UTAH DIVISION OF RADIATION CONTROL: ENERGY*SOLUTIONS'* CLIVE LLRW DISPOSAL FACILITY;

LICENSE AMENDMENT REQUEST; CLASS A WEST EMBANKMENT

ROUND 2A INTERROGATORIES

TABLE OF CONTENTS
(Highlighted items continued to Round 2)

ABBREVIATIONS AND ACRONYMS

CAW LAR	Class A West Embankment License Amendment Request
ft	foot
km	kilometer LLRW low-level radioactive waste
M	magnitude
PSHA	Probabilistic Seismic Hazard Analysis
UAC	Utah Code Annotated
US	United States
USBR	US Bureau of Reclamation

INTERROGATORY CAW R313-25-6(3)-01/2A: DESCRIPTION OF FACILITY

PRELIMINARY FINDING:

Refer to R313-25-6(3). …Provide a description of:

(a) the location of the proposed disposal site;
(b) the general character of the proposed activities;
(c) the types and quantities of waste to be received, possessed, and disposed of;
(d) plans for use of the land disposal facility for purposes other than disposal of wastes;
(e) the proposed facilities and equipment

INTERROGATORY STATEMENT:

Refer to Sections1.2.2.12 and 1.2.3 of the Class A West (CAW) Embankment License Amendment Request (LAR):

1. *Provide a revised description in Section 1.2.2.12 indicating that, contrary to the statement made that "No existing facilities will be impacted by the CAW embankment", a number of "facilities" will be affected by the proposed CAW Embankment (e.g., the Class A and Class A North Embankments, groundwater monitoring wells, and selected lysimeters [as described in Section 1.2.3]).*

BASIS FOR INTERROGATORY:

The statement "No existing facilities will be impacted by the CAW embankment" is not strictly correct. The Class A and CAN embankments are both affected, as are groundwater monitoring wells located between the two existing embankments. A number of lysimeters will also be affected. They will be removed from service. These are stated in Section 1.2.3 of the CAW LAR to be CL-W3, CL-W4, and CL-N5. If the statement means that "facilities" are only structures such as the rotary dump facility and the shredder facility then please change the sentence in Section 1.2.2.12.

REFERENCES:

Energy*Solutions, LLC 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Round 1 Interrogatory Response" and cover letter (CD11-0295) to Mr. Rusty Lundberg at Utah Division of Radiation Control dated October 31, 2011.

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Response to Interrogatory CAW R313-25-8(1)-08/1"and cover letter (CD11-0327)to Mr. Rusty Lundberg at Utah Division of Radiation Control dated November 29, 2011.

INTERROGATORY CAWR313-25-7(1)-02/1: SPECIFIC TECHNICAL INFORMATION – GROUNDWATER ELEVATION VALUE(S) USED IN ANALYSES

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R313-25-7(2)-03/2A: SPECIFIC TECHNICAL INFORMATION – BUFFER ZONE

PRELIMINARY FINDING:

Refer to R313-25-25(8). A buffer zone of land shall be maintained between any buried waste and the disposal site boundary and beneath the disposed waste. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in R313-25-26(4) and take mitigative measures if needed.

INTERROGATORY STATEMENT:

NOTE: The following comments apply to revisions of drawings issued prior to issuance of revisions submitted to the Division with Revision 1 of the License Amendment Request on October 31, 2011. These comments apply to the revisions transmitted on November 29, 2011 to the extent that they have not been addressed by the latest revisions.

Please revise Drawing 10014 C01 as follows:

1. *Correctly show the "CAW Waste Break Line" in the drawing (presently, the line style for CAW Waste Limit appears to be used to denote the CAW Waste Break Line).*
2. *Use a line style for Class A and Class A North Embankments that is easily distinguishable from that used to denote the CAW Waste Break Lines.*
3. *Provide coordinate sets that define the end points of the heavy dashed line. Label these coordinate sets so that it is clear what they represent. Explicitly state that the heavy dashed line defines the eastern extreme of waste placement and that no waste will be*

placed east of that line from its north end to its south end. NOTE: The line is presently labeled as representing an "area".

