COMPLETENESS REVIEW; ENERGYSOLUTIONS, LLC "AMENDMENT REQUEST; CLASS A SOUTH/11E.(2) EMBANKMENT" Dated January 4, 2008

GENERAL COMMENTS

1. **Incorporating by Reference**: Repeatedly throughout the Amendment Request (AR), the Licensee states that what is requested is similar to what has already been approved as justification that this request also can be approved without providing additional information. As the Division has consistently declared in response to similar statements offered in support of previous requests, the Licensee must provide specific, narrowly focused citations to previous documents containing justifications and the supporting analyses.

   Moreover, each time the Licensee incorporates material by reference, it must also demonstrate that the bases for previous situation (to which the reference applies) are sufficiently similar to those that exist in the current situation that the cited results apply directly without revision. If such demonstration cannot be made, the Licensee must either provide new analyses or justifications for the requested action or revise the request.

2. **Information Defining 11e.(2) Disposal Embankment and Its Operation:** The AR is focused on how the plan impacts the Class A license conditions but does not address how the proposed design changes will affect the 11e.(2) facility site boundaries, design, construction/operations, environmental monitoring, closure, and the associated license conditions. The AR does not address how proposed changes will comply with all of the byproduct disposal requirements in R313-24, groundwater protection requirements in R317-6, and other applicable and relevant regulations. No discussion is provided to describe how these changes will impact the stability and performance modeling assumptions, design, and operation of the 11e.(2) facility.

   No discussion is provided to describe how the current embankment, designed under the 11e.(2) regulations, will meet the Class A LLRW regulations. Neither is any discussion provided to describe how the 11e.(2) and LLW regulations differ and how the proposed system will satisfy both.

   Further, no discussion is provided to describe the current embankment conditions. This discussion should include the amount and location of existing waste in the 11e.(2) disposal embankment. All modifications to the existing embankment should be compared to the existing conditions.

3. **Stand-Alone Amendment Request**: As the Licensee provides new and revised information that affects the proposed design, construction, and operation, it should incorporate all new and revised information into the AR so that the AR at all times is a stand alone document that fully describes and justifies the requested action. Revised or new text, tables, figures, exhibits, attachments, appendices, and other materials made a part of the AR should be explicitly identified as revised and tracked through the AR review and approval process.

4. **Submission of Electronic Copies**: As the Licensee is subject to R113-12-111, the AR and all attachments to the AR must be in an acceptable electronic format. The electronic version of the AR received as a PDF was not completely searchable, and pages from the Construction QA/QC manual and other sections of the submission were distorted by copy fade and are not considered true, legible copies of the original documents. The electronic submission failed to meet the standard of the UAC R113-12-111, included below for reference:

   (1) All submissions to the Executive Secretary not exempt in paragraph R313-12-111(5) shall also be submitted to the Executive Secretary in electronic format. This requirement extends to all attachments to these documents.

   (2) The electronic copy shall be a true, accurate, searchable and reproducible copy of the official submission, except that it need not include signatures or professional stamps.

   (3) All electronic copies shall be submitted on a CD or DVD nonrewritable disc, except that documents smaller than 25 megabytes may be submitted by email.

   (4) All documents shall be submitted in one of the following electronic formats, at the choice of the submitter:

      (a) A searchable PDF document (a document that may be read and searched using Adobe Reader); or

      (b) A Microsoft Word document.

   Please revise the AR to meet these requirements.

SPECIFIC COMMENTS

1. **Acceptability of Co-Locating 11e.(2) and LLRW Disposal Embankments**: The Licensee must provide detailed plans for disposal site closure and stabilization, pursuant to UAC R313-25-9. The contradictory statements made in AR §1.4 must be resolved and documentary evidence provided to support each element of the statements that:

   > "EnergySolutions will retain ownership of the land *[emphasis added]*, and will be responsible for site closure, as well as the long-term maintenance and monitoring of the disposal site. In accordance with UAC R313-24-4 and 10 CFR Part 40.28, the ownership of the land will be transferred *[emphasis added]* to the Department of Energy (DOE), another Federal Agency designated by the President, or the State of Utah. The land will be transferred at to no cost to the DOE. The DOE or other designated agency will be responsible under the general license for custody of and long-term care of the site, including monitoring, maintenance, and emergency measures necessary to protect the public health and the safety and other actions necessary to comply with the standards."

   The EnergySolutions RML #UT2300478 for 11e.(2) is under timely renewal with UDRC. The EnergySolutions (May 15, 2007) 11e.(2) license renewal application (11e.(2) LRA, Revision 3) Round 1 Interrogatory Responses contains documentation from the DOE regarding acceptance of the currently licensed facility upon closure (ibid., Attachment 2). Documentation provided lists the specific site conditions which qualify the Clive 11e.(2) site for DOE acceptance of the facility. The proposed co-location with LLRW wastes changes the site conditions. Therefore, the Licensee must provide written evidence showing that the US DOE will accept the stabilized 11e.(2) disposal embankment for its Long-Term Stewardship Program with the new site conditions. The Licensee must state and describe the

impacts of any conditions or requirements DOE imposes that are unique to the proposed facility owing to its singular configuration (that of being co-located and integrally constructed with an LLRW disposal facility). The AR provides no description of the final disposition of the proposed 11e.(2) facility.

