From:	Chuck Head
To:	Adler, David Green
Subject:	Department of Energy - Oak Ridge - Proposed Environmental Management Disposal Facility - Ground Water Modeling
Date:	Monday, July 8, 2019 3:22:15 PM
Attachments:	2019-07-08 DOE-OR Proposed EMDF Landfill.docx

Dave, please find attached a letter stating the concerns of the Department of Environment and Conservation (TDEC) regarding the ground water modeling for the proposed Department of Energy-Oak Ridge (DOE-OR) Environmental Management Disposal Facility landfill (EMDF Landfill). TDEC has reviewed the site geologic and hydrogeologic information DOE-OR has provided for this site.

The attached letter expresses TDEC's concern about the long term use of this site for the disposal of solid waste, hazardous waste, toxic waste, radioactive waste and mixed waste. Given the nature of the wastes to be disposed at the proposed EMDF site, TDEC's first priority is protection of public health and the environment from any releases from this landfill to local ground water and surface water.

Please contact me if you have questions.

Sincerely,

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David W. Salyers, P.E.
Commissioner

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Governor

July 8, 2019

Mr. David Adler, Director
Quality and Mission Support Division
Oak Ridge Environmental Management
U.S. Department of Energy

RE: Proposed Environmental Management Disposal Facility - Groundwater Conditions at the proposed DOE-OR Environmental Management Disposal Facility

Dear Mr. Adler:

The TN Department of Environment and Conservation (TDEC) appreciated the opportunity to meet with you and Brian Henry from the U.S. Department of Energy – Oak Ridge office (DOE-OR) and representatives from the U.S. Environmental Protection Agency (EPA) Region IV CERCLA Program on June 7, 2019. The purpose of the meeting was to discuss current and future groundwater conditions at the proposed Environmental Management Disposal Facility landfill (EMDF landfill).

TDEC is committed to ensuring that the EMDF landfill, if approved, is constructed to prevent any waste disposed at the EMDF landfill from being released into the surrounding environment, particularly groundwater. DOE-OR plans to dispose several different types of waste at the EMDF landfill:

- EPA Subtitle D solid waste;
- EPA Subtitle C hazardous waste;
- EPA Toxic Substances waste;
- DOE low-level radioactive waste; and
- Mixed waste consisting of toxic, hazardous, and radioactive materials.

Our concerns begin with the design, construction and operation of the DOE-OR Environmental Management Waste Management Facility landfill (EMWMF landfill) that began receiving waste in 2002. The EMDF landfill and the EMWMF landfill are in similar geologic settings with similar physical conditions. TDEC is expressing many of the same concerns for the EMDF landfill site as it expressed for the EMWMF landfill site. These concerns range from the initial site characterization through design, construction and ultimately disposal of waste at the EMDF landfill, if built.

The EMWMF landfill site is located in an area with groundwater near the land surface. TDEC was/is concerned that groundwater at the EMWMF Landfill site will be close enough to the ground surface that it has/will affect the EMWMF landfill's geologic buffer. TDEC was concerned that ground water would rise to the level of the landfill liner and above. DOE-OR relied on computer modeling to demonstrate to TDEC and EPA that the construction methods used to build the EMWMF landfill would lower the groundwater levels beneath the site and eliminate any ground water impact on the EMWMF landfill geologic buffer. TDEC and EPA approved the EMWMF landfill site for construction based on results of the DOE-OR ground water modeling. All parties learned during construction that the groundwater levels at the EMWMF landfill site were considerably higher than predicted by the ground water model.

Beginning with the construction of the EMWMF landfill continuing through the operation of the EMWMF today, several issues have come to light at the EMWMF landfill:

- The model forecasted the groundwater elevation under the EMWMF landfill would be below the EMWMF landfill geologic buffer. The computer model used to predict the groundwater level around the EMWMF landfill was not accurate. DOE-OR reports indicate the groundwater level has risen above the design criteria for the geologic buffer for the EMWMF landfill.

- Because the groundwater level under the EMWMF landfill was higher than predicted, the engineering design for the EMWMF landfill had to be modified to address the potential for ground water to affect the EMWMF landfill geologic buffer.

- To minimize the impact of groundwater upon the EMWMF landfill, an underdrain system was installed beneath the EMWMF landfill to "intercept" groundwater. The goal of underdrain system was to reduce ground water impact to the EMWMF geologic buffer. Using an underdrain in an attempt to permanently lower or "suppress" the groundwater beneath a landfill is not allowed during construction of a permitted Subtitle D landfill in Tennessee because the "underdrain" eliminates the ability to monitor ground water for releases from the landfill. However, TDEC made an exception for this DOE-OR corrective action at the EMWMF landfill to allow DOE-OR to meet its waste disposal needs with the belief the EMWMF landfill geologic buffer would not be impacted and the landfill would not have any releases to ground water.

- Additional ground water modeling predicted the underdrain system would permanently lower groundwater under the EMWMF landfill. The underdrain discharges groundwater

beneath a portion of the EMWMF landfill, but there is still uncertainty regarding the impact of groundwater levels under other parts of the landfill.

- Rainwater that falls into the EMWMF landfill carries waste constituents into Bear Creek. Additionally, TDEC is concerned groundwater discharged through the EMWMF landfill underdrain may send even more contaminated water to Bear Creek.

- The existing groundwater monitoring network for the EMWMF landfill has been unable to provide ground water data to determine if the EMWMF landfill groundwater protection standards have been exceeded. TDEC persuaded DOE-OR to add make some necessary ground water monitoring improvements. However, installation of a standard landfill ground water monitoring network for the EMWMF landfill has not been completed.

