can be used as a means to determine statistical significance. Trend evaluation is also an important element of an intrawell statistical method. DRC, however, requires the use of other means, such as a front-line determination of groundwater quality compliance, i.e. interwell average concentration + 2 standard deviations, for analysis of groundwater quality and comparison with Groundwater Compliance Limits (GWCLs). This methodology has been established for other (similar) licensed facilities in Utah.

In general, the current Draft Groundwater Monitoring Plan is difficult to follow in that it does not provide a clear decision tree or sufficient details regarding methods that would be followed for:

- *Conducting Exploratory Data Analysis (EDA) of the various data sets depending on the characteristics of the data,*
- *Correcting for seasonal variability as well as temporal correlation in the data, including procedures for controlling or correcting for such seasonal variability and/or temporal correlation in the data, if necessary,*
- *Completing background sampling on a schedule that will ensure sample independence*
- *Selecting statistical analysis methods for each parameter of interest in each well, and*
- *Updating background groundwater quality concentrations/statistics as new data are obtained.*

One or more flow charts depicting the EDA and statistical analysis method selection and application processes would be very beneficial in helping to understand the overall structure of the statistical analysis Plan. Decision criteria that would be used for selecting the method(s) to conduct an exploratory data analyses (EDA) of the data prior to selecting the statistical analysis method(s) should be better described.

Additionally, the proposal under this section indicates that groundwater samples will be collected during at least 8 sampling periods over a period of one year before constructing control charts. These samples need to be independent (not temporally correlated) samples (USEPA 1989, (Section 7); however, there is no information provided to allow an assessment to be made as to whether the samples collected would be independent samples. Uranium One

needs to evaluate the potential for temporal variability of, and autocorellation among, the groundwater constituents (EPA 1989, Section2.4.2).

Specific Basis for Specific Listed Interrogatory Items:

1. *Figure 1, text of the Plan (all), and in the Uranium One U.S.A., Inc. Shootaring Background Water Quality document (December 12, 2007) – The legend refers to the water table contour for the Main Entrada Aquifer. The text of the document variously refers to the "lower (main) Entrada aquifer" (e.g., p. 3 and p. 5) or the "principal Entrada aquifer" (e.g., p. 5), while the Plan (e.g., p. 3 and Table 1) refers to the "Entrada Aquifer" (as a unit distinct from the "Perched Entrada Aquifer"). To avoid potential confusion, it is suggested that consistent terminology be used throughout the document.*

2. *On Page 3 and in Table 1, "Parameters to be Monitored", of the Plan, the list of parameters to be monitored does not include carbonate + bicarbonate, calcium, or nitrate + nitrite). Calcium and nitrate + nitrite are listed in Tables 4 and 5 as part of the compliance parameters for the perched aquifer and lower (main) Entrada aquifer. Additionally, calcium and carbonate + bicarbonate are parameters that are required for constructing Piper/trilinear diagrams, stiff diagrams, etc… that help characterize water quality and help distinguish between different water chemistries that might occur within different water-bearing units (Hem 1985, pp. 173-180). (Note: The distributions of other monitoring constituents such as certain trace elements should also be analyzed using one or more other multivariate statistical techniques, as a means of characterizing groundwater quality populations and patterns – see comments above).*

3. *Page 4 – "Sampling and Analysis", and Appendix 1, of the Plan do not reference EPA's Final Rule (EPA 2007) that amends relevant previous EPA Final Rules that specify acceptable analytical methods for some monitoring parameters included in Table 1, including Ra-226, chloride, fluoride, nitrate, nitrite, and sulfate.*

4. *In the Table of Contents and page 4 of the Plan, Appendix 1, Appendix 2, and Appendix 3 are not described and Appendix 1 and Appendix 3 are not attached. Appendix 2 appears to be a Uranium One U.S.A., Inc. Shootaring Background Water Quality document (December 12, 2007), but without a description of Appendix 2 provided, this assumption cannot be confirmed.*

5. *On page 5 of the Plan, under the section entitled "Test of Normality", 2nd paragraph: in the first sentence the order of the two tables as identified in the text is reversed.*

6. *The section of the Plan entitled "Trend Analysis" is, in general, difficult to follow in that it does not provide a clear decision tree or sufficient details regarding methods that would be followed for performing/conducting the identified elements. This section does not include a discussion of seasonal variability and/or temporal correlation in the data, including procedures for controlling or correcting for such seasonal and/or spatial variability and temporal correlation in the data, if necessary. With respect to the acquisition of baseline groundwater quality data, for example, this section indicates that groundwater samples will be collected during at least 8 sampling periods to establish a groundwater quality data*

baseline, before construction of control charts is initiated. However, there is no timetable given as to the frequency at which these background samples would be collected. The samples collected during this time period must be independent (not temporally correlated) samples (USEPA 1989, (Section 7). From the information provided in this section, it is not clear how it will be ensured that the samples collected during this time period would be independent samples. Additional information needs to be provided indicating how Uranium One will ensure that these background samples are independent samples. Additionally, ASTM D6312-98 (ASTM 2005) indicates that, for ensuring sample independence, if the combined Shewart-CUMSUM control chart procedure is used, wells should typically be sampled no more frequently than quarterly during routine groundwater monitoring.