4. *Revise the legend label from "Waste Restricted Area" to "Eastern extreme of CAW waste placement" or similar. Maintain consistency between terminology used in the entire drawing set.*
5. *Revise references to the "Waste Restricted Area" so that it refers to a line, limit, or boundary.*

Please revise Drawing 10014 C02 as follows:

6. *Identify the location of the "Eastern extreme of CAW waste placement" in Cross Section A.*
7. *Maintain consistency between terminology used in this drawing (that for "Shoulder") and in Drawing 10014 C05 [that for "CAW Break Line (Typical)"].*

Please revise Drawing10014 C03 as follows:

8. *Revise the term "Toe of Waste (Actual)" to "Eastern extreme of CAW waste placement" or otherwise maintain consistency between terminology used throughout this drawing set.*
9. *Revise the term "Waste Limits" to be "Authorized CAW Waste Limits".*

Please revise Drawing 10014 C05 as follows:

10. *Maintain consistency between terminology used in this drawing [that for "CAW Break Line (Typical)"] and in Drawing 10014 C03 (that for "Shoulder").*

***Note**: Additional suggested changes/corrections to drawings will be provided in Round 2b Interrogatories, as necessary.*

BASIS FOR INTERROGATORY:

The Round 1 responses adequately resolve the buffer zone matter. However, ambiguities and seemingly conflicting or confusing information exist in the drawings. These need to be resolved.

REFERENCES:

EnergySolutions, LLC 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Round 1 Interrogatory Response" and cover letter (CD11-0295) to Mr. Rusty Lundberg at Utah Division of Radiation Control dated October 31, 2011.

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Response to Interrogatory CAW R313-25-8(1)-08/1"and cover letter (CD11-0327) to Mr. Rusty Lundberg at Utah Division of Radiation Control dated November 29, 2011.

INTERROGATORY CAW R313-25-7(3)-04/2A: SPECIFIC TECHNICAL INFORMATION – DESIGN CRITERION FOR DISTORTION OF LINER AND CLAY COVER COMPONENTS

PRELIMINARY FINDING:

Refer to R313-25-7. The application shall include certain technical information….
(3) Descriptions of the principal design criteria and their relationship to the performance objectives.

INTERROGATORY STATEMENT:

1. *Please demonstrate that the maximum tensile strain associated with an angular distortion of 0.02 ft/ft is sufficiently less than the strain which causes a compacted clay liner (CCL) to crack, considering the properties of the soil(s) in question. As part of this demonstration, please integrate results/findings from more recent investigations of compacted clay layer deformation behavior with prior investigation/testing results. The demonstration should consider both axial and bending strains when relating maximum tensile strain to angular distortion. The demonstration should also address the potential role of soil creep and/or moisture changes over time in determining the maximum allowable tensile strain.*
2. *In Table 1, page 8, of the Response to Round 1 Interrogatories (EnergySolutions 2011), please revise entries in the last column is titled "Maximum Tensile Strain (%") to list the correct parameter reported for each cited case study, or delete the row summarizing results for the study if the listed value is not tensile strain. For example, the study by Le et al. 2009 measured maximum tensile strength which is not the same as maximum tensile strain as listed in the table.*

BASIS FOR INTERROGATORY

EnergySolutions' response to Interrogatory CAW R313-25-7(3)-04/1 does not sufficiently demonstrate the adequacy of the 0.02 value for the maximum allowable angular distortion used as a design criterion for the liner and clay components of the CAW Embankment cover. In its response, the Licensee attempts to demonstrate adequacy of the 0.02 distortion value by first establishing with a literature review the maximum tensile strain of clay before cracking; then correlating that strain to a corresponding angular distortion, and finally comparing that angular distortion with the design criterion. However, some deficiencies trouble the development of the justification.

