From:	DePaoli, Susan (CONTR)
To:	Froede, Carl; Brad Stephenson; Beth Rowan; Osteen, Bill
Cc:	Sager, Joy Lynn; Pfeffer, Julie (JP2); Michael D. Higgins
Subject:	RE: TM-2 -- Response to EPA/TDEC comments...
Date:	Tuesday, June 11, 2019 12:19:20 PM
Attachments:	TDEC Comments on TM-1 final.doc EPA Comments on TM-1 final.doc

Here they are.

From: Froede, Carl [mailto:Froede.Carl@epa.gov]
Sent: Tuesday, June 11, 2019 12:16 PM
To: DePaoli, Susan (CONTR) <Susan.DePaoli@orem.doe.gov>; Brad Stephenson <Brad.Stephenson@tn.gov>; Beth Rowan <Beth.Rowan@tn.gov>; Osteen, Bill <Osteen.Bill@epa.gov>
Cc: Sager, Joy Lynn <Joy.Sager@orem.doe.gov>; Pfeffer, Julie (JP2) <Julie.Pfeffer@ettp.doe.gov>; Michael D. Higgins <Michael.D.Higgins@tn.gov>
Subject: TM-2 -- Response to EPA/TDEC comments...
Importance: High

Good afternoon Susan,

I just received the "official" copy of Technical Memorandum #2. It contains a CD with the report but does not include the response to comments to EPA and TDEC comments.

Would you please send me those files electronically? That would be appreciated.

Thanks,

Carl

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EMDF Comment Resolution Matrix

Document Number: DOE/OR/01-2785 – pre-published version	**Document Title:** *Technical Memorandum #1, Environmental Management Disposal Facility Phase 1 Field Sampling Results Oak Ridge, Tennessee*		
Organization/Project: EPA/EMDF	**Comment Due Date: N/A**		

Reviewer Initials and Name	Tennessee Department of Environment and Conservation (TDEC)

Comment No.	Reviewer Initials	Comment	Resolution	Reviewer Concurrence
1	TDEC	1) OREM delivered the report text and Appendix E just one day before TDEC comments were due on the second draft (D2) Proposed Plan, per protocols in Section XXI of the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). Therefore, there was insufficient time for TDEC to review the results and evaluate their impact on the protectiveness and compliance of OREM's preferred alternative prior to submitting comments on the Proposed Plan on July 6, 2018 (within the timeframe required by the FFA).	Noted.	