Information must be provided to give reasonable assurance that the LLRW embankment design and operation will be compatible with the disposal site closure and stabilization plan and will lead to disposal site closure that provides reasonable assurance that the performance objectives of URCR R313-25-19 will be met.

2. **Impact on 11e.(2) License:** Section 1.1 of the AR states "the EnergySolutions RML #UT2300478 for 11e.(2) does not require amendment with this action". However, there are several license conditions identified below which appear to indicate the need for amendments to the 11e.(2) license:

   - UT 2300478 License Condition 9.3 states:

     Authorized use is for the receipt, storage, and disposal of 11e.(2) byproduct material in accordance with the statements description and representations contained in the licensee's application.…..…

     The documents referenced and the license renewal application for the 11e.(2) byproduct facility includes no information about the proposed change in the facility boundaries, or vertical clay barrier to constructed between the 11e.(2) and Class A portions of the disposal embankment, about how actions on one side of the vertical clay barrier might affect conditions on the other, nor compliance with other requirements.

   - UT 2300478 License Condition 9.4 states:

     b) The licensee shall obtain a license amendment pursuant to UAC R313-22-28, prior to implementing a proposed change, test, or experiment if the change test, or experiment would:

     ii Result in any appreciable increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the license application (as updated).

     v. Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated);

     vi. Create a possibility for a malfunction of an SSC with a different result than previously evaluated in the license application (as updated);

     The proposed use of the 6-foot-thick vertical clay barrier wall between the 11e.(2) waste and the Class A portions of the disposal embankment must be described and justified in light of these license conditions and applicable regulatory requirements.

   - UT 2300478 License Condition 10.8 states:

     The license shall operate the facility in compliance with the following specifications;

a) *The maximum bulk mass of waste disposed of annually will not exceed 4.536 x 10^5 tons….*

b) *The open cell area will not exceed 64,858 m^2….*

e) *The maximum volume of waste that may be stored as in-cell bulk storage on site prior to disposal will not exceed 8.418 x10^4 m^2….*

Section 1.3.1 of the AR indicates a change would be made in the CQAQC manual to provide for stockpiling 11e.(2) waste, for operational flexibility. However, the AR does not explain how this change affects compliance with license condition indicated above.

Section 1.3.1 of the AR also states that the deadline for storage in the 11e.(2) waste stock-pile will need to be extended. This change will require a revision to the RML #UT2300478 license and contradicts the statement in Section 1.1 that no change to the RML #UT2300478 is needed.

- The AR directly relates to drawings, procedures, and waste storage limits controlled by the RML #UT2300478 for 11e.(2) waste. Specifically, License Condition 13.1 requires:

  Except as specifically provided otherwise in this license, the Licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Utah Radiation Control Rules, Utah Administrative Code R313 shall govern unless the statements, representations, and procedures in the Licensee's application and correspondence are more restrictive than the rules.

  No documentation has been submitted to show that the requirements, statements, procedures, and representation within the 11e.(2) license in general and within License Condition 13.1 in particular will not change or will not need to be changed.

3. **References Provided**: Each reference cited in Section 11 should be used in the AR. The list of references below is taken from Section 11 but the references are not otherwise cited in the AR. If these documents contain information critical to the AR, the text should discuss the referenced information and provide justification that it is indeed applicable.

   - CEntry, "Overpack Design". submitted to DRC on March 20, 2003
   - Envirocare of Utah, Inc., "Application for License Amendment: Containerized Class A, B, and C LLRW Disposal," December 13, 2000
   - Envirocare of Utah, Inc., "Durability Assessment of Concrete Overpacks", submitted to DRC on March 10, 2003
   - Envirocare of Utah, Inc., "Engineering Justification Report: Addendum", October 2, 2001
   - Envirocare of Utah, Inc., "Quality Control Inspection List", submitted to DRC on June 11,2003
   - Envirocare of Utah, Inc., "Request for License Amendment: Containerized Class A LLRW Disposal", April 12, 2001
   - Envirocare of Utah, Inc., "Safety Evaluation Report", August 1998
   - Envirocare of Utah, Inc., "Safety Evaluation Report", June, 2001

- Envirocare of Utah, Inc., "Siting Evaluation Report", May 2, 2000
- USNRC, "Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 1 le.(2) Byproduct Material Near Clive, Utah", Docket Number 40-8989, August, 1993.
- Whetstones Associates, "Envirocare of Utah Class A, B, & C Cell Infiltration and Transport Modeling", August 1, 2000
- Whetstone Associates, "Envirocare of Utah Class A Cell Infiltration and Transport Modeling", Whetstone, July 19, 2000

The list below discusses references cited in the text but not included within Section 11. A full citation for these documents is needed to accurately locate the documents for review. Several of these documents appear to be revisions of other documents. The difference in revisions, and the correct applicable material should be concisely referenced.

