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Memorandum

Date: 18 June 2007

To: Ms. Missy A. Hedgecoth, Tennessee Valley Authority

From: Neil Davies, P.E., Geosyntec Consultants
Jay Beech, Ph.D., P.E., Geosyntec Consultants

Subject: Bottom Ash Drainage Layers
Dredge Cell Lateral Expansion
Kingston Fossil Plant

In November 2004 Geosyntec performed an independent peer review of the 50 percent design for a proposed lateral expansion of the dredge cell at the Tennessee Valley Authority's (TVA's) Kingston Fossil Plant. This review included a number of components of the proposed expansion including drainage layers to be constructed at the base of the expansion area and within the ash placed in the lateral expansion. Based on the plans that Geosyntec reviewed, the drainage layers are to be constructed using bottom ash. Based on discussions between Missy Hedgecoth and Neil Davies (12 June 2007), it is our understanding that TVA is planning to move ahead with the construction of the Dredge Cell Lateral Expansion. It is also our understanding that TVA has some concerns regarding the constructability of the drainage layers and the availability of the anticipated quantities of on-site bottom ash. In response to your request, we have prepared this memorandum to capture the previous review comments pertaining only to these drainage layers and to make specific recommendations relative to this matter. It should be noted that the comments summarized here are based on the 50 percent design documents and TVA should confirm that the comments are still appropriate for the final design. For example, the 50 percent design anticipated that both ash and gypsum would be placed in the lateral expansion area, but it is our understanding that the current plan is to place only ash in the lateral expansion area.

The review comments summarized here relate to the extent and vertical spacing of the drainage layers, settlement of the drainage layers, and constructability.

EXTENT AND VERTICAL SPACING OF DRAINAGE LAYERS

The 50 percent design called for bottom ash drainage layers to be installed at the base of the proposed gypsum-ash stack and at elevations 810 feet, 870 ft and 930 feet with in the stack. The apparent purpose of the drainage layers is to facilitate drainage in the overlying ash and gypsum layers. Drainage from the ash into these layers will facilitate consolidation by helping dissipation of excess pore pressures generated during subsequent filling and will allow the material to move more quickly from an undrained to drained state. The review of the 50 percent design noted that calculations were not provided to support the proposed vertical spacing of the drainage layers. Without the calculations it was not possible to comment on the effectiveness or the actual need for the drainage layers. Therefore, Geosyntec recommends that any calculations prepared as part of the 100 percent design be reviewed to identify potential flexibility in the lateral extent or vertical spacing of the drainage layers.

In the event calculations for the drainage layers have not yet been prepared, it is recommended that calculations be prepared to determine the lateral extent and vertical spacing of the drainage layers. For example, stability analyses included in the 50 percent design assumed the water surface is near the top of the stack and approximately 150 ft away from the face of the slope. Based on these assumptions, the slope stability analyses indicated a stable condition. If this water condition can be maintained with only the drainage layer at the base of the lateral expansion, it may not be necessary to install the proposed drainage layers within the ash. (During the 50 percent review Geosyntec performed preliminary calculations that indicated the drainage layer may not be needed over entire base of the lateral expansion to achieve the water surface assumed in the stability analyses, and that a drainage layer around the perimeter of the cell may be adequate. Therefore, it appears that optimization of the drainage layers may be feasible.)

The permeability of the bottom ash is know to be greater than the flyash to be placed in the lateral expansion, which will allow liquid in the flyash to drain into the bottom ash drainage layer. However, the required permeability of the drainage material will depend on the following factors in addition to being more permeable than the flyash: the rate of infiltration of liquids into the drainage layer and the angle of inclination, thickness and length of the drainage layer. It may be possible to optimize the drainage layer design if the bottom ash has sufficient permeability. Therefore, the required permeability of the drainage layer material should be confirmed and compared to the available permeability to see if any optimization of the drainage layer design is possible.

SETTLEMENT OF DRAINAGE LAYER

As configured on the 50% drawings, the drainage layer is sloped at approximately one percent across the proposed ash stack. A simplified stratigraphy for the material under the lateral expansion includes 50 to 60 feet of various mixtures of loose ash, 15 feet of soft to stiff natural clay, and 11 feet of clayey silty sand residuum. It was noted that these materials will undergo compression and consolidation as ash is placed in the lateral expansion. This compression and consolidation will result in settlement of the various drainage layers over time. Although no settlement analyses were provided, settlement is expected to be close to zero at the toe of the slope and based on experience could be several feet under the maximum height of the stack. If the settlement is large enough, the slope of the drain could reverse rendering it inoperable during its operational life. Calculations prepared as part of the final design package should be reviewed to determine that the slope of the drainage layers will not reverse during operation. In the event reversal of the drainage layers is expected then other methods for constructing the drainage layers may be practical. Examples of alternatives for the drainage layer construction include the use of a saw tooth arrangement of the drainage layer or use of only a perimeter drainage blanket.

CONSTRUCTABILITY

The 50 percent design drawings called for a filter layer consisting of a 6 in. layer of fly ash mixed into a 6 in. layer of bottom ash. It was noted that uniformly mixing these materials may be difficult to achieve and a test pad was recommend. It is noted that the filter layer appears to be required between the gypsum and the bottom ash drainage layer. Since gypsum is no longer being disposed in the lateral expansion area, it is recommended that the need for this filter layer be reviewed. Geosyntec also notes that TVA has concerns regarding the constructability of a continuous drainage layer across the stack while the stack is in operation (i.e., assuming that the stack is operated as a rim ditch). For this reason, it may be advantageous to consider other drainage alternatives (such as a perimeter drain or other localized drainage system) to facilitate future construction operations.

RECOMMENDATIONS

Based on recent discussions we understand that the anticipated volume of on-site bottom ash materials may not be available at Kingston to construct the bottom drainage layer as currently designed. This would require the use of off-site imported material that may not be of similar type and gradation. There appears, based on the above summary of the 50 percent review comments, to be other alternatives for approaching the design. Therefore, Geosyntec recommends that TVA

consider evaluating alternative drainage configurations for the proposed lateral expansion. In the event that an alternative arrangement proves to be beneficial in terms of cost, constructability and/or materials availability, it is likely that a permit modification would have to be submitted to TDEC. Depending on the nature of the modification, a "Minor Modification" may be the appropriate regulatory process.

CLOSING

We hope that the above information is useful. If you have any questions or would like to discuss this matter further, please feel free to contact either Jay Beech or Neil Davies at 678-202-9500

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