ANDREWS
ENGINEERING, INC.

October 08, 2013

Mark S. Vincent
Franklin County Counselor
203 East Main Street
Suite C
Union, MO 63084

Re: Proposed Coal Ash Waste Landfill
Ameren – Labadie Power Plant
Franklin County, Missouri

Dear Mr. Vincent:

We have completed a review of the Ameren Missouri ("Ameren") letter dated July 8, 2013 in response to "IRPE Comments" and the August 7, 2013 additional information submitted for the Construction Permit Application. Andrews Engineering, Inc. ("Andrews") is under contract to Franklin County ("County") to perform duties as the Independent Registered Professional Engineer ("IRPE") pursuant to the Franklin County Unified Land Use Regulations and landfill ordinances that pertain to Utility Waste Landfills, Section 238, ("Ordinance"). Ameren references three sets of IRPE comments in their letter concerning the permitting and review process for the proposed Labadie Ash Disposal Facility.

The last sentence of the opening paragraph of the Ameren letter states, "This will confirm that these three sets of IRPE comments on the Application are complete for purposes of the Application and Ordinance." This statement requires clarification. I can confirm that to date the body of work prepared by our firm (Andrews) is complete, but only to the extent where information was provided by Ameren and no further comments are necessary. However, as you are aware, for approximately half of the technical comments prepared, Ameren has either not provided a response or their response does not address the technical issue. Therefore, the review process has not been completed.

Attached to this letter are two memorandums. One includes comments concerning the groundwater and the other the engineering. At your request we have identified certain comments as critical. The remaining comments and concerns include additional information relating to the critical comments or reference discrepancies within the document that should be clarified prior to issuing a permit. In order for Andrews to complete our review we request that Ameren address these comments.

The statements made by Ameren in their July 8, 2013 letter bring to light the difficulty we have had trying to complete our review. That being Ameren has declared the Missouri Department of Natural Resources ("MDNR") the final authority, which "pre-empts the great majority of the IRPE's comments." The letter goes on to question the validity of the County Ordinance with respect to a technical review process independent of MDNR.

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Section 238(C)(3)(a) states in part that:

> *Under no circumstances shall any construction of any component of a Utility Waste Landfill be commenced prior to the approval of all designs, plans, addendums, construction documents by the Independent Registered Professional Engineer.*

We have proceeded with the interpretation that the County rules and ordinances do not conflict or reinterpret the MDNR regulations but allow the County to conduct its own review and the County has the authority to require additional documentation beyond that found acceptable by MDNR. Therefore the potential exists that the County, under their authority, can impose additional safeguards for design, permitting, construction, and compliance determinations.

If you have any questions or concerns, please contact me at (217) 787-2334.

Sincerely,

Kenneth W. Liss
Vice President of Operations
Andrews Engineering, Inc.

KWL:dwm:sjb

Attachment(s)

cc:

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Correspondence
!Unexpected End of Formula

ATTACHMENTS

Groundwater Comments

This document summarizes comments prepared from a review of Ameren's July 11, 2013 response letter.

Franklin County Commission Precedence

Gredell asserts that the approval of the Detailed Site Investigation Report and Groundwater Monitoring Program by Missouri DNR supersedes the technical review and comments prepared by Franklin County's IRPE.

It is understood that Missouri DNR has reviewed and approved the separate site investigation and monitoring well installation work plans and reports. However, as specifically stated in Section 238(C)(3)(a) of Article 10, "Supplementary Use Regulations" of the Franklin County Planning and Zoning Unified Land-Use Regulations:

> "Under no circumstances shall any construction of any component of a Utility Waste Landfill be commenced prior to the approval of all designs, plans, addendums, construction documents by the Independent Registered Professional Engineer."

It would seem that installation of the proposed groundwater monitoring well network prior to the approval of Franklin County's IRPE, shows indifference to this requirement.

Characterization of the Uppermost Aquifer and Confining Unit

Gredell has neglected to address the characterization of the uppermost aquifer and the confining unit to the satisfaction of the Franklin County IRPE.

The guidance in Appendix 1 of 10 CSR 80-2.015 and 10 CSR 80-11.010(11) are clear on the requirements for characterization of the physical and hydrogeologic properties of the uppermost aquifer and upper confining unit. Pursuant to 10 CSR 80-11.010(11)(C)(1)(A) groundwater monitoring wells shall be installed so that the number, spacing and depths of monitoring systems shall be determined based upon site-specific technical information that shall include thorough characterization of:

(I) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and

(II) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer; including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities and porosities.