- Section 1.2.1 references Class A LLRW RML License Renewal Application June 20, 2005. This reference is not in the reference list. The reference section cites Envirocare of Utah, Inc., Radioactive Material License Renewal Application, March 16, 1998; and Envirocare of Utah, Inc., Radioactive Material License Renewal Application, provided to DRC on July 2, 2003. These references are not cited in the document text.
- Section 2.3.2 references AMEC, "Report: Combined Embankment Study, Envirocare," December 13, 2005; AMEC, "Round 2 Interrogatories and Response, Class A Embankment Height Study, EnergySolutions Facility Near Clive, Utah," April 28, 2006; AMEC, "Interrogatory Statement and Response, AMEC Interrogatory Response Letter Dated April 28, 2006, Class A Embankment Height Study, EnergySolutions Facility Near Clive, Utah," May 22, 2006. These references are not in the reference list.
- Section 2.3.2 references Application for 11e.(2) Radioactive Material License Renewal, February 17, 2006. This reference is not in the reference list.
- Section 2.6.2 references Whetstone, December 7, 2007. This reference is not in the reference list.
- Section 3.1.5 references Appendix J of “Pre-licensing Plan Approval Application” Dated March 15, 2000. This reference is not in the reference list.
- Section 7.1.1 references an EnergySolutions Radiation Protection Program without specifying if it is part of the EnergySolutions “Radiation Safety Manual,” Rev. 7, August 4, 2006.

4. **Vertical Clay Barrier:** The Licensee must demonstrate that the proposed design change will satisfy all regulatory requirements related to:

   - The buffer zone (see UAC R313-25-7(2), 25-25(8), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction),
   - The ability of the environmental monitoring program to detect releases from the facility (see UAC R313-25-7(2), 25-7(12), 25-23(2), 25-23(11), 25-25(8), 25-26, 25-28(2), and UAC R313-24-3, and
   - Stability of the disposal unit and cover system (see UAC R313-25-7(2), 25-8(4), 25-11(6), 25-22, 25-25(9), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction))

The vertical clay barrier within the Class A South/11e.(2) disposal embankment is proposed to separate the Class A waste portion from the 11e.(2) waste portion of the reconfigured embankment (see Section 3.1.3 of the January 4, 2008 AR and Drawings V3 and V6). The vertical clay barrier that forms the barrier between the two portions of the disposal embankment is an engineered barrier according to UAC R313-25-2 This engineered barrier will also allow Class A waste to be disposed in much closer proximity to disposed 11e (2) waste. This engineered barrier and its projected performance have not previously been described, analyzed, or reviewed. The proposed change is major in scope, purpose, and possible effect on waste containment and the environment. The design basis, characteristics, and design of the engineered barrier and impact on the existing embankment must be justified in the AR.

The vertical clay barrier is a new principal design feature that must be comprehensively analyzed with respect to its required principal and secondary functions, design criteria, characteristics, and projected performance. Specifically, the effects of the vertical clay barrier on the following functions must be described, evaluated, and justified:

- Structural stability (including slope stability, settlement, and differential settlement), considering normal and abnormal conditions.
- Infiltration and contaminant transport modeling under open-cell and closed conditions, considering normal and abnormal conditions for both the LLRW and 11e.(2) portions of the proposed embankment. Emphasis here must be on how the presence of the vertical clay wall does not change the long-term performance of either disposal cell to protect the underlying groundwater for at least 500 years.
- Environmental monitoring under or through the vertical clay barrier and between the two disposal embankments that enables correct attribution of environmental releases and impacts. See Item 6 for additional discussion of Environmental Monitoring.
- Means of ensuring that the vertical clay barrier will physically and hydraulically isolate the two types of wastes, including the means to ensure that surface water contacting the Class A waste will not flow across the top of the vertical clay barrier and into the 11e.(2) portion of the embankment, throughout the operational period of the embankment, considering normal and abnormal conditions.
- Control of lateral movement of pore-liquids between the Class A LLRW and the 11e.(2) portions of the embankment, both during operations and following closure of the embankment, considering normal and abnormal conditions.
- Ability of the proposed vertical clay barrier to resist degradation due to weathering, erosion, and freezing temperatures.

The applicant also should provide information on the projected performance of the vertical clay barrier with regard to each required principal design function and each secondary design function/complementary aspect under the applicable normal and abnormal conditions.

5. **Material Specifications and Procedures**: The Licensee must provide information to support its analyses demonstrating that the facility can be constructed and remain stable as required

in UAC R313-25-7(2), 25-8(4), 25-11(6), 25-22, 25-25(9), and UAC R313-24-4 (10 CFR 40 Appendix A Introduction). Material specifications must be provided for the vertical clay barrier and must respond to the demands of the design criteria identified (e.g., maximum allowable permeability and other material / engineering properties) and used in required analyses. The specific procedures required to achieve the conditions identified by design criteria and material specifications must be stated. The CQA/QC Manual needs to provide additional details regarding the procedures for constructing and testing of the vertical clay barrier. Such additional information should include the methods and tests used during construction of the vertical clay barrier and operation of the embankment to ensure that required functions and design criteria for the vertical clay barrier will be met.