The need for preparing time series plots and evaluating seasonal effects, if sufficient data are available, should be discussed. The need for identifying that baseline data do not show any evidence of an increasing trend should also be discussed. The use of control charts for a given well is appropriate only if it is assumed that there is no evidence of contamination or an increasing trend in a parameter concentration with time in that well. Procedures potentially applicable to addressing sample independence and seasonality include the (Seasonal) Kendall test/Mann-Kendall test, Time and/or Lag Plots, Sens Slope Estimator, Wilcoxon Rank Sum test, Wald- Wolfowitz test, etc… (see, e.g., USEPA 1989, Section 7; USEPA 1992, Sections 2 and 3; USEPA 2006, Sections 4.3 and 4.8).

Use of the combined Shewart-CUMUSUM control chart procedure is also recommended only if the constituents are detected in at least 25 % of the samples (ASTM 2005), whereas a non-parametric Prediction Limits /Poisson Prediction Limit approach is recommended if the detection frequency is less than 25% and greater than 0% and there are at least 13 background samples. Additional information should be provided to indicate the criteria that would be used for selecting the most appropriate statistical analysis method for various monitored constituents and monitored wells. One or more flow charts depicting the statistical analysis method selection and application processes would be very beneficial in helping to understand the overall structure of the statistical analysis plan. These flow charts should include decision criteria that would be used for selecting the method(s) to conduct initial analyses of the data as well as decision criteria that would be used for selecting the appropriate statistical analysis method(s) which are in compliance with EPA guidance. Included should be the recognition that compliance is established by the appropriate comparison of results to criteria in R317-6.16.

7. *On page 11 of the Plan in the section entitled "Frequency", 1st paragraph, second sentence, the word "down" should instead be "downgradient".*

8. *On page 11 of the Plan in the section entitled "Frequency", the discussions presented in the 2nd and 3rd paragraphs address actions that would be taken in the event of an exceedance or evidence of a statistically significant trend in one or more parameter concentrations within a well. These discussions should be presented under a heading entitled "Actions Taken if Monitoring Data Are Out of Control" or under some similar context. In the 2nd paragraph, it is indicated that if an exceedance of any COC in one or more downgradient wells is confirmed through a re-sampling at that well, the well in question would be re-sampled and*

re-analyzed for the COC's that exceeded compliance criteria. No timetable (i.e. maximum number of days lapsed) is provided for conducting such a verification sampling event. In the 2nd paragraph, it is also indicated that if re-sampling and analysis confirms an exceedance for a COC, UDEQ would be promptly notified and monthly sampling and analysis for the wells yielding the exceedance would begin (for all compliance COCs) until values below the criteria are obtained from two consecutive months (after which a quarterly sampling and analysis schedule would be resumed). Such a complete COC analysis regime could occur in response to evidence indicating that a release had occurred from the tailings containment cell(s). However, no specific timetable (i.e. maximum number of days lapsed) is provided for initiating monthly sampling following the confirmation of such evidence of an exceedance.

9. *In the 3rd paragraph, it is indicated that if control charts indicate a statistically significant increasing trend over three sampling events for any process-related COC (i.e., K. Mg, Na, Unat, and sulfate), quarterly sampling and analysis would be accelerated to monthly, the UDEQ would be advised in writing of such a trend, and a similar increasing trend for any other COC would not trigger an accelerated sample and analysis schedule unless it is accompanied by a concomitant increase in the conservative process-related COCs. This information seems to be in conflict with information presented in the 2nd paragraph as described above. It is therefore recommended that this paragraph be revised.*

10. *The ASTM Standard (ASTM 2005, p. 12) suggests that when large intra-well background databases are available (e.g., more than 3 years worth of semi-annual monitoring data) obvious cyclic or trend patterns can be removed from both the baseline data and from future data that would plotted on a control chart. Additionally, the discussion presented in the last section of the Plan does not include sufficient information regarding how and when the baseline data would be updated by including newer data that are shown to be not out of control and how and when control charts would be updated. The ASTM Standard (ASTM D6312-98) suggests that updating of baseline data may be done at a time interval of 1 or 2 years, after which a new trend analysis should be performed to ensure that no gradual upward or downward trends are observed. These updated parameters could then be used to construct updated control charts. Additionally, there is no discussion of whether, or under which criteria, truncated baseline data sets might be used for constructing such updated control charts.*