A paper titled "OAK RIDGE ENVIRONMENTAL MANAGEMENT WASTE MANAGEMENT FACILITY DOE-EM's FIRST ON-LINE PRIVATIZED DISPOSAL FACILITY" authored by DOE-Environmental Management and Bechtel Jacobs Company, LLC and presented at the 2004 Annual Waste Management soon after the EMWMF landfill opened illustrates TDEC's groundwater concerns:

"*One of the challenges presented by the site location, high groundwater, is the source of several lessons learned that have impacted all aspects of the project. For the design aspect, the project learned that there is no such thing as too much independent subject matter review of the groundwater model…. The designers correctly predicted that the groundwater level in the fill at the NT-4 channel [underdrain] would rise, but the magnitude of the rise exceeded predictions.*"

Given the proposed EMDF landfill site geology is similar to the EMWMF landfill and the ongoing problems at the EMWMF landfill, TDEC is concerned about constructing the EMDF landfill at the proposed site. The current plans for construction of the proposed EMDF landfill depend upon lowering the groundwater levels up to 40 feet without building an underdrain during construction. If the DOE-OR model incorrectly predicts the ground water level below the EMDF landfill site and ground water contacts the geologic buffer, an underdrain system, as a "corrective action" will not be allowed.

DOE has proposed relying in part on the TDEC geologic buffer standards for solid waste landfills as grounds to waive groundwater location requirements under TSCA and state radiological health standards. The TDEC solid waste disposal regulations require a ten foot geologic buffer with a specific hydraulic conductivity between waste and the seasonal high water table, per the TDEC Solid Waste Management regulations at 0400-11-01-.04(4)(a)(2). This ten foot geologic buffer in conjunction with the five foot liner provides a fifteen foot separation between the waste and the seasonal high water table. DOE's groundwater modeling must demonstrate how construction of the proposed EMDF landfill will meet this required geologic buffer requirement. Such a geologic buffer is necessary to

ensure elevated groundwater conditions do not affect the protectiveness of the proposed landfill.

The site geology for the proposed EMDF landfill is very similar to the EMWMF landfill. As listed earlier, DOE-OR plans to place solid waste, hazardous waste, toxic waste, mixed waste and radioactive waste into the proposed EMDF landfill. TDEC's primary mission is to protect public health and the environment. TDEC must ensure that groundwater at the proposed EMDF landfill site will not contact the geologic buffer to ensure proper protection of public health and the environment.

TDEC looks forward to the July 10, 2019 joint DOE-OR, EPA and TDEC meeting for groundwater professionals to discuss the model used by DOE-OR to predict post-construction groundwater levels at the site. As agreed, TDEC officials will be able to observe operation of the model, ask questions about the capabilities of the model and discuss assumptions made for site characteristics and variables entered into the model. While a one-day meeting is planned for this discussion, if TDEC representatives do not believe enough information has been provided to validate the results of the groundwater model, then TDEC will ask for additional time to understand whether the model is likely to accurately predict post-construction groundwater levels at the proposed EMDF landfill.

The groundwater modeling information requested by TDEC and EPA for the proposed EMDF landfill is essential for TDEC to properly review the landfill for CERCLA compliance. Accordingly, TDEC requests that DOE **only** submit a D1 version of the proposed EMDF landfill ROD after all parties have sufficient ground water information to perform the necessary review. After discussion at the June 7, 2019, meeting concerning the proposed EMDF landfill site, DOE committed to granting TDEC additional time to review the D1 ROD should DOE submit the D1 ROD before TDEC has the opportunity to review required groundwater modeling information.

If DOE-OR cannot acceptably demonstrate to TDEC that seasonal high groundwater at the proposed site will be below an approved geologic buffer, then TDEC cannot approve the proposed EMDF landfill site for disposal of 2,200,000 yd^3 of waste. In that case, DOE-OR might consider constructing a smaller landfill and shipping more waste to existing off-site disposal facilities. TDEC appreciates DOE-OR's offer to place a contingency in the D1 ROD stating; "Should groundwater modeling prove incorrect, as was the case at the EMWMF landfill, DOE will not place waste in the proposed EMDF landfill."

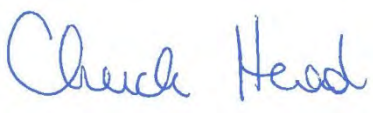
The primary focus of this letter was to discuss groundwater conditions at the proposed EMDF landfill site and their potential impact on construction. However, our February 14, 2019 letter to DOE-OR reiterates the State's seven key concerns with DOE's plan. Each concern must be resolved to TDEC's satisfaction in the Record of Decision (ROD) before TDEC will agree to the construction of the proposed EMDF landfill. As identified by TDEC after review of the original EMDF Landfill Proposed Plan, the State's key concerns are:

- Site characterization;
- Identification of applicable or relevant and appropriate requirements (ARARs);
- Waste acceptance criteria (WAC);
- DOE performance assessment (PA) & composite analysis (CA) in the administrative record;
- Mercury disposal limits;
- Use of underdrains; and
- Landfill wastewater discharge limits.

TDEC will continue to work with DOE-OR to review the suitability of the proposed EMDF landfill. DOE-OR estimates the cost to build the proposed EMDF landfill would exceed $350,000,000 and estimates the total cost, including operations, would be $700,000,000. These cost estimates do not account for long-term stewardship necessary to safely contain mercury and radioactive contaminants that will remain a threat to public health and the environment forever. Given the projected costs of construction, operation, and post closure maintenance, TDEC will decide if the ground water impacts the proposed EMDF landfill using information that accurately captures current and future site conditions. TDEC, EPA and DOE-OR do not want to expend hundreds of millions of dollars for construction of a landfill at an unacceptable site; a site that has the potential to release many different types of wastes into the environment.

Should you have any questions or concerns please contact me.

Sincerely,



Chuck Head

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