Information provided for the vertical clay barrier that relates to its required functions and design criteria that must be addressed include, but is not limited to:

- The required maximum allowable permeability for the completed clay barrier, and compaction procedures and clay material moisture conditioning needed to meet that permeability criterion;
- Engineering properties and characteristics of the clay barrier, including, but not limited to: chemical / mineral composition, USCS soil classification, plastic index, minimum dry density, grain size distribution or gradation limits, minimum and maximum moisture content at placement, lift thickness, etc.
- Measures to prevent or minimize desiccation cracking of, frost/weathering-related damage to, and erosion damage to the constructed portion of the vertical clay barrier throughout the embankment operational period, especially when incremental construction of the vertical clay barrier is not occurring and clay lifts are not being added and compacted;
- Measures for inspecting the vertical clay barrier throughout the embankment construction/operational period to ensure that permeability and surface water drainage requirements are being maintained;
- Measures for ensuring the structural stability of the vertical clay barrier, given uncertainties in the differing rates of waste receipts between the two portions of the embankment; and
- Testing procedures for demonstrating that the design objective/design criteria are being achieved during construction and embankment operations.

6. **Environmental Monitoring**: The AR does not describe how the monitoring system will provide early warning and discretely distinguish potential radionuclide releases from the Class A and/or the 11e.(2) portions of the embankment, as required by UAC R313-25-7(12), R313-25-23(2); R313-25-23(11), R313-25-26, R313-24-4(b), and R317-6-6.9]. A high potential exists that releases from the 11e.(2) portion will be masked by releases from the Class A portion of the embankment, or vice versa.

   In the case of groundwater, the water gradient in the vicinity of the proposed clay curtain wall is predominantly southwest to northeast. The AR does not describe how the proposed monitoring will be able to provide early warning of potential radionuclide releases and discretely distinguish which portion of the modified embankment generated the release of

materials. Discussion in AR §4.4.3 inadequately addresses the need to positively identify the sources of contaminants detected in groundwater monitoring wells. Greater definition is required of the paths contaminants might follow upon release from either the Class A waste and/or 11e.(2) waste portions of the embankment.

While the four proposed monitoring wells in the vertical clay barrier are located at the very edge of the Class A waste, and appear to be in close proximity to the waste source term [in accordance with UAC R317-6-6.9(A)]. However, the wide spacing of these wells leaves the possibility that releases could be undetected if they came from a liner defect between the monitor well locations. Under these circumstances, a contaminant plume would not be detected until it had passed under the 11e.(2) Cell and arrived at monitoring wells on the north or eastern margin of that cell. Ignoring groundwater flow directions and using a perpendicular path from the vertical clay barrier to the east 11e.(2) Cell monitoring wells (e.g. MW-20), the resulting travel path would be over 1,000 ft. This distance is significantly greater than the corresponding 250-foot topslope design basis that has been used for all other previous transport models approved hereto at the site. As a result of these longer flow paths, significant delay would result in detection of a contaminant release. Therefore, additional justification is needed regarding the number of wells and maximum well spacing distance along the north-south vertical clay curtain wall. At a minimum, it appears that additional monitoring wells need to be located along the vertical clay barrier to discretely monitor the Class A waste in the combined embankment. Please provide additional justification for the number and location of these additional wells.

Adequacy of the system proposed to monitor contaminant migration must be demonstrated. The presence of contaminants in the vadose zone should be monitored before they enter the aquifer where they can mix with contaminants from other sources. Consideration needs to be given to constructing and monitoring sumps in the bottom of the Class A waste portion of the embankment to hasten the detection of potential releases from respective portions of the disposal embankment. This means that collection lysimeters must be constructed under the LLRW portion of the embankment along the western margin of the clay curtain wall. Please revise the design to incorporate an adequate number of collection lysimeters along the eastern margin of the LLRW waste area. Please provide engineering details regarding design and construction of each lysimeter pan and its corresponding access pipe.

The AR must provide equivalent analyses of the environmental monitoring program for other environmental transport pathways, such as transport of contaminants through air. If the changes in the environmental monitoring program require additional or modified procedures, then these procedures must be provided. Information on the environmental program must be provided to give reasonable assurance that the proposed disposal site is located so that nearby facilities or activities (including particularly the adjacent 11e.(2) portion of the disposal embankment) will not significantly mask the environmental monitoring program, as per UAC R313-25-23(11).

The Licensee must describe how it will collect pre-operational monitoring data along the eastern margin of the LLRW embankment where the wells are to be installed. Information also needs to be provided on how these wells will be protected during construction of the embankment. Because the wells are to be installed with directional drilling or as horizontal wells before clay liner construction, access to them will be sub-horizontal. In the event that

there were to be settlement of the embankment foundation, there is a potential that the well casing could be distorted or sheared, thereby preventing pump maintenance or replacement.

