



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

July 30, 2019

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. John Michael Japp
Federal Facility Agreement Manager
Oak Ridge Office for Environmental Management
Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831

Dear Mr. Japp:

The U.S. Environmental Protection Agency (EPA) participated in meetings with the U.S. Department of Energy (DOE) and the Tennessee Department of Environment and Conservation on July 10, 2019, to review the DOE preliminary design groundwater model for Central Bear Creek Valley Site 7c. The meeting was informative and handouts answered many questions previously raised by comments shared from EPA. Because the model was presented using handouts, the group was unable to run and analyze specific model changing conditions. Questions remain regarding the variability of results.

The EPA understands the presentation is a preliminary model and ongoing refinement occurs with new data currently being collected (e.g., Technical Memorandum #3). We were informed that the final landfill design will occur as a post-Record of Decision through documentation associated with the Remedial Action Work Plan/Remedial Design Report.

The EPA has comments and questions (see attached) that DOE should address as part of the acceptance and approval of the DOE model.

If you have any questions or concerns regarding this matter or need any additional information, then please contact me at (404) 562-8550, and electronically at froede.carl@epa.gov.

Sincerely,

A handwritten signature in black ink that reads "Carl Froede Jr." with a stylized flourish at the end.

Carl R. Froede Jr.
Senior Remedial Project Manager
Restoration and DOE Coordination Section
Superfund and Emergency Management Division

cc: Brian Henry, DOE (Electronic copy)
Joy Sager, DOE (Electronic copy)
Melyssa Noe, DOE (Electronic copy)
Patricia Halsey, DOE (Electronic copy)
Randy Young, TDEC (Electronic copy)
Cathleen Burnette, TDEC (Electronic copy)
Beth Rowan, TDEC (Electronic copy)
Brad Stephenson, TDEC (Electronic copy)
ORSSAB

EPA Comments from the Preliminary Groundwater Model Design Meeting for the Central Bear Creek Valley Site 7c, Oak Ridge, Tennessee

1. A major limitation of the current DOE model is the assumption of a “Drain” boundary for the ditch north of the proposed landfill. The term Drain boundary, as defined in MODFLOW, would restrict any rise of the groundwater table above the bottom elevation of the ditch on the downgradient side, where the landfill is located (see Figure 1). As a result, this model parameter will not allow the water table to rise adjacent and possibly within the landfill footprint during an extreme rainfall event or extended period when the ditch is full. Although it appears that rainfall events are transient and may not have any sustained effect on the proposed landfill, any short term rise in the ditch water level may cause the water table to rise because of the steep north-south gradient. The current model boundary condition for the north ditch should be changed to a “River” boundary, which will allow the model to consider this boundary as a source or sink. By MODFLOW definition, a “River” boundary could act as a “Drain”, but a “Drain” could never be a “River”. Therefore, a “River” boundary for the north ditch could act as a “Drain” (or sink) during average condition, while during extremely or prolonged rainfall events it could become a “River” (or source and head boundary).

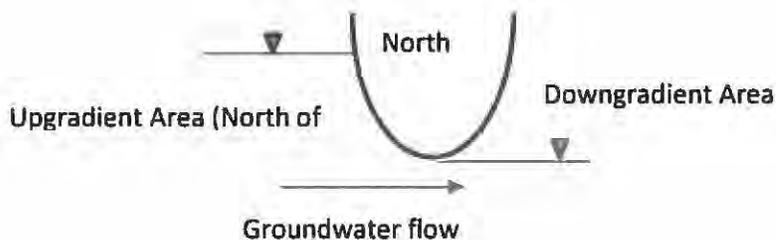


Figure 1. Water table on both sides of a “Drain” boundary during a heavy rainfall event

2. The model boundary conditions, parameters, calibration, sensitivity and application are conceptualized for the base flow condition only. It does not address any effect of the peak flow condition. To model for the peak flow condition, the surrounding surface water boundaries should be converted to “River” boundaries, as explained in the previous comment.
3. The model is calibrated as steady-state. A transient model calibration should also be performed since the piezometer water elevation data shows an instantaneous rise following rainfall events.
4. Are there any springs within the CBCV? Since there is an upward gradient from the bedrock to surficial aquifer, it is possible to find some preferential flow path from the bedrock to the surficial aquifer. The model does not address any possibilities of preferential flow through fractured bedrock. Also, there should be a contingency plan in case seeps are found during construction of the landfill.
5. Fractured bedrock thickness within the model domain should be provided for review. Model layering should replicate the fractured bedrock thickness spatially. Linearization of fractured thickness is not justified.