11. *The correct ASTM Standard Method is ASTM D6312-98.*

12. *Use of the combined Shewart-CUMSUM control chart approach assumes that the data are independent and normally distributed, or that natural log or square-root transformation of the data prior to analysis would be adequate (ASTM 2005, p. 11). Uranium One needs to provide additional information to address how the results presented in the columns entitled "Distribution" in Tables 1 and 2 of the Background Water Quality document would or would not be consistent with use of the combined Shewart-CUMSUM control chart approach for those parameters which are listed as having neither a normal nor lognormal distribution.*

13. *The meaning of "n", and the reasonableness of the stated n values, cannot be confirmed based on the information provided.*

REFERENCES:

ASTM D 6312. "Standard Guide for Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Programs". ASTM, West Conshohocken, PA.

Davis, J.C., 2002, Statistics and Data Analysis in Geology: New York, John Wiley & Sons, Inc., 638 p.

Everitt, B.S., 1993, Cluster Analysis (Third Edition): NewYork, Arnold, London, and Halsted Press, 170 p.

Everitt, B.S., and Dunn, G., 2001, Applied Multivariate Data Analysis (Second Edition): New York, Oxford University Press, 352 p.

Johnson, R.A., and Wichern, D.W., 2002, Applied Multivariate Statistical Analysis (Fifth edition): Upper Saddle River, New Jersey, Prentice Hall, 767 p.

Hem, J.D. (1985) Study and Interpretation of the Chemical Characteristics of Natural Water. United States Geological Survey Professional Paper 2254.

Hydro-Engineering, LLC. Ground Water Monitoring of Shootaring Canyon Tailings Site – 2005. February 2006.

NRC 2003. NUREG-1620, Rev. 1, "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 of 1978." Washington, DC: NRC 2003.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd. Ground-Water Monitoring of Shootaring Canyon Tailings Site – 2005. Hydro-Engineering, L.L.C, February 2006.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

USEPA (United States Environmental Protection Agency), 1989, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Office of Solid Waste, Waste Management Division, USEPA, Washington, DC 20460.

USEPA. 1992. Statistical Analysis Of Ground-Water Monitoring Data At RCRA Facilities - Addendum To Interim Final Guidance, Office of Solid Waste, Waste Management Division, USEPA, Washington, DC 20460. July 1992.

USEPA 2001. 40 CFR Parts 9, 141, and 142, National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Final Rule. January 22, 2001.

USEPA. 2006. Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S. EPA/240/B-06/003. Office of Environmental Information, Washington, D.C. Download from: http://www.epa.gov/quality/qs-docs/g9s-final.pdf

USEPA 2007. 40 CFR Part 122, 136, et al. Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; National Primary Drinking Water Regulations; and National Secondary Drinking Water Regulations; Analysis and Sampling Procedures; Final Rule. Federal Register, March 12, 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

Uranium One USA, Inc., "DRAFT Shootaring Ground Water Monitoring Plan", November 30, 2007.

Utah Department of Environmental Quality. Ground Water Quality Discharge Permit. Permit #UGW170003, issued January 14, 2004.

Utah Department of Environmental Quality. Division of Radiation Control. Radioactive Material License UT 0900480, Amendment # 2.

Ward, J.H., 1963, Hierarchical Grouping to Optimize an Objective Function: Journal of the American Statistical Association, v. 58, p. 236–244.

INTERROGATORY R317-6-6.3F-28/03: INFORMATION ON EFFLUENT DISCHARGE RATES

PRELIMINARY FINDING:

Refer to R317-6-6.3F: 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:

F. The type, source, and chemical, physical, radiological, and toxic characteristics of the effluent or leachate to be discharged; the average and maximum daily amount of effluent or leachate discharged (gpd), the discharge rate (gpm), and the expected concentrations of any pollutant (mg/l) in each discharge or combination of discharges. If more than one discharge point is used, information for each point must be given separately.