Information must be provided to give reasonable assurance that during construction and operation of the proposed embankment, the environmental monitoring program will produce data that provides early warning of releases of waste from the disposal embankment.

Information and description should describe how air monitoring, radon monitoring, and direct gamma monitoring will be conducted for the LLRW, separate and distinct from similar monitoring for the 11e.(2) embankment

7. **Installation of Groundwater Monitoring Wells:** Additional information is needed to explain how the proposal complies with the requirements of UAC R313-24-4 [R317-6-6.3, and R317-6-6,9], and R313-25-26. The four horizontal monitoring wells proposed for installation beneath the proposed vertical clay barrier (see Section 4.4.3 of the January 4, 2008 AR and proposed wells GW # 1 through GW # 4 shown on Drawing U3) must be:

   - Installed at the proper locations
   - Constructed of appropriate, inert materials, and in a reliable, adequate manner,
   - Constructed to yield adequate volumes of groundwater during each scheduled groundwater sampling event and provide representative data on chemical and physical conditions or groundwater immediately downgradient of the Class A South waste portion of the proposed embankment.

   The proposed methodology for installing these wells (either directional drilling or horizontal placement prior to cell construction) must be thoroughly described. Moreover, demonstration must be provided with reasonable assurance that these monitoring wells can be successfully installed, accessed, operated, and maintained during the entire life of the facility, including pre-operations, disposal operations, and post-closure periods. Well configuration must allow ready and easy access for pump replacement. Given the width of the vertical clay barrier and the horizontal distance between the proposed screen position and the south edge access for the directional drilling (or horizontal well construction), the lateral deviation between each installed and intended position must be very small (a few feet or less) to ensure that each monitoring well would be directly below the vertical clay barrier. Well locations needs to be closely coordinated to prevent conflict with the required collection lysimeters and their access pipes along the eastern margin of the LLRW waste. As a result, the corridor under the vertical barrier could become extremely congested in light of these collection lysimeters and the need for additional well screens that may be needed to provide a well spaced monitoring well network on the east side of the LLRW waste.

   Additionally, because the perforated zone (screened interval) in each such proposed monitoring well would be horizontally or sub-horizontally inclined (apparently never been attempted at this site), additional information is required regarding the feasibility of screen and sandpack construction and configuration. Also, the effectiveness of providing reliable samples at the required monitoring frequency and the potential effects of groundwater elevation changes over time (in the area of these proposed wells) on the viability of using these proposed wells for groundwater monitoring must be evaluated

Additional information must be provided that identifies how the required high degree of well installation accuracy in the drilling will be achieved. Currently available technologies might offer a high degree of accuracy for directional drilling, with documented cases demonstrating accuracy as high as 0.1% of drilling distance (or even better accuracy) over the length of drilling that would be required for this embankment. However, the applicant has not provided adequate information or details regarding identified the attitude control methods to be used. Additional information must be provided on:

- Technology to be employed for the directional drilling
- Expected range of lateral deviations for the wells for the technology to be used
- Attitude control technology to be used/methods to be used to verify well installation accuracy
- Possible contractors that can provide the required service, including referrals to and records of any previous experience they have with directional drilling.

Additional information must be provided to demonstrate that the proposed horizontally or subhorizontally-inclined monitoring wells comply with pertinent, applicable regulatory requirements and guidelines specified in R317-6, with respect to well construction and to collection and analysis of groundwater samples. Additional information must be provided to demonstrate that the proposed monitoring wells (GW # 1 through GW #4) will be able to provide reliable groundwater samples in sufficient volumes to permit representative groundwater monitoring immediately downgradient of the Class A waste portion of the embankment. Steps must be taken in the well design to avoid excess screen length that could lead to borehole dilution and groundwater quality bias.

Applicable groundwater well construction and groundwater sampling and analysis guidance for horizontally or subhorizontally-inclined groundwater monitoring wells must be provided, along with information demonstrating that the proposed horizontally or subhorizontally-inclined monitoring wells will comply with applicable guidance.

8. **Drainage Features of Proposed Embankment**: The Licensee must demonstrate the adequacy of the proposed design for directing surface water runoff from the proposed embankment at velocities and gradients that will not result in erosion that will require ongoing active maintenance in the future, as required by R313-25-24. The design to prevent internal erosion must be presented and justified. Since the LLRW cell consists of a sacrificial soil layer sandwiched between two filter layers under the riprap that do not exist in the 11e.(2) cover system, the transition for the LLRW cover system to the 11e.(2) cover system with difference features must be described in detail and long-term performance analyzed and justified. The ability of up-slope LLRW areas to conduct internal drainage off of the embankment, across and away from the down-slope 11e.(2) area must be addressed.