The literature review presented by the Licensee consists of references to seven publications (some of which appear to be derived from the others) published since 2002. In focusing on more recent literature, the Licensee has not integrated the results obtained from more recent investigations and laboratory testing with results from its previous work (AMEC 2000). A partial list of previous work includes reports by Tschebotarioff et al. (1953), Leonards and

Narain (1963), Marsal and De Arellano (1967), Al Hussaina and Townsend (1971), Covarrubias (1971), Krishnayya et al. (1974), Ajaz and Parry (1975a, 1976b, 1976), Wilson and Marsal (1979), Gaind and Char (1983), Chandhari and Char (1985), Gilbert and Murphy (1987), Scherbeck et al. (1991), Jessberger and Stone (1991), Scherbeck and Jessberger (1993), Claire et al. (1994), and Lozano and Aughenbaugh (1995).

Several of the references listed above were considered and referenced in AMEC 2000; however, a comprehensive assessment that more wholly reflects the current state of knowledge has not been provided in response to Interrogatory CAW R313-25-7(3)-04/1. Several of these references also indicate that the maximum tensile strain before cracking occurs in a CCL (compacted clay liner) may be as low as 0.1%, which is less than the 0.2% value that the Licensee has declared to be "a very conservative lower bound." Of course, maximum tensile stain before cracking does depend upon the specific properties (particularly the plasticity index) of the soil(s) in question. Thus, 0.2% may yet be shown to be appropriate for this project. More work is, however, needed to fully demonstrate the validity of the Licensee's conclusion.

More recent investigation results reported in the literature should be integrated with results the Licensee has reported earlier (AMEC 2000). For example, the more recent study by Rajesh and Viswanadham (2010,) cited by in the Licensee's response features numerical- and measurement-based subsidence profiles, together with axial and bending strains. The results of Rajesh and Viswanadham (2010) suggest higher localized strain levels for a given angular distortion than does the simple model of LaGatta et al. 1997. In AMEC 2000, as well as in its response to Interrogatory CAW R313-25-7(3)-04/1, the Licensee relies upon a simple mathematical model presented in LaGatta et al. (1997) to relate maximum tensile strain to displacement ratio. The model is a linearized representation of a settlement/subsidence profile and accounts only for the axial lengthening of the clay liner. Consequently, the strain provided by LaGatta et al.'s model is an <u>average</u> of only axial strain that does not account for bending-induced strains away from the neutral axis. The strain-distortion relationship presented graphically in Gilbert and Murphy (1987) also seems to be based on average tensile strain without consideration of potential bending.

If the Licensee seeks to clearly and transparently justify the angular distortion criterion by relating it to the maximum tensile strain (strength) in the clay liner, these more recent and realistic relationships should be considered.

Additionally, the maximum tensile strains cited in the Licensee's response from Viswanadham and Mahesh's study (2002) are not explicitly stated in that study, and the maximum tensile strains reported by the Licensee from the study by Rajesh and Viswanadham (2010) appear to be for a fiber-reinforced clay liner (FRCL), not for a plain CCL which seems to have cracked at lower strain.

The Licensee has not stated whether results from these controlled, short-term laboratory tests are directly transferable to the long-term performance of clayey soils where soil creep and/or moisture changes can affect the soil behavior. On Table 1, page 8, of the Response to Round 1 Interrogatories, the last column is titled: Maximum Tensile Strain (%). However, the values in the column are not all tensile strain values. For example, the study by Le (2009) measured

maximum tensile strength, not maximum tensile strain as listed in the table. The table needs to be corrected and the correct parameters listed as stated in each reference.

REFERENCES

Ajaz, A. and Parry, R.H.G. (1975a). "Stress-Strain Behavior of Two Compacted Clays in Tension and Compression," Geotechnique, Vol. 25, No. 3, pp. 495-512.