INTERROGATORY STATEMENT:

Estimate the leakage through the secondary liner in similar fashion to the method used to calculate leakage through the primary liner (Section 5.1.4.7 of the TMP). Prepare the estimate using assumptions of head based on the intended operating conditions within the secondary containment sumps (i.e., head caused by one day of leakage and reasonable assumptions as to the leakage through the liner into the underlying subgrade. State and justify the estimated discharge quality and quantity. State the estimated leakage rate for each of the areas, recognizing that the impoundments each will be lined with secondary containment, and that the ore pad will allow greater leakage through the clay liner

Please provide the maximum daily leachate (gpd) and discharge rate (gpm) in each discharge or combination of discharges. Include in this information any discharge that may result from leakage through the tailings cells liner systems, the ore pad liner, and the Evaporation and Process Pond Cell. Please provide the appropriate calculations for each discharge. Also, please state the expected concentrations of pollutants in each discharge and the basis for the determination.

BASIS FOR INTERROGATORY:

Uranium One must provide the above requested information on all discharges of pollutants that impact or have the potential to impact ground water. This information must include all discharges or potential discharges associated with effluent discharge, storage, and liner systems.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY PR R317-6-6.3G-29/03: SURFACE WATER CONTROLS

PRELIMINARY FINDING:

Refer to R317-6-6.3G: 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:

G. Information which shows that the discharge can be controlled and will not migrate into or adversely affect the quality of any other waters of the state, including the applicable surface water quality standards, that the discharge is compatible with the receiving ground water, and that the discharge will comply with the applicable class TDS limits, ground water quality standards, class protection levels or an alternate concentration limit proposed by the facility.

INTERROGATORY STATEMENT:

Please provide information on how surface water run-on and run-off controls will be applied to control the migration of contaminants from the site and associated operations. This is to include a hydraulic analysis for surface water flow and control that could impact the site during milling operations. The analysis needs to be the same level of detail as provided for the Tailings Reclamation and Decommissioning Plan (Section 6.3), and include:

- *How (specifically) surface water flow from contaminated areas will be handled separately from surface water from non-contaminated areas.*
- *How impounded water will not alter or compromise the groundwater flow directions in the Upper Entrada Aquifer.*
- *Layout of flow patterns for surface water controls*
- *Design and details of surface water control structures and respective flow rates*
- *Design basis*
- *Operation and maintenance involved*

Please justify statements that infer that no storm water will impact "waters of the State" in consideration that surface water will be impounded and has the potential to impact groundwater. This justification could be combined with a response to Interrogatory R317-6-6.3F-28/03.

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

Uranium One's response to Round 1 Interrogatory referred to Section 5.1.6 of the TMP that includes a limited summary of the surface water controls to be implemented during operation. No detailed information on the design and sizing of these controls was included, nor were there details on how water from contaminated areas will be kept and handled separately from water from non-contaminated areas. The same type of hydraulic analysis that was done for the Tailings

Reclamation and Decommissioning Plan for storm water control after cell closure (Section 6.3) needs to be performed for the storm water control during mill operation.

In addition, the statement is made that no storm water will leave the site as surface discharge. However, water will be impounded and could be discharged to groundwater (see Interrogatory R317-6-6.3F-28/03). According to R313-6-6.3G, the operator is required to determine that discharges will not affect "waters of the State" which includes groundwater.

Discussions held with Uranium One in December 2007 on the revised cell design (regarding Tetra Tech memo 12/13/07 p. 3) indicated that storm water retained within the bermed areas will be pumped into a division channel and then flow offsite. Please include how it will be demonstrated and confirmed that water pumped from contaminated areas will meet the State's requirements for surface discharge.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-33/03: POST-CLOSURE DRAINAGE AND EROSION CONTROLS AND POSTCLOSURE MAINTENANCE

PRELIMINARY FINDING:

Refer to R313-24-4 (10 CFR 40, Appendix A, Criterion 6 (1), (7)): In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years, and (ii) limit releases of radon-222 from uranium byproduct materials, and radon-220 from thorium byproduct materials, to the atmosphere so as not to exceed an average release rate of 20 picocuries per square meter per second (pCi/m2s) to the extent practicable throughout the effective design life determined pursuant to (1)(i) of this Criterion. In computing required tailings cover thicknesses, moisture in soils in excess of amounts found normally in similar soils in similar circumstances may not be considered. Direct gamma exposure from the tailings or wastes should be reduced to background levels. The effects of any thin synthetic layer may not be taken into account in determining the calculated radon exhalation level. If non-soil materials are proposed as cover materials, it must be demonstrated that these materials will not crack or degrade by differential settlement, weathering, or other mechanism, over long-term intervals.

Refer to R313-24-4 (10 CFR 40, Appendix A, Criterion 6 (7)): The licensee shall also address the nonradiological hazards associated with the wastes in planning and implementing closure. The licensee shall ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. To the extent necessary to prevent threats to human health and the environment, the licensee shall control, minimize, or eliminate post-closure escape of nonradiological hazardous constituents, leachate, contaminated rainwater, or waste decomposition products to the ground or surface waters or to the atmosphere.