   The design of perimeter drainage ditches must be justified, either through reference to existing justification (with demonstration that the existing justification applies to the proposed design) or by providing new analyses based in the proposed design. In either case, the justification must demonstrate that the proposed drainage ditch designs are adequate not only to accommodate runoff from the proposed embankment, but also discharge from the Vitro Ditch at the northeast corner of the proposed embankment.

9. **Buffer Zone**: As defined in Section 1.2 of NUREG-1573, a ". . . buffer zone is that portion of the disposal site that is controlled by the Licensee and which lies under and between the disposal units and any disposal site boundary. The buffer zone provides controlled space to establish monitoring locations that are intended to provide an early warning of radionuclide movement." An adequate buffer zone is required for LLRW disposal by UAC R313-25-2, R313-25-7(2), and R313-25-25(8).

Further, UAC R313-25-7(2) requires the Licensee to describe certain design features, including "… the adequacy of the size of buffer zone and potential mitigation measures." With this in mind, since 1992 the DRC has approved a wide buffer zone around each disposal cell, from the edge of the waste to the Point of Compliance well. Nominally, this is a distance of 90 feet. It amounts to even a larger distance when you consider 2 cells are adjacent to one another, there's 90 feet or more available for each, e.g., LARW and Mixed Waste Cell, or the LARW and 11e.(2) Cell, etc.. So, it appears that the current proposal is a major departure from the previous approved approach. Consequently, the Licensee will have to justify and argue before the public why a 6-foot space between the LLRW and 11e.(2) waste rather than 180-feet is now acceptable.

In 1992, DEQ engineering staff determined that the size of buffer zone was large enough to do both groundwater and other environmental monitoring, and construct mitigation measures to control groundwater pollution, e.g., slurry walls, a pumping well networks, permeable reactive treatment walls, etc. The critical concern was excavation for a slurry wall somewhere near the toe of the embankment. In that case, a 30-foot deep trench would be cut to a depth below the water table and would have to be benched in order to keep the trench walls stable enough for slurry placement. In 1992 the Division concluded there was enough room outside of the toe of the LARW embankment, and inside Section 32 to excavate the necessary benches and trench, should the LARW Cell leak.

This type of mitigation would not be as feasible in the situation now proposed for the CAS Cell, considering that: 1) the top of the cover system, near the vertical clay barrier wall , is more than 25 feet above the natural grade. Hence a larger vertical distance would have to be excavated – producing a wider horizontal distance to provide the benches required to get down to the water table, and 2) the wider excavation would disturb and expose a significant amount of 11e.(2) and/or LLRW waste - resulting in more exposures to workers and greater potential for releases to the environment.

The proposed design does not provide the location and dimensions of any buffer zone between the LLRW and 11e.(2) waste for the proposed embankment change (see AR, Attachment 2). Further, the buffer zone coordinates provided in Table 7 of the AR (p. 37) do not correspond with those shown on the engineering drawings in Attachment 2. Please reconcile this discrepancy and revise the engineering design drawings to clearly show the limits of the buffer zone between these two types of waste. From the drawings provided it appears the modified embankment does not have an adequate buffer zone on all sides of the Class A waste portion of the proposed Class A South/11.e(2) embankment. Part of the area that would normally be the low-level waste buffer zone is occupied by 11e.(2) waste and/or the vertical clay barrier. While the probability of unexpected radionuclide releases to groundwater might be small, the proposed configuration does not meet the requirement for a buffer zone in which radioactive releases could be detected early and mitigative measures

could be taken, pursuant to the LLRW requirements of UAC R313-25-7(2). Please justify why a 6-foot wide clay wall is adequate for purposes of both monitoring and contaminant mitigation.

Transport models used to date for LLRW performance assessment have relied on this 90-foot horizontal distance between the edge of waste and the monitoring wells to help provide 500 years of time before groundwater contaminants exceed their respective Ground Water Quality Standard (GWQS). This was also the same horizontal distance assumed in the 12/7/07 Whetstone Associates transport report (p. 81) for the CAS Cell.

The proposed design calls for a 6-foot wide clay curtain wall between the LLRW and 11e.(2) waste. Assuming that the Licensee is able to place the monitoring well screen in the exact middle of that interval a 3-foot horizontal travel distance is provided. Even if the angle of the groundwater flow relative to the disposal unit boundary is accounted for, this disposal and resulting travel time will be much less than previously estimated. Certainly, the 12/7/07 Whetstone Associates model for the CAS Cell does not represent what will be constructed. This difference on physical conditions must be addressed in transport modeling. Please provide a new groundwater flow and contaminant transport model to simulate the discrete behavior of each disposal embankment, including the Class A and 11e.(2) wastes in the proposed cell.