2	TDEC	2) An initial review of the data provided by OREM indicates that groundwater levels appear to be substantially higher than predicted or assumed in the fifth draft (D5) of the Remedial Investigation/Feasibility Study (RI/FS) report over a large portion of the proposed landfill. TM-1 does not mention the higher-than-projected water levels. • At GW-988/989, groundwater levels presented in TM-1 are about 35 feet higher than originally projected in the D5 RI/FS report. • As acknowledged by OREM, groundwater levels presented in TM-1 may not represent the highest water groundwater levels that might be encountered at CBCV Site 7c. ○ At the May 23 project team meeting, OREM acknowledged the data collection effort missed the peak groundwater level of the 2018 winter wet season. They said TM-1 would estimate the peak water levels at Central Bear Creek Valley (CBCV) Site 7c based on measurements from wells at the Environmental Management Waste Management Facility (EMWMF). ○ TM-1 mentions that OREM installed continuous groundwater elevation monitors at EMWMF in 2017. Figure 6.20 labels those locations as "EMWMF Comparable Wells". However, TM-1 does not present groundwater levels measured at those locations. ○ Water levels measured at the EMWMF indicate the highest water levels during 2018 at 13 of the 27 continuously monitored wells appear to have occurred during early February 2018. However, this is uncertain because OREM had not provided data from late February at the time of TDEC's preliminary evaluation of TM-1. ○ OREM began recording groundwater levels at newly installed wells at the CBCV Site 7c on March 8, 2018. In an effort to provide data from the winter wet season before installing wells at Site 7c, OREM agreed to monitor existing wells at comparable sites identified in the Phase 1 Field Sampling Plan (Table 6) throughout January and February. Unfortunately, monitoring did not begin until February 22, 2018 at those locations. ○ Recognizing that the peak groundwater level varies from year to year depending on rainfall and other factors, TDEC offers the following as a point of reference for one of the comparable wells shown on Figure 6.20. The fourth draft (D4) RI/FS report (Appendix E, Attachment A, p. 68) says: "The water level hydrographs (Figures 27 and 28) indicate that the highest water levels reached for the period of record so far occur around January 6, 2015, in most wells except for GW-976(I) where the maximum water level occurs around January 22, 2015." (Page 65 of Appendix E, Attachment A says the maximum was on January 20, 2015.) Either way, the 2015 data suggest that the 2018 data set may have missed the highest water level at that well (GW-976).	[Comparisons made below in this response are based on TM-1 data only.] None of the seasonal high correlated water level estimates or measured water level elevations in the Phase 1 wells exceeded the D5 RI/FS assumptions by 35 feet. Two of the well pairs (GW-980R/981 and GW-988/989) indicated seasonal high water levels that exceeded the RI/FS assumptions by a significant amount, the maximum of which was 28 feet. Both these well pairs are located on the slope of the knoll, and both exhibited downward gradients with the downward gradient in GW-980R/981 being quite significant. Downward gradients indicate recharge in those areas is attributable to precipitation. Water elevations in the well pair at the top of the knoll were approximately 12 ft <u>lower</u> than assumptions in the RI/FS. No gradients (upward or downward) were measured in this well pair. This is the location of the footprint where the most cut will occur. All water elevation data (correlating wells and CBCV wells) graphically represented in TM-1 were provided to TDEC on Compact Disks on June 14, 2018. Comment 2, sub-bullet 4 indicates that "OREM agreed to monitor existing wells at comparable sites identified in the Phase 1 Field Sampling Plan (Table 6) [FSP 1] throughout January and February." And that "…monitoring did not begin until Feb 22." Continuously monitored wells at EMWMF and the existing well at Site 5 (GW-976), for which January information was available, were determined to not be the best correlating wells. The best correlating wells were found to be wells that did not previously have continuous monitoring. Monitoring in those wells (all but two) actually	

			began on Feb 16, and FSP 1 stated that monitoring would begin "…*prior to completion and instrumenting CBCV piezometers*". The timeframe was: • 12/7/17. Dispute Resolution Agreement signed • 1/2018. Instrumenting additional wells (to serve as correlating wells to Site 7c) discussed • 1/22/18. Proposal to instrument new wells released • 2/1/18. Contract award • 2/2-15/18. Contractor does field work, orders instruments, installs instruments • 2/16/18. Data collection begins in 8 of 10 wells Regarding GW-976 information quoted from the 2016 D4 RI/FS in sub-bullet 5, TDEC indicates that in 2015 the high recorded water levels were in January, and therefore the 2018 data "…may have missed the highest water level at that well (GW-976)." DOE does not agree with TDEC's interpretation, that, because one year the high water levels occurred in January, it follows that high water levels are likely to occur in January for subsequent years. Precipitation in January of 2018 was *very* low compared to February 2018, when seasonal high water levels were measured (as indicated in TM-1). The high level in GW-976 in 2015 actually occurred in April 2015, a time period that was summarized in the D4 RI/FS Site 5 Characterization Attachment to the Appendix, not the Appendix itself which only covered December-January monitoring. While GW-976 was noted as a possible correlating well, ultimately the water levels in that well were not used in any analysis, as the well's response did not correlate with precipitation responses in the CBCV wells.	
3	TDEC	3) Based on conceptual design information in the D5 RI/FS (Figure 6-29) and site characterization data collected for TM-1, groundwater levels during the spring of 2018 would be within the waste over a large portion of the proposed landfill.	DOE disagrees with the terminology "large portion". Temporary peak readings of some water levels in the current condition intersect a portion	