Refer to R317-6-6.3.S.: Unless otherwise determined by the Executive Secretary, applicant for a groundwater discharge permit ..shall include the following information: S. A closure and postclosure maintenance plan demonstrating the measures to prevent ground water contamination during the closure and postclosure phases of operation.

INTERROGATORY STATEMENT:

In accordance with UAC R317-6-6.3.S, please provide a plan for closure and post-closure maintenance that discusses post-closure maintenance requirements and identifies measures that will be taken to prevent groundwater contamination during the facility's closure and postclosure phases and to minimize the need for active maintenance following closure. Maintenance of the cover and erosion control systems should also be addressed.

Please provide analyses and discussion of the long-term performance of the cover system considering wind erosion, slope stability, settlement, seismic events, etc. Please describe and provide a basis for the demonstration period during the interim period of site transfer to the custodial party. Please demonstrate that the cover system will remain effective for 1000 years,

to the extent achievable, and for a minimum of 200 years and require minimal maintenance following closure.

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

The licensee should demonstrate that the cover system and other closure design control features will remain effective for 1000 years, to the extent achievable, and for a minimum of 200 years and require minimal maintenance following closure without posing risks due to the release of radiological and potentially hazardous constituents.

The following portion of the 1st Round Interrogatory on Rock Cover (Interrogatory R313-24-4-17/01) is combined and moved to this section - Post-Closure Drainage and Erosion Controls and Post-Closure Maintenance; please provide analyses (or modeling) and discussion of the long-term performance of the cover system and associated erosion controls following closure. Section 6.0 of the Tailings Reclamation and Decommissioning Plan (Hydro-Engineering, L.L.C. 2006) discusses the design of the drainage and erosion control systems for reclamation, however, the section does not appear to thoroughly address post-closure performance required to demonstrate with reasonable assurance that the integrity of the cover system will be maintained and will control radiological and non-radiological hazards for a minimum of 200 years, and to extent achievable, for 1,000 years. Section 6.0 and prior responses indicate that the primary concern for disruption of the cover is erosion by water with the cover designed to accommodate a Probable Maximum Flood (PMF).

In review of information provided in December 2007 from Uranium One on the revised cell design, it was noted that the final cover surface water drainage is to the east into a drainage channel that flows to the south and offsite. However, it appears that the elevations and grading for this channel needs refinement. It is uncertain how the final cell cover surface flow will be transferred into the ditch and then around the dam to the south (in the south east corner of the cell area). Please ensure that the grading design for the final storm water control demonstrates adequate drainage ability and capacity.

REFERENCES:

Plateau Resources, Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December 2005, Revised December 2006.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility," Dated December 2005, Revised April 2007.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-34/03: RADON RELEASE MODELING

PRELIMINARY FINDINGS:

Refer to R313-24-4(2)(J)(ii): Clarifications or Exceptions. "Utah Administrative Code, Rule R317-6, Ground Water Quality Protection" for ground water standards in "Environmental Protection Agency in 40 CFR part 192, subparts D and E" as found in the Introduction, paragraph 4; or "Environmental Protection Agency in 40 CFR part 192, subparts D and E (48 FR 45926; October 7, 1983)" as found in Criterion 5;

Refer to R313-24-4 and 10 CFR Part 40, Appendix A, Criterion 6(1): "In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years, and (ii) limit releases of radon-222 from uranium byproduct materials, and radon-220 from thorium byproduct materials, to the atmosphere so as not to exceed an average release rate of 20 picocuries per square meter per second (pCi/m2s) to the extent practicable throughout the effective design life determined pursuant to (1)(i) of this Criterion. In computing required tailings cover thicknesses, moisture in soils in excess of amounts found normally in similar soils in similar circumstances may not be considered. Direct gamma exposure from the tailings or wastes should be reduced to background levels. The effects of any thin synthetic layer may not be taken into account in determining the calculated radon exhalation level. If non-soil materials are proposed as cover materials, it must be demonstrated that these materials will not crack or degrade by differential settlement, weathering, or other mechanism, over long-term intervals."

Refer to R313-24-4 [10 CFR 40 Appendix A(6)(6)]: The design requirements in this criterion for longevity and control of radon releases apply to any portion of a licensed and/or disposal site unless such portion contains a concentration of radium in land, averaged over areas of 100 square meters, which, as a result of byproduct material, does not exceed the background level by more than: (i) 5 picocuries per gram (pCi/g) of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over the first 15 centimeters (cm) below the surface, and (ii) 15 pCi/g of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over 15-cm thick layers more than 15 cm below the surface. Byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are as low as is reasonably achievable.