It is understood that the level of effort to characterize the uppermost aquifer and upper confining unit may be lessened by the Missouri Department of Natural Resources Geological Survey Program (see Appendix 1 of 10 CSR 80-2.015). However, it seems that the Franklin County's IRPE should have been involved in the process of determining the extent of the characterization effort as this information is critical to the understanding of groundwater flow, both shallow and

deep and for evaluation of the adequacy of the proposed groundwater monitoring well network to monitor the uppermost aquifer.

The information presented does not address the thickness of the uppermost aquifer, does not identify the uppermost confining unit, does not characterize variations in vertical or horizontal hydraulic gradients or hydraulic conductivity throughout the uppermost aquifer nor does the information address the hydraulic conductivity of the upper confining unit.

Well Spacing Evaluation

Gredell asserts that the proposed and already installed groundwater monitoring well network is based on a representative evaluation and characterization of groundwater flow and the uppermost aquifer. It is Franklin County IRPE's conclusion that Gredell's well spacing evaluation is based on atypical groundwater elevations from an atypical year of precipitation (see Comment No. 2 in Section 6.0 Summary and Conclusions of the July 11, 2013 Response to April 22, 2013 Franklin County IRPE Comments), an incomplete evaluation of the properties and thickness of the uppermost aquifer and confining unit, and unconservative source width assumption and arbitrary concentration contour.

As such, Franklin County's IRPE cannot comment on the PLUME modeling effort other than to say that the information provided is incomplete and does not warrant further evaluation given the limited data provided and Gredell's refusal to collect additional data.

Critical Comments

1. Page 1, last line of paragraph 1. Gredell Engineering Resources, Inc. (Gredell) indicates that the groundwater monitoring network has only to meet the approval of MDNR. Andrews Engineering, Inc. (Andrews) is under contract to Franklin County (County) to perform duties as outlined in the Franklin County Unified Land Use Regulations and landfill ordinances that pertain to Utility Waste Landfills, Section 238 (Ordinance). Contrary to the Ordinance, the investigation of the site and construction of components of the proposed Utility Waste Landfill have commenced without the approval of the County's IRPE. (Article 10, Section 238, C.3.a.)

2. Page 4, paragraph 1. The assertion here is that the proposed and already installed groundwater monitoring well network is based on a representative evaluation and characterization of the uppermost aquifer and confining unit. However, as admitted by Gredell, the groundwater flow direction and the hydraulic gradients are not representative of typical surface water and groundwater elevations. As a result, the plumes are based on hydrodynamic dispersion values calculated from atypical groundwater velocities; furthermore, the value used to characterize the effective porosity of the uppermost aquifer is: (1) based on a literature value and (2) for total porosity. The effective porosity (n) directly impacts the dispersion value which affects the groundwater velocity and ultimately the plume width. (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

   The dispersion coefficients are functions of the average contaminant velocity, the dispersivities, and the molecular diffusion coefficient for the chemical of interest in water:

$$D_x = a_x v + D_m$$
$$D_y = a_y v + D_m$$

Where: a_x and a_y are the longitudinal and transverse dispersivities, respectively; and D_m is the effective molecular diffusion coefficient for the chemical of interest through the porous medium.

The average contaminant velocity, v, is computed as:

$$v = Ki/Rn$$

Where: K is the hydraulic conductivity
i is the groundwater gradient
R is the retardation factor
n is the effective porosity

The dispersivities and velocity are used in the PLUME equation; calculation for the PLUME model is provided below:

$$C_{(x,y,t)} = (C_0/4)\exp\{(xv/2D_x)[1-(1+4kD_x/v^2)^{1/2})]\}$$
$$erfc\{[x-vt(1+4kD_x/v^2)^{1/2}\}/2(D_xt)^{1/2}\}$$
$$\{erf[(y+Y/2)/2(D_yx/v)^{1/2}]-erf[(y-Y/2)/2(D_yx/v)^{1/2}]\}$$

Where: $C_{(x,y,t)}$ is the concentration at x,y,t
C_0 is the source concentration
x is the distance downstream from the source
y is the transverse distance from the source
k is the first-order radioactive decay constant
Y is the width of the source
v is the average contaminant velocity
D_x is the longitudinal dispersion coefficient
D_y is the transverse dispersion coefficient
t is time