Ajaz, A. and Parry, R.H.G. (1975b). "Analysis of Bending Stresses in Soil Beams," Geotechnique, Vol. 25, No. 3, pp. 586-591.

Ajaz, A. and Parry, R.H.G. (1976). "Bending Test for Compacted Clays," ASCE Journal of the Geotechnical Engineering Division, Vol. 102, No. 9, pp. 929-943.

Al-Hussaina, M.M. and Townsend, T.C. (1971). "Investigation of Tensile Testing of Compacted Soils," Miscellaneous Paper S-74-10, U.S. Army Waterways Experiment Station, Vicksburg, Mississippi, June.

AMEC 2000, "Letter; Allowable Differential Settlement and Distortion of Liner and Cover Materials; New LARW and Proposed LLRW Embankments; Clive, Utah", from Pilz and White of AMEC to Alkema of Envirocare of Utah, October 4, 2000.

Chandhari, A.P. and Char, A.N.R. (1985). "Flexural Behavior of Reinforced Beams," ASCE Journal of Geotechnical Engineering, Vol. 111, No. 11, pp. 1328-1333.

Claire, R.F., Kuo, J.C., and Wanket, D.R. (1994). "Evaluation of the Cover Cracking Potential Due to Ground Subsidence at UMTRA Project Disposal Cells." Morrison Knudsen Corporation, Boise, Idaho.

Covarrubias, S.W. (1971). "Cracking of Earth and Rock Dams – Comparison of Observed and Theoretical Tensile Strains in the Crests of Two Earth and Rock Dams," Contract Report S-71-11, U.S. Waterways and Experiment Station, Vicksburg, Mississippi. April.

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Round 1 Interrogatory Response" and cover letter (CD11-0295) to Mr. Rusty Lundberg at Utah Division of Radiation Control dated October 31, 2011. Gaind, K.J. and Char, A.N.R. (1983). "Reinforced Soil Beams," ASCE Journal of Geotechnical Engineering, Vol. 109, No. 7, pp. 977-982.

Gilbert, P.A. and Murphy, W.L. (1987). "Prediction/Mitigation of Subsidence Damage to Hazardous Water Landfill Covers." Report EPA/600/2-87/025, U.S. Army Waterways Experiment Station, Vicksburg, Mississippi.

Jessberger, H.L. and Stone, K. (1991). "Subsidence Effects on Clay Barriers," Geotechnique, Vol. 41, No. 2, pp. 185-194.

Krishnayya, A.V.G., Eisenstein, Z., and Morgenstern, N.R. (1974). "Behavior of Compacted Soil in Tension," ASCE Journal of the Geotechnical Engineering Division,Vol.100, GT-9, pp. 1051-1061.

LaGatta, M.D., Boardman, B.T., Cooley, B.H., and Daniel, D.E. (1997). "Geosynthetic Clay Liners Subjected to Differential Settlement," Journal of Geotechnical and Geoenvironmental Engineering, Vol. 123, No. 5, pp. 402-410.

Le, TNH, et al. 2009. "Discrete Analysis of Clay Liner Tensile Strength", in Powders and Grains 2009, Proceedings of the the 6th International Conference on Micromechanics of Granular Media, 970-0-7354-0682-7.

Leonards, G.A. and Narain, J. (1963). "Flexibility of Clay and Cracking of Earth Dams," ASCE Journal of the Soil Mechanics and Foundations Division, Vol. 89, No. 2, pp. 47-98.

Lozano, N. and Aughenbaugh, N.R. (1995). "Flexibility of Fine-Grained Soils," Geoenvironment 2000, Geotechnical Special Publication No. 46, D.E. Daniel and Y.B. Acar (eds.), ASCE, New York, NY, Vol. 1, pp. 844-858.

Marsal, R.J. and De Arellano, L.R. (1967). "Performance of El Infiernillo Dam 1963 -1966," ASCE Journal of the Soil Mechanics and Foundations Division, Vol. 93, SM4, pp. 265-298.