INTERROGATORY STATEMENT:

Please provide additional justification for the moisture content and dry density values proposed or, alternatively, more conservative values should be substituted in the modeling (refer to the discussion included in the Basis for Interrogatory).

Please provide adequate justification to support taking any credit for the presence of the HDPE geomembrane for reducing radon release in the long-term after the geomembrane's radon release barrier efficiency is essentially no longer effective.

Provide adequate justification for not completing a radon release simulation where the radon attenuation effects of the cover system layers overlying the radon barrier layer component of the cover are neglected, or include this simulation.

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

In their response to Round 1 of this Interrogatory, Uranium One has not demonstrated that the (long-term) moisture content (24 percent) and dry density values (90 percent for Shootaring Canyon Dam-derived clay materials and 86 percent for alternate clay source-derived clay materials) specifically selected for use in the radon release modeling are sufficiently conservative to bound the range of uncertainty associated with the long-term values of moisture content and dry density that could occur in the radon barrier layer. Variations in the moisture content and dry density of the compacted clay cover layer could likely occur over its design life and such variations need to be considered in evaluations performed to estimate long-term radon emission rates through the cover system (DOE 1989, Section 7.1; EPA 2004, Section 2.3.2.2.8). Additional justification should be presented for the values proposed or, alternatively, more conservative values should be substituted.

Applicable/relevant guidance for estimating long-term moisture content and dry density values for radon barrier layers, including the need for considering possible variations in climate, consideration of physical processes that would be involved, and the possibility of using the –15-bar moisture content of the radon barrier material as a reasonable lower bound estimate of the long-term radon barrier layer moisture content for conducting a worst-case radon release model simulation, are given in NRC Regulatory Guide 3.64 (NRC 1989, pp. 3.64-2 through 3.64-9) and DOE (1989, pp.163-176).

The HDPE geomembrane will have a finite effective service life (see Interrogatory R313-24-4-26/01: INFILTRATION AND CONTAMINANT TRANSPORT MODELING above). Therefore the HDPE geomembrane would provide a measure of conservatism for the radon release modeling only during the active service life of that geomembrane. Adequate justification needs to be provided to support taking any credit for the presence of the HDPE geomembrane for reducing radon release in the long-term after the geomembrane's radon release barrier efficiency is essentially no longer effective.

In addition, Uranium One has not provided adequate justification for not completing a radon release simulation where the radon attenuation effects of the cover system layers overlying the radon barrier layer component of the cover are neglected. Performance of such an analysis case is consistent with precedence that has been used for many years on the UMTRA Project where materials above the radon barrier layer were not modeled (DOE 1989, p. 170). Radon release simulations completed for other similar facilities designed and/or constructed in the State of Utah (Monticello tailings repository final cover system – Waugh and Richardson 1997, p. D-41;

Moab tailings repository final cover system (Office of Environmental Management 2006) each included one or more simulation cases where the cover layers overlying the radon barrier layer were not included in the radon release modeling.

REFERENCES:

DOE, 1989, "Technical Approach Document," Uranium Mill Tailings Remedial Action Project, Rev. II, Section 7.1, "Design of the Radon Barrier". U.S. Department of Energy, UMTRA-DOE/AL 050425.0002. Albuquerque, New Mexico. December 1989.

EPA 2004. "Draft Technical Guidance for RCRA/CERCLA Final Covers", USEPA - USACE Superfund Partnership Program Policy, Guidance, and Activities, Chapter 2. http://hq.environmental.usace.army.mil/epasuperfund/geotech/

Plateau Resources, Ltd.,"Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project", Dated December, 2005.

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility" Amended December, 2005, Revised April 2007.

Plateau Resources, Ltd., Responses to Round 1 TMP Interrogatories, April 2007

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-36/03: OPERATIONAL DUST CONTROL

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(8): To control dusting from tailings, that portion not covered by standing liquids must be wetted or chemically stabilized to prevent or minimize blowing and dusting to the maximum extent reasonably achievable. This requirement may be relaxed if tailings are effectively sheltered from wind, such as may be the case where they are disposed of below grade and the tailings surface is not exposed to wind. Consideration must be given in planning tailings disposal programs to methods which would allow phased covering and reclamation of tailings impoundments because this will help in controlling particulate and radon emissions during operation. To control dusting from diffuse sources, such as tailings and ore pads where automatic controls do not apply, operators shall develop written operating procedures specifying the methods of control which will be utilized.