3. Page 4, paragraph 2. The assumption by Gredell is that all groundwater flow within the uppermost aquifer is shallow. However, the uppermost aquifer is comprised of at least 100 feet of alluvial valley sediments overlying an undetermined thickness of permeable bedrock. The bottom of the uppermost aquifer, the confining unit, has not been characterized. The possibility of the vertical movement of water is wholly ignored. The issue regarding deeper wells has nothing to do with the existing landfill unit. Deeper wells are for monitoring the entirety of the UMA. As it is, contamination that migrates deeper than 20 to 25 feet, the depth of the proposed groundwater monitoring well system, will be missed. Also, groundwater quality resulting from the existing unit should be characterized to determine effects on upgradient/background groundwater quality of the proposed unit. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

4. Page 5, paragraph 4. If Gredell is trying to establish efficiency, then MEMO should be used. While there are no requirements regarding monitoring efficiency, it would seem that the minimum appropriate efficiency that should be strived for is 95%. This is often the USEPA benchmark for compliance issues. What they have done by turning the plumes around and making the wells the source location is confusing and I don't believe is representative of the

modeling effort. The source should be located at the waste boundary. (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

5. Page 6, general comment. The assumption by Gredell that the groundwater data collected are representative of the following typical years is not appropriate. The water levels were abnormally high resulting in widely varying flow direction, more so than in most past years. This widely varying flow direction used as part of the dispersivity has shortened the plume lengths and widened the plumes. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

6. Page 8, paragraph 4. The proposal for deep wells is not directed toward the groundwater quality of the existing impoundments. The deep wells are proposed as part of the uppermost aquifer characterization and monitoring. Vertical gradients have not been characterized, as such, the adequacy of the currently installed groundwater monitoring system is unknown. Our argument regarding vertical migration is not aimed at evaluating contaminant transport due to density differences. Vertical gradients due to variations in river stage and groundwater elevation in the uplands and the river terrace sediments are not unknown phenomena. Gredell has ignored the issue of vertical groundwater flow. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

7. Page 10, general comment. Gredell assumes that groundwater compliance is only an issue at the property boundary. Pursuant to discussion with Mo DNR, the permit boundary is where compliance must be demonstrated. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

Additional Comments & Concerns

8. Page 2, general comment. The uppermost aquifer and confining unit have not been characterized. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B); Article 10, Section 238 C.3.f.)

9. Page 3, paragraph 1. The concentration contour used for well spacing should be applicable to the anticipated source concentration and compliance concentration ratio. An assumption of a 1000:1 (0.001 concentration contour) source to compliance ratio is unfounded. Also, note that the ratio of 1000:1 provides for a larger plume width than a ratio of 100:1 or even 10:1 (i.e., 0.01 and 0.1). (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

10. Page 3, paragraph 2. Gredell identifies the property boundary as the limit for compliance. Per conversation with MNDR staff, groundwater compliance must be within the permitted boundary. If compliance is only an issue at the limits of the property boundary, then it would seem the entire property boundary should be identified as the permit boundary. (Appendix 1 of 10 CSR 80-2.015; Article 10, Section 238 C.3.f.)

11. Page 5, paragraph 2. Gredell uses a porosity value that is not site-specific and dispersion values are based on atypical groundwater levels. The contention that the PLUME modeling effort is based on representative data is incorrect. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.) The wording used to describe the

development of well spacing from the locations of the wells with respect to the waste boundary is confusing. I'm not sure what the point is here.

12. Page 7, paragraph 1. The statements by Gredell regarding porosity and dispersivity are not true. The porosity affects the length and width of the plume since the velocity is indirectly proportional to the effective porosity. The velocity is a factor in calculation of the dispersivity. The assumption of a higher porosity shortens the plume.