Rajesh, S. and Viswanadham, B.V.S. (2010). "Performance Assessment of Deformation Behavior of Landfill Barriers at the Onset of Differential Settlement," International Journal of Environmental Engineering, Vol. 2.1, pp. 269-289.

Scherbeck, R. and Jessberger, H.J. (1993). "Assessment of Deformed Mineral Sealing Layers." Proceedings, Green '93, Bolton University, Manchester England.

Scherbeck, R., Jessberger, H.J., and Stone, K. (1991). "Mineral Liner Reaction from Settlement Induced Deformation." Centrifuge 1991. Ko, H.Y., and McLean, F.G., Eds. A.A. Balkema, Rotterdam, Netherlands, pp. 121-128.

Tschebotarioff, G.P., Ward, E.R., and Dephilippe. A.A. (1953). "The Tensile Strength of Disturbed and Recompacted Soils," Proc. Third International Conference on Soil Mechanics and Foundation Engineering, Vol.1, Session2/28, pp. 207-210.

Wilson, S.D. and Marsal, R.J. (1979). "Current Trends in Design and Construction of Embankment Dams," ICOLD Committee on International Relations and Geotechnical Division, ASCE, New York, NY.

Viswanadham, B.V.S. and Mahesh, K.V. (2002). "Modeling Deformation Behavior of Clay Liners in a Small Centrifuge," Canadian Geotechnical Journal, Vol. 39, pp. 1406-1418.

INTERROGATORY CAW R313-25-7(7)-05/1: SPECIFIC TECHNICAL INFORMATION -- CLOSURE PLAN

Follow –up issues will be included in the Round 2B Interrogatories

INTERROGATORY CAW R313-25-7(9)-06/2B: SPECIFIC TECHNICAL INFORMATION – QUANTITIES OF RADIOACTIVE MATERIALS

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-7(10)-07/1: SPECIFIC TECHNICAL INFORMATION – CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL MANUAL

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R313-25-8(1)-08/2B: TECHNICAL ANALYSES; RELEASES OF RADIOACTIVITY

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-8(2)-09/2B: TECHNICAL ANALYSES; PROTECTION OF INADVERTENT INTRUDERS

A performance assessment to be completed in 2012, will address dose limits for disposal.

INTERROGATORY CAW R313-25-8(4)-10/1: TECHNICAL ANALYSIS – DESIGN SAFETY FACTORS

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R313-25-8(4)-11/2B: TECHNICAL ANALYSIS - ROCK COVER DESIGN AND ROCK COVER DESIGN CALCULATIONS/ ANALYSES

Follow-up issues, if any, will be included in Round 2B Interrogatories

INTERROGATORY CAW R313-25-8(4)-12/2B: TECHNICAL ANALYSIS - FILTER STABILITY/ FILTER PERMEABILITY CRITERIA

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-8(4)-13/2B: TECHNICAL ANALYSES-PERIMETER DRAINAGE DITCH CALCULATIONS

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-8(4)-14/2B: TECHNICAL ANALYSES – INFILTRATION AND TRANSPORT MODELING: CLIMATE CONDITIONS, ENGINEERED BARRIER CONDITIONS, AND VERTICAL TRANSPORT DISTANCE

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-8(4)-15/1: TECHNICAL ANALYSES – GROUNDWATER DEPTH IN GEOTECHNICAL STABILITY ANALYSIS

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R313-25-8(4)-16/2A: SEISMIC HAZARD EVALUATION / SEISMIC STABILITY ANALYSIS UPDATE

PRELIMINARY FINDING:
Refer to R313-25-8(5). Analyses of the long-term stability of the disposal site shall be based upon analyses of active natural processes including erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses shall provide reasonable assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.