10. **Constructability**: In accordance with UAC R313-25-7(6) and R313-25-7(10), the sequencing of construction activities in the Class A waste and 11e.(2) waste portions of the proposed disposal embankment must be better defined. Analyses must be provided that identify and evaluate how the construction sequences might have to be revised, should LLRW and 11e.(2) waste not arrive a optimal rates that best support the concurrent development of the co-located disposal units and the proposed vertical clay barrier. Despite uncertainties in relative waste receipt rates, the constructability of the proposed disposal embankment must be demonstrated. As a minimum, the Licensee must address the possibility that:

- 11e.(2) waste will be received at a rate that does not allow construction of the vertical clay barrier on a schedule that allows disposal activities in the Class A waste portion of the embankment to proceed without delay.
- LLRW will be received at a rate that does not allow construction of the vertical clay barrier on a schedule that allows disposal activities in the 11e.(2) waste portion of the embankment to proceed without delay.

The methods and structures required to construct the vertical clay barrier must be specifically identified to demonstrate that the vertical clay barrier can be constructed with confidence that its characteristics will conform to its specifications. The methods used to integrate successive clay lifts with previous clay lifts to prevent layering of the clay or seams between clay lifts must be described and specified.

Given that the LLRW side of the clay barrier wall might raise to an elevation above current level of 11e.(2) waste, the Licensee must demonstrate that contact stormwaters will NOT flow eastward over the 11e.(2) waste. Were such flow to occur 11e.(2) waste could become contaminated with mobile fission products, for which the 11e.(2) cell was never designed to contain or control.

11. **Geotechnical Stability of Foundation Soils**: Additional information is required pursuant to UAC R313-24-4 (10 CFR 40.31, 10 CFR 40 Appendix A Criterion 1, 4, and 5A[2]), R313-25-3, and R313-25-7(1 and 2) The Licensee must provide a basis for concluding that the loading conditions on the foundations soils is unchanged from what has been previously approved. The Licensee must also demonstrate that foundation soils will be stable under expected new loading conditions, considering both static and dynamic conditions. All possible loading conditions that might drive differential settlement within foundation soils must be addressed and evaluated.

12. **Design Criteria and Characteristics**: Additional information is required by UAC R313-24-4 (10 CFR 40.31, 10 CFR 40 Appendix A Criterion 4), R313-25-7(2), R313-25-7(3), R313-25-7(10) Although AR Table 3.2 summarizes the impacts of thicker Type B filters, a similar tabulation should be presented to demonstrate that the design bases and criteria for the principal design features are comparable and that the proposed design feature characteristics are comparable and appropriate. Any differences should be explained and justified. Information comparable to that presented in Table 3-3 through 3-5 of the 2005 LRA should be presented.

13. **Long-Term Stability for 11e.(2) Cell**: The AR does not but must address the requirements stated in UAC R313-24-4 and 10 CFR 40 Appendix A Criterion 4(c):

    > *Embankment and cover slopes must be relatively flat after final stabilization to minimize erosion potential and to provide conservative factors of safety assuring long-term stability. The broad objective should be to contour final slopes to grades which are as close as possible to those which would be provided if tailings were disposed of below grade; this could, for example, lead to slopes of about 10 horizontal to 1 vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v. Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable should be provided, and compensating factors and conditions which make such slopes acceptable should be identified.*

    The effects of the Class A portion of the disposal embankment on the long-term stability of the embankment, as they relate to performance of the 11e.(2) portion of the embankment must be described. Moreover, compliance with the requirements of 10 CFR 40 Appendix A Criterion 6(1) must also be demonstrated, considering the presence and potential effects of the vertical clay barrier, e.g., control of radiologic hazards for at least 1,000 years and limited release of radon gas.

14. **Sharing of Construction and Operating Equipment and Personnel**: Additional information is required by UAC R313-15-406, R313-25-7(6), R313-25-7(10), R313-25-7(11), R313-24-4 (10 CFR 40.31, 10 CFR 40.61) The AR must describe the extent to which construction and operating equipment and personnel will be shared between the Class A waste and 11e.(2) waste portions of the disposal embankment. Procedures for decontaminating equipment prior to transfer between portions must be provided and justified. Personnel control procedures between the 11e.(2) and Class A South portions of the facility must be clearly described and illustrated

15. **Operating Procedures**: Additional information is needed pursuant to UAC R313-25-7(6), R313-25-7(10), R313-24-4 (10 CFR 40.31, 10 CFR 40.61) The AR must describe the means the Licensee will use to ensure that waste accepted for disposal in one portion of the disposal

embankment is not mistakenly directed to or disposed of in the other. The AR does not, but must, describe how operations involving multiple waste types within the same fence-line will be conducted. The AR should specifically address how 11e.(2) and LLRW will be controlled to prevent delivery to the incorrect embankment. Descriptions should include but not be limited to: waste receipt and placement controls, training, emergency plans, QA/QC, prevention of cross-contamination, operations activities, document control, and review and internal audit.

Changes to existing emergency and contingency plans required to respond to new conditions and situations that have not previously been considered should be identified and justified.