INTERROGATORY STATEMENT:

Please provide written procedures, material specifications, and supporting detail on dust suppression and air monitoring methods to be used on the tailings piles and drying and packaging operations. Please state the reasonable requirements for dust suppression and monitoring for these operations.

Please provide specifications on the alternative reagents that might be used for dust suppression associated with both the tailings piles and the drying and packaging operations.

Include details on methods for dust suppression for interim covering a portion of a cell when not working in the area, and discuss the impact it will have the engineering properties of the tailings (long and short term), and state the justification for the impacts. Also, provide air monitoring requirements and ALARA evaluations performed for dust suppression to ensure that airborne effluent releases are reduced to levels as low as reasonably achievable.

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

Sections 4.1.1 and 6.2 of the TMP briefly reference applying agents for dust suppression but do not provide sufficient information. The applicants' initial response stated "The RMTP methodology requires further evaluation and refinement, and the production of dust from the paste or moist tailings is not yet quantified. It will be necessary to conduct testing of the fluid extraction process, reduced moisture tailings properties, and available dust suppression agents prior to operation of the mill."

The Division requires a consideration of airborne effluent releases to ensure they are ALARA and that population exposures are reduced to the maximum extent reasonably achievable.

REFERENCES:

Plateau Resources, Ltd., "Tailings Management Plan for Shootaring Canyon Uranium Processing Facility," Dated December 2005, Revised April 2007.

Regulatory Guide 3.56, "General Guidance for Designing, Testing, Operating, and Maintaining Emission Control Devices at Uranium Mills," Task CE 309-4, USNRC, May, 1986.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

INTERROGATORY R313-24-4-37/03: COST ESTIMATES FOR DECOMMISSIONING AND RECLAMATION

PRELIMINARY FINDING:

Referring to R313-24-4: Financial surety arrangements must be established by each mill operator prior to the commencement of operations to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the mill and site and for the reclamation of any tailings or waste disposal areas. The amount of funds to be ensured by such surety arrangements must be based on Executive Secretary-approved cost estimates in a Executive Secretary-approved plan for (1) decontamination and decommissioning of mill buildings and the milling site to levels which allow unrestricted use of these areas upon decommissioning, and (2) the reclamation of tailings and/or waste areas in accordance with technical criteria delineated in Section I of this Appendix. The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and evaluates alternatives for mitigating these impacts.

INTERROGATORY STATEMENT:

After all design changes are made *for the facility and its component equipment, structures, and systems pursuant to this and subsequent rounds of interrogatories, please respond to the following general and specific directives and requests:*

1. *Provide the basis for EACH quantity, duration, allowance, and lump sum identified in the cost estimates presented in Section 11 of the "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project – Revised 2006." This basis should be related in some way to the quantity of materials to be handled (based on relevant drawings) and a documented productivity for similar activities.*
2. *Estimate and include the cost of providing an appropriate level of security at the facility during reclamation and decommissioning.*
3. *Either (A) make a connection between the structures, components, and systems listed in the second paragraph of Section 8.0 and the cost estimate presented in Section 11.1* ***OR*** *(B) estimate and include the costs of decommissioning each of the structures, components, and systems listed in the second paragraph of Section 8.0*
4. *Justify and provide references for unit costs used with quantity (hour, volume, area, etc) estimates shown throughout Section 11.*
5. *Include an adder of 31.7 percent in salaries for individuals listed in Sections 11.1.18, 11.2.10, and 11.3.10 to account for total benefits provided to workers by the contractor, consistent with the information provided for construction workers in Table 5 of the report located at page 11 of http://www.bls.gov/news.release/pdf/ecec.pdf*
6. *Justify OR revise and justify the allowance for Living Costs of $40, $67, and $66 per person per day in Sections 11.1.18, 11.2.10, and 11.3.10, respectively. Justify discrepancies between the crew sizes used in Sections 11.2.10 and 11.3.10 for calculating*

the allowance for Living Costs and the crew sizes stated in Item 1 of Sections 11.2 and 11.3, respectively, OR revise them to make them consistent.