13. Page 7, paragraph 2. The size of the plume is greatly influenced by the concentration contour selected. The concentration contour is representative of the ratio of the source concentration to the compliance concentration. No explanation was provided by Gredell of how the 0.001 concentration contour is applicable to the contaminant concentrations and compliance concentrations for this facility and wastes. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

14. Page 8, paragraph 2. Gredell should have approximate value of chloride concentrations within the coal ash waste. (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

15. Page 8, paragraph 3. If conservatism is the goal, then Gredell should be using a concentration contour of 0.01 for the PLUME evaluation. (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

16. Page 8, paragraph 3. Gredell is incorrect. Groundwater compliance within the permitted boundary needs to be shown. (10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

17. Page 9, paragraph 4. Gredell uses total porosities values based on literature as related to grain size. The effective porosity characterized by near-by in situ testing has a mean value of 26.5%. Much less than the 30, 35 and 40 proposed. This should be addressed at it directly impacts contaminant transport calculation. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

18. Page 11, paragraph 1. As indicated above, the velocity is directly affected by the effective porosity. The velocity is indirectly proportional. The total porosity value of 35% is much higher than nearby determined average effective porosity of 26.5%. Andrews used the effective porosity from tracer test studies conducted in the same Missouri alluvium sediments in the nearby St. Charles well field. This is the best data available given the lack of site specific porosity data. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

19. Page 12, paragraph 1. Gredell comments that the groundwater elevation data they collected is not typical of yearly precipitation events and river stages. However, this is what their PLUME evaluation is based upon. It would seem that the PLUME modeling effort completed by Gredell is compromised. (Appendix 1 of 10 CSR 80-2.015; 10 CSR 80-11.010(11)(B)(4)(B)); Article 10, Section 238 C.3.f.)

Engineering Comments

Please find below Andrews Engineering's response to the Ameren Construction Permit Application for Proposed Utility Waste Landfill originally submitted on January 29, 2013 with additional information submitted on August 7, 2013.

1. Calculate the bearing capacity of the subgrade in varying locations throughout the footprint. Additionally, calculate the bearing capacity during a maximum credible seismic event which induces liquefaction during each phase of construction and filling of the landfill. (Article 10, Section 238 C.3 & 10 CSR 80-11.010(5)(A)4.A)

   Bearing capacity analysis has been performed on static conditions. The factor of safety slightly exceeded 1.0. The model analysis had multiple error codes which are typically indicative of improper input parameters. No explanation of the error codes was provided other than the stability software's output.

2. On Sheet 19, the Perimeter Ditch at Closure shows 12" of cover soils over the geomembrane with no clay liner beneath the geomembrane. A minimum of two feet of soil cover must be over the landfilled CCR. Additionally, erosion protection in the perimeter ditch is necessary to prevent exposure of the geomembrane. (Article 10, Section 238 C.3. & 10 CSR 80-11.010(14)(C)3.)

   This has not been revised and still remains an outstanding issue. This issue can be handled in a permit condition that requires two feet soil required in the final cover and the stormwater perimeter ditches are part of the cover system due to the fact that they are directly over waste. No erosion protection exists in the design and will need to be addressed during construction.

3. Liquefaction has been determined to occur in multiple layers. When reviewing the post-liquefied shear strengths provided in the table for the stability analysis, they don't match the shear strengths from correlation charts based upon the SPT blow counts. The chart referenced in the Reitz & Jens report was H. Bolton Seed's 1987 chart. Seed and Harder updated this chart with additional information in 1990 and this chart is available with a 3rd Order Best-Fit curve to simplify the correlation. Please provide the graphed correlations providing the residual shear strengths based upon the SPT blowcount corrected for the percentage of fines. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign).

   The model runs have been revised with some new values but the Table E-1 has not been revised so the values don't correlate between the model runs and the table. Additionally, the model runs have the revised inputs with the reduced cohesive values but resulted in higher FOS. Please explain how the model was revised to obtain a higher FOS when using reduced cohesive values.

4. The waste boundary should be reduced to allow the groundwater monitoring wells to be installed in the area of the DSI. If the wells are installed outside the area of the DSI, the data from the wells must be complied and correlated to existing DSI data and provided as

an addendum to the DSI. (Article 10, Section 238 C.3; 10 CSR 80-2.015(1)(D) & 10 CSR 80-2.015 Appendix I)

No revisions were made pertaining to this comment. The geologic data from the new groundwater monitoring wells that were installed needs to be used to update the DSI.

5. Section 4.1.2 Sequence of Phase Construction describes the construction sequence of each phase. The Phase 1 Construction Sequence doesn't discuss the timing of constructing the stormwater pond, but Phases 3 and 4 Construction Sequence discusses constructing the stormwater ponds after placing CCR in the phase area. The construction of each stormwater pond and the CQA report for each must be approved prior to placing CCR into the phase area associated with the stormwater pond. (40 CFR Part 122.26; 10 CSR 20-6.200)

   No revisions were made. The construction of each stormwater pond and the CQA report for each must be approved prior to placing CCR into the phase area associated with the stormwater pond. A condition could be added to the construction permit to require that the stormwater ponds are constructed and permitted prior to the operating permit for each associated cell.