INTERROGATORY STATEMENT:

Justify using the outdated "semi-probabilistic" approach reported in the response or preferably perform a probabilistic seismic hazard analysis (PSHA). In addition,

a. If an attempt is made to justify the semi-probabilistic, explain and justify the basis for using the radius of the circular area of 18.74 km in the deterministic calculations.
b. Decluster the earthquake catalog as is done in standard probabilistic approaches and as was done by Pechmann and Arabasz (1995) and use that catalog in any ground motion calculations.
c. Correctly label the vertical axis in Figure 3 and correctly interpret the information presented in Figure 3 (cumulative frequency plot).

BASIS FOR INTERROGATORY:

In lieu of performing a PSHA to assess the ground motions from background earthquakes as they had previously done for this site, AMEC has attempted to take what they call a "semi-probabilistic" approach. The justification for taking such an approach is however unstated. Semi-probabilistic approaches are not standard practice and have been abandoned since the late 1990's.

In some aspects, the "semi-probabilistic" approach has similarities with the methodology used by the U.S. Bureau of Reclamation (USBR) since the early 1980's but long since abandoned since the late 1990's. As pointed out by Pechmann and Arabasz (1995) for the Wasatch Front region, this approach which they call "semi-deterministic" yields peak horizontal accelerations that are a factor of 1.5 to 5.7 lower than values obtained by a more complete PSHA. The USBR performs a PSHA to address the hazard from background earthquakes.

Even given these observations, the approach appears flawed as follows:

1. *The statement is made on page 4 of the AMEC report that the "resulting earthquake activity rate curve is conservative and exceeds the Pechmann and Arabasz (1995) rate of earthquakes < 5." This difference may have resulted because AMEC did not decluster their earthquake catalog as is done in standard probabilistic approaches and as was done by Pechmann and Arabasz (1995). At the magnitude range of importance M > 5, the rate of activity is lower than Pechmann and Arabasz (1995) which may be appropriate for this area west of the Wasatch Front.*
2. *For a 1000 km^2 area, the radius of 17.84 km is used. The recurrence interval of an earthquake of M 6.5 and greater from the AMEC analysis is 9950 years but that earthquake can occur anywhere within the 1000 km^2 area. Specifying the earthquake occurs at 17.84 km effectively places the event at the further distance from the site for that probability. Note the vertical axis on Figure 3 is mislabeled. It is "Recurrence Interval" not "Return Period".*
3. *The recurrence curves shown on Figure 3 are cumulative frequency plots. AMEC is interpreting earthquake magnitudes from these plots but is ignoring the fact that these magnitudes represent events that have the specified magnitude value and larger. As stated above, the magnitude on Curve B that has a recurrence interval of 9950 years is a M 6.5 and greater.*

Note: *An additional interrogatory item related to the topic addressed in this interrogatory may be provided in the Round 2B Interrogatories.*

REFERENCES:

AMEC Earth & Environmental, Inc., "Response to Interrogatory CAW R313-25-8(4)-16/1: Seismic Hazard Analysis", Job Number 10-817-05290, October 25, 2011.

Pechmann, J.C. and Arabasz, W.J., 1995, The problem of the random earthquake in seismic hazard analysis: Wasatch Front region, Utah in W.R. Lund (ed), Environmental and Engineering Geology of the Wasatch Front Region, 1995 Symposium and Field Conference: Utah Geological Association Publication 24, p. 77-93.

INTERROGATORY CAW R313-25-24(1 THROUGH 3)-17/1: DISPOSAL SITE DESIGN FOR NEAR-SURFACE DISPOSAL - LINER DESIGN AND CONSTRUCTION

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R313-25-24(5)-18/2B: DISPOSAL SITE DESIGN FOR NEAR-SURFACE DISPOSAL - DRAINAGE JUNCTURE AND DRAINAGE OUTLET DESIGN FOR PERIMETER DRAINAGE DITCH SYSTEM

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-25(6)-19/2A: RADIATION DOSE RATE AT THE SURFACE OF THE COVER

PRELIMINARY FINDING:

Refer to R313-25-25(6). Waste shall be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with all provisions of R313-15-105 at the time the license is transferred pursuant to R313-25-16.