7. *Include in the cost of verifying that soils have been properly cleaned up the cost of remedial action support surveys (Section 11.1.16). Justify, on the basis of MARSSIM guidance, the estimate that final status surveys will require only 48 person-hours. Include in the estimate the costs of analyzing remedial action support and final status survey samples.*
8. *Include the cost of excavating, hauling, spreading, and compacting sandy Interim/Grading material, clay cover material, and Rocky Soil Cover material from local borrow sites, lack of royalty notwithstanding, (Section 11.2.4).*
9. *Justify that 44 bags of grout per well is adequate for the purposes of abandoning monitoring wells (Sections 11.2.8 and 11.3.8).*
10. *Ensure that the costs of environmental monitoring are included in closure and decommissioning costs estimates as appropriate.*
11. *Apply 25 percent of subtotal costs for contingency allowance in Tables 12-1-Cell-1 and 12-1-Cell-2, consistent with relevant NRC guidance on cost estimates supporting determination of financial assurances.*
12. *Revise the Uranium One Management Overhead percentage allowed in Tables 12-1-Cell-1 and 12-1-Cell-2 to reflect the possibility that the Tailings Reclamation and Decommissioning Plan will be performed by an independent third-party contractor. This percentage should allow for:*
    - *Labor Overhead and Profit*
    - *Materials and Subcontract Overhead and Profit*
    - *General Conditions*
    - *Subcontract Administration and Engineering*
    - *Construction Oversight*
13. *Ensure that all revisions made in Section 11 and 12 are incorporated into other sections of the Tailings Reclamation and Decommissioning Plan and elsewhere in the License Amendment Request.*

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

As examples of providing the bases for quantities, durations, allowances, and lump sums, consider the following.

- *Uranium One should explain the basis for estimating that the duration of the ore hopper demolition (Section 11.1.4) is two weeks. This duration should be related in some way to*

the quantities of materials to be handled and a documented productivity for similar activities.

- *Two examples (from numerous instances) of needed explanations: Uranium One should explain why allowances of $500 per month for Miscellaneous Office Supplies and of $40,000 for the "Environmental Radiological & Other Required Surveying, Quality control & Testing Equipment" (Section 11.1.18) are adequate and appropriate. Where quantity of an individual cost item is readily identifiable (e.g., collecting and analyzing environmental monitoring samples and neutralization), the cost estimate should be identified and supported through reference to those quantities.*

Unit costs presented throughout Section 11 should be justified and referenced to published sources, such as R.S. Means Building Construction Cost Data.

The allowances for contingency, management, and overhead costs are too small and should be increased.

REFERENCES:

Plateau Resources Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project –2005; Garfield County, Utah", December 2005, Revised: December 2006.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.

US Bureau of Labor Statistics, "Employer Costs for Employee Compensation – March 2007", http://www.bls.gov/news.release/pdf/ecec.pdf as of July 10, 2007.

US Nuclear Regulatory Commission. "NMSS Decommissioning Standard Review Plan," NUREG-1727, September 2000.

US Nuclear Regulatory Commission. "Revised Analyses of Decommissioning Reference Non-Fuel-Cycle Facilities," NUREG/CR-6477, December 2002.

INTERROGATORY R313-24-4-38/02: LONG TERM SURVEILLANCE COSTS

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A(9); The surety must also cover the payment of the charge for long-term surveillance and control required by Criterion 10. In establishing specific surety arrangements, the licensee's cost estimates must take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the Executive Secretary may accept financial sureties that have been consolidated with financial or surety arrangements established to meet requirements of other Federal or state agencies and/or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance and control, provided such arrangements are considered adequate to satisfy these requirements and that the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge is clearly identified and committed for use in accomplishing these activities.

INTERROGATORY STATEMENT:

Justify OR revise and justify the allowance of $752,600 for DOE to provide Long Term Maintenance (as shown in Table 12-1-Cell-1 and 12-1-Cell-2). Base the allowance on EITHER:

1. *A detailed listing of activities and cost components (expressed as quantities with unit costs), together with an orderly estimate of associated costs, including an explanation of basis. This cost estimate should address planned and expected costs for a period of at least 100 years following reclamation and decommissioning and should consider a rate of return on secure financial instruments of 2 percent real.*
2. *Justifying, including explanation of basis*
    - *A value that was acceptable to DOE in 1978,*
    - *That DOE still honors the 1978 basis for determining costs that should be covered for it providing Long Term Maintenance, and*
    - *Cost escalation from 1978 to 2007 using an appropriate construction cost index.*

BASIS FOR INTERROGATORY:

The response to Round 2 was that the response to this submittal will be provided in the next submittal.

Although the response to Round 1 Interrogatory R313-24-4-38/01 might be reasonable, no basis is provided that allows intelligent evaluation of the allowance for the cost of Long Term Maintenance by DOE. The basis for estimating the present value of costs for DOE to provide long-term surveillance and maintenance should be clearly elaborated.

REFERENCES:

Plateau Resources Ltd., "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project –2005; Garfield County, Utah", December 2005, Revised: December 2006.

Uranium One USA, Inc., "Shootaring Canyon Uranium Mill Amendment Request for Radioactive Material License No. UT 09004480, 2nd Round Interrogatory Responses", November 28, 2007.