6. The information provided in Section 5.3 Estimate of Yield Acceleration and Lateral Spreading for the short-duration time history appears to be incorrect and/or not the most critical based upon the provided charts. The data provided for the short-duration time history came from chart #10 (page C-9) when chart #2 (page C-10) provide a higher peak rock acceleration = 0.25 and PHGA = 0.24 based upon the output provided from SHAKE2000 analysis using the same soil profile. The values provided are for the unfilled conditions. Additional model runs were completed for the filled conditions for use in the final cover but not discussed in this section. Provide a narrative with the Appendix C Results of Seismic Risk Analyses to detail the assumptions and correlate the model analysis from the inputs to the generated results. Update this information and use it in your modeling. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

   This has not been revised. This section needs further justification.

7. Friction angles for the geomembrane/clay interface appear to be too high. The direct shear testing performed on the interface did not adequately displace the interface and the normal loads were low. The displacement testing should be on the order of inches and the normal stresses need to meet the full capacity of the landfill design. Additionally, at lower normal stresses, the critical interface may occur between the geomembrane and geotextile or geocomposite. All of the designs need to be analyzed to have the proper inputs for stability analysis. The bottom liner illustrated as detail 3/17 Bottom Liner and Leachate Collection Detail shows a smooth geomembrane, not a textured HDPE geomembrane as was tested and provided in Appendix A-1 of Appendix J. The interface friction angle (15 degrees) utilized in the Analysis and Design of Veneer Cover Soils, Figure E-42, is a more representative value for textured HDPE geomembranes/clay interface. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4.B. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor

of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

This comment was not addressed. Direct shear analysis of the clay liner borrow material and the textured HDPE for the composite liner will need to be properly tested and analyzed during preparation of the construction specifications to verify the permanent cumulative deformation analysis.

8. The Construction Quality Assurance Plan inadequately addresses the requirements in 10 CSR 80-11.010(6)(B)1.A. "A detailed description of the QA/QC testing procedures that will be used for every major phase of construction. The description must include at a minimum, the frequency of inspections, field testing, laboratory testing, equipment to be utilized, the limits for test failure, and a description of the procedures to be used upon test failure;" Specifically, this section should include tables showing the frequency and acceptable test result values for each testing procedure. The Air Pressure Testing of seams cannot allow a drop of 4 psi during the 5 minute test. It must not drop more than 10% of the equalized pressure of at least 25 psi. (Article 10, Section 238 C.3 & 10 CSR 80-11.010(6)(B)1.A.)

   This comment was not addressed. The air pressure testing still needs to be revised as it does not meet the industry standard.

Additional Comments & Concerns

9. Interior berms filled with CCR must be constructed immediately after receiving the Operating Permit or Authorization to Operate due to placing waste within the landfill footprint. Additional CQA reporting will then be required for the construction of the interior berm and requires approval prior to placing CCR material onto it. (Article 10, Section 238 C.3.d.)

   No revisions were found within the revised CPA. This can be made a condition of the construction permit.

10. The minimum factor of safety recommended by the draft technical guidance document from MDNR-SWMP and Stark is 1.2 to 1.3, not 1.1 as listed in Table E-2 Results of Slope Stability Analyses. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

    Revisions to the narrative of Appendix J with regards to the minimum factor of safety have been further discussed and now agrees with the above draft technical guidance document but Table E-2 has not been updated.

11. After closure, all stormwater should be routed through the stormwater ponds to reduce sediment loading rather than allowing the letdown structures to discharge over the exterior berms. (General Engineering Comment)

This comment was not addressed. This is something that can be dealt with in the future as part of the construction specifications for the final cover of the landfill.

12. The separation between the compacted soil component of the composite liner shall be two feet above the Natural Water Table in the site area. Provide a potentiometric surface map for the critical monitoring events from the DSI with the post-settlement base grades provided of the landfill footprint. In any area where the potentiometer surface map illustrates that the surface is above the existing topography, use the top of the existing topography (pre-land disturbance) for those areas. (Article 10, Section 238 C.3.c..)