6. Survey data for the north ditch should be provided in reference to a base map for review.
7. Calibration statistics for each model layer for the entire CBCV should be submitted for review. Initial review of the calibration result shows poor match at GW-986/987, GW-988/989, and GW-994/995 clusters. Residual error values for these clusters show 12, 41, and 18 ft errors, respectively. These error/residual values are in the same range of model predicted water level change between existing and post-construction conditions. Significant improvement in model calibration is necessary to reduce model uncertainty.
8. Distribution of the hydraulic conductivity value for each model layer should be provided for review.
9. Residual distribution map for each model layer should be provided for review.
10. Target wells and dataset used in model calibration, validation and sensitivity analyses should be provided for review.
11. Modeling files should be provided for review.

Reviewer 2

1. The model should be run to verify a worst-case scenario to determine if the proposed base of waste elevations is appropriate, especially given the wide range of actual vs. modeled groundwater elevations beneath the proposed landfill.
2. There was no “post-fill/closed landfill” scenario run. Given the runoff expected from a capped landfill, this model should be run to verify post-closure conditions are acceptable.
3. The layer thicknesses appear to be over-generalized. To address this, one option could have been to make the grid outside of proposed landfill area less refined and focus on actual layer thicknesses in the area of concern. If they were able to decrease the grid refinement outside of the proposed landfill area and interpolate the layers rather than normalize them, it’s possible you’d see a better representation of actual layer thicknesses in the proposed landfill area.
4. In general, the model should be run over more scenarios, with discussion and evaluation of each scenario, its inputs and outputs, and calibration and residuals results.

Reviewer 3

1. The presentation of modeling input and output was beneficial. It needs to be backed up by detailed results from the modeling runs and further EPA analysis of both model input and modeling results. As examples of detailed results, there should be model calibration statistics provided, as well as a figure showing the spatial distribution of residuals (the difference in feet between model-predicted water levels and observed water levels) for the calibrated base-case model. Additional details should include explanation of why model input was selected. For example, in the base condition, the calibration target values for water levels at wells was selected as an average, not a maximum observed water level. There needs to be a modeling report presented for review that explains why the average water levels were selected as targets for the initial calibration run.

2. There should be detailed documentation of how model input was changed to derive the final model input values that produced the base-case calibrated model (show results from different model runs that fully document model refinement leading to the calibrated base-case model).
3. The modeling results that were presented indicated that much of the shallow groundwater flow is to tributary streams on either side of the proposed landfill. Conceptually, if these tributary streams are present because of enhanced rock fracturing in the streambed area, then the modeling should consider adjustment of the hydraulic conductivity in model cells in stream areas to account for what is likely a higher hydraulic conductivity there. This is an example of a numerical model element that probably could be better aligned with the conceptual model.
4. Isopach maps should be prepared showing the model-predicted thickness of the unsaturated zone between the base of the landfill and the water table. This separation thickness is ultimately a key condition that defines the acceptability of the landfill. The separation thickness isopach maps should show the projected separation thickness at different phases of landfill operation and for each phase of landfill operation should include model-predicted separation thickness maps for lower probability, high rainfall year conditions as well as the expected long-term average rainfall condition.

(End of Comments)

Brad Stephenson

Subject: EPA comment letter on preliminary EMDF Groundwater Model and meeting

Importance: High

From: Froede, Carl [<mailto:Froede.Carl@epa.gov>]

Sent: Tuesday, July 30, 2019 12:05 PM

To: Japp, John Michael; Randy Young; Jones, Connie; Henry, Brian; Sager, Joy Lynn; Noe, Melyssa P; Halsey, Patricia J; Cathleen Burnette; Beth Rowan; Brad Stephenson; ORSSAB@orem.doe.gov

Cc: DePaoli, Susan (CONTR); Pfeffer, Julie (JP2); Garland II, Sidney B (QSG)

Subject: [EXTERNAL] EPA comment letter on preliminary EMDF Groundwater Model and meeting

Importance: High

Folks:

Please call me if you have any questions.

It is EPA's expectation that these comments will be resolved as part of the EMDF groundwater/EMDF design discussion.

Thanks,

Carl