INTERROGATORY STATEMENT:

Refer to Section 3.1.9 of the Class A West (CAW) Embankment License Amendment Request (LAR):

Please submit a Microshield output showing the dose rate at the surface of the cover, taking into account the revised cover design described in the November 29, 2011 response to Interrogatory CAW R313-25-8(1)-08/1.

BASIS FOR INTERROGATORY:

Since the cover design and thickness have been revised, the previous Microshield analysis is no longer valid.

REFERENCES

Energy*Solutions, LLC 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

Energy*Solutions*, LLC 2011. *Responses to Round 1 Interrogatories: License Amendment Request (UT2300249) for the Class A West Embankment and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control, dated October 28, 2011.*

EnergySolutions, LLC 2011. "License and Modification Request – Class A West Embankment: Response to Interrogatory CAW R313-25-8(1)-08/1"and cover letter (CD11-0327)to Mr. Rusty Lundberg at Utah Division of Radiation Control dated November 29, 2011.

INTERROGATORY CAW R313-25-26(1)-20/2A: ENVIRONMENTAL MONITORING

PRELIMINARY FINDING:

Refer to R313-25-26(1). During the land disposal facility site construction and operation, the licensee shall maintain an environmental monitoring program. Measurements and observations shall be made and recorded to provide data to evaluate the potential health and environmental impacts during both the construction and the operation of the facility and to enable the evaluation of long-term effects and need for mitigative measures. The monitoring system shall be capable of providing early warning of releases of waste from the disposal site before they leave the site boundary.

INTERROGATORY STATEMENT:

Please revise the Environmental Monitoring Plan to include installation and operation of at least 2 additional air monitoring stations on the east side of the proposed CAW disposal embankment and west of the Vitro disposal area.

BASIS FOR INTERROGATORY:

Although access to the Vitro disposal area is restricted, no means presently exists to monitor how much particulate matter is release from the proposed CAW embankment to the Vitro disposal area – not within EnergySolutions' controlled area. EnergySolutions and the Division are both responsible to ensure that these possible releases are monitored and to demonstrate that LLRW disposal operations are not causing contamination to adjacent and downwind properties.

The air monitoring stations located south of the 11e.(2) embankment perform this function for potential releases to unrestricted areas south of the 11e.(2) embankment.

REFERENCES:

Energy Solutions, LLC 2011. License Amendment Request: Class A West Embankment, with Attachments 1 through 7 and Cover Letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.

INTERROGATORY CAW R313-25-26 (2 AND 3)-21/2B: TECHNICAL ANALYSES - HORIZONTAL TRANSPORT AND WELL SPACING ANALYSIS INPUT PARAMETERS

Follow-up issues, if any, will be included in Round 2B Interrogatories.

INTERROGATORY CAW R313-25-33(1)-22/1: RECORDS

Round 1 Interrogatory Response is satisfactory.

INTERROGATORY CAW R317-6-6.4-23/2A: ISSUANCE OF DISCHARGE PERMIT: BEST AVAILABLE TECHNOLOGIES - MONITORING WELLS REQUIRING ABANDONMENT AND DECOMMISSIONING AND LYSIMETERS PROPOSED FOR ABANDONMENT

PRELIMINARY FINDING:

Refer to R317-6-6.4(A). 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: …2. the monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements; 3. the applicant is using best available technology to minimize the discharge of any pollutant;…".