16. **Remedial Action**: An evaluation of potential complications that might result during remedial action in one or the other disposal embankment is required pursuant to UAC R313-25-7(2) and R313-24-4 (10 CFR 40 Appendix A Criterion 1). The remedial action required to address a problem on one side of the clay curtain wall must not create or induce disturbance of the other side. A satisfactory demonstration will show how all remedial or mitigation actions that might be required in the future will be contained within an adequately sized buffer zone that separates the LLRW from the 11e.(2) waste, see discussion above. The effects of these potential complications on surety arrangements must be addressed. The regulatory complications must also be addressed.

17. **Performance of 11e.(2) Cell Cover Affected by Class A Cover**: Additional information is required pursuant to UAC R313-24-4 (10 CFR 40 Appendix A Criterion 4).Water is expected to flow laterally through the filter zone of the LLRW cover system into the filter zone of the 11e.(2) cover system. The effects of such flows from the Class A to the 11e.(2) cover portion of the embankment must be addressed. Water that flows from the surface of the Class A cover and onto the 11e.(2) cover may adversely affect the 11e.(2) cover performance (namely infiltration). Please revise the 11e.(2) Cell infiltration and contaminant transport models to address this issue.

18. **11e.(2) Cell Radon Barrier**: Additional information is required by UAC R313-25-25(6), and R313-24-4 [10 CFR 40 Appendix A, Criterion 6(1)]. Demonstrate that the radon barrier is sufficiently thick at the transition between the 11e.(2) waste and the Class A waste to satisfy the requirements for limiting radon release from the stabilized embankment. The 11e.(2) cell requires a thicker radon barrier than the Class A cell. At the transition between the 11e.(2) waste and the Class A waste, the design must include a sufficient thickness and permeability of clay radon barrier to prevent radon from the 11e.(2) waste from escaping via the potentially preferential pathway through the thinner Class A radon barrier.

    The AR does not, but must, discuss compliance with the radon release requirements detailed in 10 CFR 40 Appendix A Criterion 6(5). These requirements “apply to any portion of a licensed and or disposal site”. Any such portions must be based on the current license UT 2300478, including the area which will be used for the disposal of Class A waste.

19. **Radium Concentration in Near-Surface Soils**: The AR does not indicate how the proximity of the Class A waste will impact the radium levels in the near surface cover, as required in UAC R313-24-4 and 10 CFR 40 Appendix A Criterion 6(5) for the 11e.(2) Cell. Additionally, specific requirements exist in the license which may require modification. For example, UT 2300478 License Condition 10.2 states:

The licensee shall analyze and adequately characterize;

b) The following key radon attenuation model parameters during placement….

c) The distribution of the Ra-226 and Th-230 concentrations in the 11e.(2) byproduct material ….

The Licensee should describe how the changes in the size and configuration of the disposal embankment might impact the radon attenuation model and values of the parameters used. The Licensee should describe how the placement of Class A waste in close proximity to the 11e.(2) disposal embankment might require modifications to the distribution of Ra-226 and Th-230 in the upper 3 meters of the embankment.

20. **Occupational Radiation Exposure Discussion without a Corresponding ALARA Evaluation**: The AR does not consider or evaluate the potential for changes in occupational exposure from new onsite transportation routes, facility configurations, and operating modes, as required by UAC R313-15-101, R313-15-406. While these changes may appear to create minor or imperceptible changes to occupational radiation exposure, each routing, activity, and geometry change, plus changes to forecasted receipt rates of Class A and 11e.(2) material must be described and evaluated to document their impact rather than being categorically dismissed. Section 7.0 and subordinate sections refer to a Radiation Protection Program and an ALARA program not expressly identified in the reference section. Section 7.0 and the subordinate sections do not provide, or refer to, a detailed, specific ALARA evaluation of the planned configuration, tasks, and anticipated radiation design features, and how this shall differ from the existing cell operation. Please provide the required evaluations.

21. **Availability of Clay and Rock for Embankment Closure**: Additional information in needed pursuant to UAC R313-24-4 (10 CFR 40, Appendix A, Criterion 4) and R313-25-7(2) Only the most cursory mention is made in AR §1.2.2.5 that ". . . construction materials are comprised of native clays and native rock from a local quarry". Availability of adequate supplies of clay and rock possessing required characteristics and required to construct all proposed embankments and the associated economic cost must be demonstrated.

22. **Upstream Drainage Area**: Additional information is required pursuant to UAC R313-24-4, (10 CFR 40 Appendix A Criterion 4), and R313-24-7(2), The adequacy of both proposed operational and proposed post-closure drainage structures (such as ditches and berms) to handle potential volumes and rates of runoff water from nearby disposal areas and undisturbed upstream drainage areas must be demonstrated. Appropriately selected design basis precipitation events should be identified and justified for operations and post-closure conditions.

23. **Discharge of Groundwater within the Disposal Site**: The Licensee must demonstrate that the hydrogeologic unit used for disposal does not discharge ground water to the surface within the disposal site. Although this area has been approved for 11e.(2) disposal, this is a LLRW disposal requirement (UAC R313-25-23(8)) and must be addressed. If previous evaluations of this matter have been reported, a specific citation and justification that its conclusions are applicable to this area must be provided.