    On January 7, 2013, Andrews provided a letter as requested by Ameren for inclusion in their permit application. In that letter, it states that we agree with the concept but we couldn't provide an approval until we received an application to review. Franklin County's Article 10, Section 238 C.3.c. sets the limit for separation between the compacted soil component of the composite liner and the Natural Water Table. Franklin County's regulation does not have an allowance for a demonstration specifically stated.

13. Settlement analysis demonstrates some differential settlement which could cause ponding in the flat stormwater channels, a reduction in the overall height of the berms and settlement of the base grades of the landfill. Each of these must be discussed including how Franklin County's regulations will be satisfied during all phases of construction, filling and closure. Additionally, the settlement analysis typically has a range of settlement that may occur due to variability in the underlying subgrade and must be conservatively considered in the analysis to prevent overtopping of the exterior and interior berms due to a 500-year flood event. (Article 10, Section 238 C.3; Article 10, Section 238 C.3d.i.; 10 CSR 80-11.010(5)(A)4.A & 10 CSR 80-11.010(8)(B)1.F.(IV))

    This comment was not addressed. No changes or discussion on the stormwater channels. Operationally, it is added to maintain the berm height during operations of the facility.

14. Due to the size of the cells, provide calculations to show the removal rate of leachate generated from a storm event during the first couple of weeks of filling. Justify the storm event, calculate the removal rate and describe disposal method utilized. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.E.)

    This comment was not addressed. This will need to be specified in the construction specifications and approved prior to construction.

15. On Sheets 5 and 7, show how the stormwater from Cell 2 will flow into the Stormwater Pond 1. (General Engineering Comment)

    This comment was not addressed. At some point in time, they appear to regrade the stormwater ditches to connect from Cell 2 to Cell 1 with no discussion. This is an operational issue that would need to be addresses prior to issuing the operating permit for Cell 2.

16. The stormwater management plan for the site allows most stormwater to become contact waters and thus leachate. Based upon the stormwater management plan, no waters onsite will be allowed to discharge from the site and must be contained and treated as leachate. Additionally, a one-way valve rather than a gate valve alone would be required in the Stormwater Ponds (Leachate Ponds) to prevent leachate out of the ponds during the

equalization. These ponds will additionally need to be designed with a liner system which meets the requirements of MDNR's Solid Waste Management and Water Protection Programs for storing leachate (waste waters). The use of these waters will be limited to within the composite lined landfill area or for use as makeup waters within the power plant's future scrubber systems. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e.; 10 CSR 80-11.010(8)(B)1.F.(V); 10 CSR 80-11.010(8)(C)2. & 10 CSR 80-11.010(9)(C)2.)

In the response to MDNR Comment #7, it is stated that "Leachate and stormwater that cannot be utilized within the UWL limits for dust control or for conditioning of the ash prior to disposal in the UWL will be pumped back to ash ponds at the plant for discharge through NPDES Outfall 002." Based upon this response, it appears they intend to manage their leachate via dilution with the stormwater. No revisions made to the plan.

17. Seeding to establish vegetation on the intermediate side slope cover needs to occur within a much shorter period than annually as provided in the Phases 1, 2, 3 and 4 Aesthetic Cover section. (Article 10, Section 238 C.3 & 10 CSR 80-11.010(13)(B))

    This comment has not been incorporated into the CPA. On page 4-4, Section 4.1.2 Sequence of Phase Construction; Phases 1, 2, 3 and 4 Aesthetic Cover states "Seed to establish vegetation on the intermediate side slope cover annually." This is still unacceptable.

18. The Leachate and Stormwater Forcemains are shown in the Exterior Berm without the depths noted. The forcemains must be installed at a depth to prevent freezing during cold weather conditions. Additionally, account for these forcemains being located in a berm above grade and the landfill will not have exothermic reactions. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.D.)

    This comment was not addressed. This will need to be specified in the construction specifications and approved prior to construction.

19. If soils from onsite are acceptable for clay liner, prior to use for such, a test pad for these materials would be necessary since the offsite borrow soils are different. (Article 10, Section 238 C.3. & 10 CSR 80-11.010(10)(C)1.)

    This comment was not addressed.

20. The landfill liner and overlying leachate collection system must have a minimum slope of 1%, pre and post settlement. Revise the landfill grades to meet this requirement during all times within the landfill footprint. Provide plan sheets with the critical cross sections which show the pre and post settlement landfill base grades. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(10)(B)4.)

    This comment was not addressed.