INTERROGATORY STATEMENT:

Refer to Section 1.2.3 of the Class A West (CAW) Embankment License Amendment Request (LAR) and Drawing 10014 C01 in Attachment 2 to the Round 1 Interrogatory Response submitted in support of the CAW Embankment LAR:

1. *Please provide additional information regarding feasible systems and/or means that will be implemented for ensuring that there will be a reliable means for acquiring data on vadose zone conditions (soil moisture, pore-water chemistry) underlying the southeastern portion of the proposed CAW Embankment. Drawing 10014 C01 indicates that two existing or currently planned lysimeters (CL-W3 and CL-W4) located beneath the southeastern portion (southeastern "quadrant") of the CAW Embankment footprint are proposed to be abandoned. However, no new lysimeters or other types of vadose zone monitoring devices are proposed to be installed beneath this CAW Embankment "quadrant" area (the eastern part of the existing Class A Embankment).*

2. *Please provide information and details to demonstrate that the system and/or measures* Energy*Solutions proposes to implement will provide reliable data to aid in early warning detection of potential releases from this portion of the proposed CAW Embankment, and include means for obtaining pore-water chemistry data (e.g., to help confirm and/or characterize constituents in leachate associated with a potential release). Identify and evaluate available monitoring technologies that could be feasibly employed and used to*

acquire such data, including, but not limited to: (1) suction lysimeters (e.g., SoilMoisture Equipment Corporation Model 1940 Hi-Pressure/Vacuum soil water sampler) constructed and installed in angled boreholes; (2) neutron probe access tubes, possibly combined with a means of obtaining a sample of accumulated liquid present, if any, from beneath the eastern portion of the current Class A Embankment footprint portion of the CAW Embankment within the vadose zone monitored interval; or (3) other technologies, to the extent that they may be available and feasible. Demonstrate that the system and/or measures to be employed, if different than the current or planned vadose zone monitoring method, satisfy criteria for best available technologies for this type of monitoring.

BASIS FOR INTERROGATORY:

The total number of existing and proposed lysimeters originally proposed for installation under the Class A Embankment area was 8, and was subsequently reduced to 7 with the Division's approval. The total number of lysimeters currently proposed for this same area is 5, according to the information included in the CAW Embankment LAR (Section 1.2.3 and Drawing 10014 C01). The total surface area of coverage per lysimeter for the Class A Embankment area, as proposed in the CAW Embankment LAR, would be 10 acres. By comparison, the total surface area of coverage per lysimeter for the Class A North Embankment area, according to the CAW Embankment LAR, would be 8 acres. Additionally, given the prevailing groundwater flow direction in the area (northeastward); the relative proximity of the Vitro Embankment northeast (in the downgradient groundwater flow direction from) of the CAW Embankment area and the consequent need to respond quickly to potential releases of constituents from the CAW Embankment to soil and/or groundwater reliable early detection of releases from the proposed embankment be ensured);, and the proposed removal of lysimeters CL-W4 and CL-W3 located in the Class A Embankment area, a "gap" would occur in the vadose zone monitoring system coverage underlying the eastern part of the area now occupied by the Class A Embankment, especially from the perspective of the monitoring system needing to provide a reliable early warning detection capability to facilitate timely response/corrective actions to any such releases. EnergySolutions needs to provide information regarding how this vadose zone monitoring gap will be filled, or, alternatively, provide detailed justification as to why the currently proposed lysimeter monitoring plan would be adequate and reliable.

REFERENCES:

Energy*Solutions, LLC 2011. License Amendment Request: Class A West Embankment, with Attachments 1 Through 7 and cover letter to Mr. Rusty Lundberg at Utah Division of Radiation Control dated May 2, 2011.*

"Ground Water Discharge Permit UGW450005", Department of Environmental Quality, Utah Water Quality Board, held by Energy*Solutions, LLC, July 29, 2010.*

Utah Department of Environmental Quality 2011. Request for Modification to Appendix C. "Construction Quality Assurance Plan for Collection Lysimeter Construction" and Collection

Lysimeter Operation, Maintenance and Closure Plan" Groundwater Quality Discharge Permit No. UGW450005: Approval. June 27, 2011.