<table>
<tr><td></td><td></td><td></td><td>(significantly less than half) of the proposed waste in the conceptual design. However, site specific data will be used to inform the <u>engineering</u> design, which will be based on modeled seasonal high water levels resulting when recharge is cut off, and will incorporate design optimizations that will continue to meet capacity needs but may appear modified from the RI/FS conceptual design (e.g., number of cells, orientation, height, cut/fill, etc.).</td><td></td></tr>
<tr><td>4</td><td>TDEC</td><td>4) Vertical hydraulic gradients at the CBCV Site 7c locations measured for TM-1 range from strongly downward to strongly upward. Throughout the RI/FS and Proposed Plan phases of the EMDF project, OREM has hypothesized that landfill construction would lower groundwater levels sufficiently to meet siting requirements by cutting off infiltration from precipitation. Given the presence of upward gradients and the height of observed existing water levels above the projected elevation of the bottom of waste, there is no certainty that landfill construction will lower water levels sufficiently to keep water levels below the waste.</td><td>TM-1 data demonstrate there are no significant upward gradients – only two slight upward gradients were noted, which are located in areas where significant fill will be required. The following table summarizes the information provided in TM-1 regarding gradients encountered at the site:

<table>
<tr><th>Well Pair</th><th>TM-1 quoted text</th><th>TM-1 Table-6.4.</th><th>TM-1, Per Graphs (Fig 6.12 to 6.19)</th></tr>
<tr><td>GW-978/979</td><td></td><td>Slightly downward</td><td>~0 (Fig 6.12)</td></tr>
<tr><td>GW-980R/981</td><td>significant downward gradients beneath the knoll (GW-980R/GW-981)</td><td>Downward</td><td>~ 8 ft downward (Fig 6.13)</td></tr>
<tr><td>GW-982/983</td><td></td><td>None</td><td>~0 (Fig 6.14)</td></tr>
<tr><td>GW-986/987</td><td></td><td>None</td><td>~ <1 ft (Fig 6.15)</td></tr>
<tr><td>GW-988/989</td><td></td><td>Downward</td><td>~ 1.8 ft downward (Fig 6.16)</td></tr>
<tr><td>GW-992R/993</td><td>little to no gradient between the shallow and deeper piezometers nearer the streams (GW-992R/GW-993)</td><td>None</td><td>~0 (Fig 6.17)</td></tr>
<tr><td>GW-994/995</td><td>slight upward gradients in the southern part of the footprint (GW-.994/GW-995)</td><td>Slight upward</td><td>~ 1ft upward (Fig 6.18)</td></tr>
<tr><td>GW-998/999</td><td></td><td>Slight upward</td><td>~0 (Fig 6.19)</td></tr>
</table></td><td></td></tr>
</table>

			NOTE: TM-2 has evaluated the full year of data and the conclusions in the table above (information taken from TM-1) are still basically valid. Only slightly upward gradients were observed; no strongly upward gradients are present.	
5	TDEC	5) Surface water sampling location maps in Appendix A present a location mislabeled as *NT10-14*. The location shown is on the D10W drainage.	TM-1 was modified to make this correction.	
NA	TDEC	The December 7, 2018, Dispute Resolution Agreement (DRA) says the results and analysis of the field investigation shall be included in the administrative record before the Proposed Plan public comment period. It also says that TDEC and EPA shall review the results before selecting the remedy and executing the Record of Decision (ROD). During the July 25, 2018, project team meeting, OREM contractors stated that TDEC and EPA formal comments will be on Technical Memorandum #2 (TM-2), which will incorporate a full year of data to be collected before ROD execution. In the meantime, we look forward to discussing TDEC's analysis of the TM-1 data in more detail and getting a better understanding of DOE's conclusions.	TM-1 was made available to the public prior to the Proposed Plan. TM-2 incorporates the full year of data. Per the approved Field Sampling Plan, TM-2 was scheduled for submittal prior to the RDWP.	

EMDF Comment Resolution Matrix

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Document Number: DOE/OR/01-2785 – pre-published version	**Document Title:** *Technical Memorandum #1, Environmental Management Disposal Facility Phase 1 Field Sampling Results Oak Ridge, Tennessee*		
Organization/Project: EPA/EMDF	**Comment Due Date: N/A**		

Reviewer Initials and Name	CF = Carl R. Froede Jr., P.G.