21. Specify the geotextiles for the cushion fabric and the filter fabric shown in the Bottom Liner and Leachate Collection System Detail. Provide the supporting documentation and any necessary calculations. (General Engineering Comment)

    This comment was not addressed. Will need to be specified in the construction specifications and approved prior to construction.

22. Provide detail drawings for the pipe perforation or slotting pattern for the leachate collection lines and sump riser pipe. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.C.)

    This comment was not addressed. Will need to be specified in the construction specifications and approved prior to construction.

23. In Appendix Y(a) Leachate Pipe and Pump Calculations, the leachate storage tank is listed as a 12-ft diameter horizontal tank. The drawings provided for the site have a vertical storage tank shown without any detail drawings for the storage tanks. Provide a detailed drawing for the storage tanks and the anticipated operations of the tanks to prevent them from exceeding capacity. Provide the pump details for the pumps within the leachate storage tanks. This should be included in the leachate management plan. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.A.)

    This comment was not addressed. This should be provided in the construction specifications prior to construction.

24. The leachate storage tanks have no capacities or sizes listed or illustrated in the drawings. The leachate storage tanks must be sized based upon the pumping rates of the sumps within the landfill, and the maintenance and inspection schedule or control systems for each. (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.A.)

    This comment was not addressed. This will need to be specified in the construction specifications and approved prior to construction.

25. The stability analysis failed to meet the required and recommended factor of safeties. Cross-section E-E' failed to meet the factor of safety of 1.5 for the static drained global circular failure surface both with the initial and full fill of CCP. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

    The CPA stated the required factor of safety as 1.5 for the static drained global circular failure. Our review concurred with this statement and further implemented it during the review.

26. Liquefaction analysis is typically performed in the upper 50' of unconsolidated materials. Almost every boring was stopped at 35' in depth. Due to the lack of information from the 35' to 50' interval of the unconsolidated materials, provide a narrative justifying why liquefaction would not be anticipated at depths below 35'. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

    This comment was not addressed.

27. Provide the actual stability analysis for the deformation analysis and provide with a narrative rather than a table listing the yield accelerations and deformations for the short and long-duration events. (Article 10, Section 238 C.3; 10 CSR 80-11.010(5)(A)4. & *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by The Solid Waste Management Program/DEQ/MDNR and Timothy D. Stark, Ph.D., P.E. Associate Professor of Civil Engineering, Department of Civil Engineering, University of Illinois at Urbana-Champaign)

    This comment was not addressed and needs to include appropriate narrative explaining the interface shear values used for deformation analysis.

28. Provide the calculations correlating the CPT test data to the elastic modulus utilized in the Settlement Analysis. The CPT logs which were provided in the DSI don't provide enough detail to verify the elastic moduli provided in the settlement analyses. Additionally, heavily loaded conditions decrease the modulus, so these factors need to be accounted for relative to their location within the footprint of the fill. The Bowles 1997 reference appears to be dated and newer, more precise correlations are widely available which utilize the normalized cone resistance and normalized friction ration. (Article 10, Section 238 C.3 & 10 CSR 80-11.010(5)(A)4.A)

    This comment was not addressed.

29. In Appendix Y(a), the Leachate Pipe Crushing and Buckling Scenarios, Scenario 1 provides an H20 truck in the analysis. This size of truck is normal for highway use but it is anticipated based upon the amount of CCR being deposited that the size of the equipment and tire loads could be greater. Scenario 3 uses a live load of a 3 ton skid steer on the sump riser trench with one foot of CCR placed over the top of the sump riser trench. In all likelihood, this loading would occur prior to the placement of the CCR and the geotextile, and would be used to place the clean gravel. Additionally, Scenarios 1 and 3 drawings appears to be in error that CCR would be placed as the protective cover over the geocomposite drainage. Please revise these drawings and recalculate with the proper loading. It also appears that the pipe values were not reduced due to the perforations in Scenarios 1 and 2. Density of waste is listed as 75 pcf. Testing results in Appendix J report higher densities for CCPs. A density of 93 pcf is assumed in calculations in Appendix Y(d). (Article 10, Section 238 C.3.; Article 10, Section 238 C.3.e. & 10 CSR 80-11.010(9)(B)1.C.)

    This comment was not addressed.

30. Provide the approved design and drawings of the proposed underpass for Labadie Bottom Road and all approvals from the controlling authorities. (Article 10, Section 238 C.3 & 10 CSR 80-11.010(4)(C)1.)

    This comment was not addressed, but will be required by the county.