Comment No.	Reviewer Initials	Section, Page, Paragraph	Comment/Suggested Change/Rationale	Resolution	Reviewer Concurrence
General	CF	n/a	Conceptual Site Suitability - Interest in the Bear Creek Valley, Site 7c location is based on several factors presented in the EMDF D5 RI/FS Report. One of the most important issues is the location of the groundwater table beneath the site: a. " . .. the water table is assumed to remain below the geologic buffer material at all locations (i .e. the thickness of the unsaturated buffer zone is everywhere ≥ 15 ft) ... " (RI/FS, p. 7-7). b. "More importantly, leaks ... must penetrate at least 15 ft or more of low permeability clay liner and geobuffer materials and native low permeability materials in the unsaturated zone before reaching the water table… " (RI/FS, p. 6-42). 1. "Because these sites are not constructed over stream valleys, an additional key assumption is that the final design will not require permanent underdrains beneath the waste to maintain sufficient buffer zone thickness." (RI/FS, p. 7-7). These concepts are presented graphically in Figure 6-7 (RI/FS, p. 6-32) and in Figure 8 of the Proposed Plan (p. 11 - see below)	The Proposed Plan contains the agreed upon language and figures developed by the FFA parties through the dispute resolution process. The engineering design has not been developed and will consider both current groundwater elevations and the expected change as recharge is cut off during landfill construction. As stated in Section 6.3.3: “Groundwater elevations determined from depth-to-water measurements are used to: (1) estimate the groundwater surface elevations across the entire footprint of EMDF prior to construction, and (2) provide information to develop the engineering design.” Data obtained during this investigation supported locating the disposal facility at this location.	

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			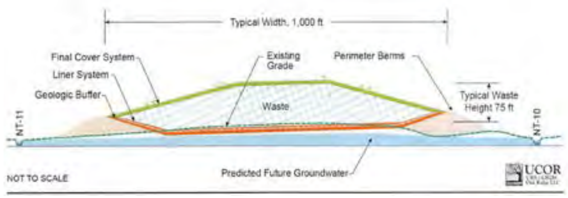 The TM-1 Report, Section 8 - VALIDATION OF KEY ASSUMPTIONS states: "Groundwater levels measured in both deep and shallow piezometers during the Phase I characterization confirmed that prior to landfill construction, groundwater discharges as seeps in the valleys and drainages, and mirroring topography, is higher beneath knolls/ridges with the elevation beneath the largest knoll in the site lower below ground surface than predicted in the RI/FS. Groundwater levels show responses to rainfall events and downward gradients beneath the knoll, indicating minor recharge is occurring on the site." "Results of the Phase 1 site characterization validate the key assumptions regarding the hydrogeologic setting (groundwater and surface water conditions) at the site. The results confirm the acceptability of the CBCV site for a new, low-level waste landfill and support final site selection." <u>EPA Comment</u>: TM-1, Section 6.3 FINDINGS (p. 6-7): The report suggests that groundwater level is highly variable and elevational data from Table 6.3 appears to indicate the water table may be higher than predicted by the original site conceptual model (i.e.,~ 15 ft beneath the ground surface). For purposes of informing the public, the DOE should modify "Figure 8" in the Proposed Plan to reflect expected consistency with TM-1 data and state that modifications to the original site conceptual model based on the additional collection of site characterization data (i.e., TM-1 and TM-2) may		

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			require design changes that will be conveyed (should Site 7c be selected) in the Remedial Design Report/Remedial Action Workplan. The conclusions conveyed in TM-1 (above) seem to be overly optimistic and do not mention the need to modify the original conceptual model that the groundwater table surface will be ≥ 15 ft beneath the ground surface.		
1	CF	6.3.4	Section 6.3.4 explains the procedure that was used to extrapolate water levels at the piezometers for the earlier part of the wet season, before the piezometers were installed. The procedure seems reasonable. The Section 6.3 .4 text states "Groundwater elevation data for an appropriate BCV well were matched to the groundwater elevation data for a given EMDF well to ·help predict the wet season data for that well to date, during this calendar year." There is no means to independently evaluate the degree to which the selected wells in other parts of BCV are a good match for the EMDF. There should be documentation in the Tech Memo that shows the relevant data from the selected wells that were considered to demonstrate a reasonable match to the EMDF wells. Graphical water levels from each well in other parts of BCV that were matched with each EMDF well need to be included, along with some indication of the geographic, topographic, and stratigraphic location of the other BCV wells, for comparison to the associated EMDF wells.	For TM-1, use of correlating wells estimated the portion of the wet season that was missed prior to installation of the EMDF piezometers. However, a year of data is provided in TM-2, capturing the complete wet season at these locations and making correlations with other Bear Creek Valley wells less meaningful than the actual piezometer measurements.	
2	CF	Table 6.4	Table 6.4 presents "Vertical gradient direction, Spring 2018" values for each of the eight shallower/deeper well pairs. There is obviously some basis for developing an overall average based on the limited-duration data set. The means of reaching the overall Table 6.4 conclusion needs to be described in the Tech Memo. For the GW-992R/GW-993 and GW-982/GW-983 well pairs, Table 6.4 indicates there is no overall vertical gradient direction. A series of spot checks of Figure 6.6 and Figure 6.9 (figures showing the water levels for these well pairs) indicates that at numerous times over the early-March to early May period of water level monitoring of this well, the	TM-2 provides the full year of data, including hydrographs. Additional evaluation is provided in the text and the table (now Table 7.3) was revised to include wet and dry seasons hydraulic gradients and directions.	

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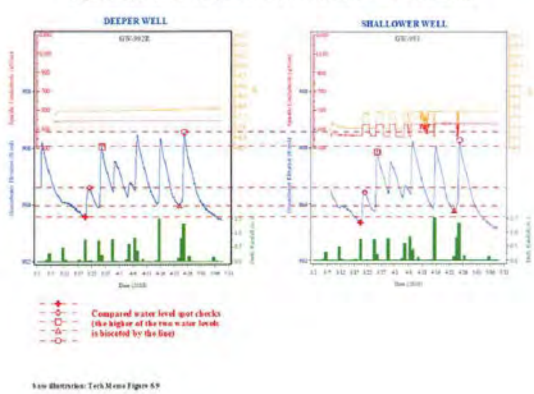
			deeper of the GW- 992R/GW-993 wells had a higher water level than the shallower well (see Figure 1 below) while at GW- 982 and GW-983, the shallower well typically had the higher water level (see Figure 2 below). These water-level relationships are consistent with the overall conceptual model of groundwater flow (downward vertical gradient component in upslope recharge areas; upward vertical component in downgradient discharge areas). The conclusions reached should be better explained within the context of the seasonality of changing water levels in these wells. As presented the conclusions are misleading. Correct to reflect the varying nature of the wells by adding another column (or two) indicating a different time and a different hydraulic gradient. **Figure 1. Spot Check Comparisons of GW-992R and GW-993 Water Levels** 		
3	CF	Table 7.1	Table 7 .1 presents geotechnical data with individual samples from a boring identified as "SS-1," "SS-5," et cetera. Presumably the numbers refer to sample depth. If that interpretation is correct, the table footnotes should indicate the numbers refer to sample depths.	The sample numbers and depths are provided on the borehole logs in Appendix B. These are sequential sample numbers and do not correlate with sample depths so no change would be needed.	
4	CF	Table 7.1	Table 7.1 shows that at individual borings, numerous samples were collected but other than the moisture content of individual samples, most of the samples were not tested for texture or other	Borehole logs and soil samples were reviewed by the design engineer to select samples representative of the various subsurface conditions. Geotechnical laboratory tests were then assigned to	

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			geotechnical indices. The Section 7.1 text should include discussion of the rationale that went into selection of specific samples at each boring for the more comprehensive geotechnical testing.	representative samples by the design engineer. Moisture contents were the most numerous tests because these are relatively inexpensive and provide information on the change in moisture content with depth. This information is important to support design considerations such as development of engineering properties, settlement analyses, and recommendations for material reuse such as compaction characteristics for the geologic buffer or structural fill. Rationale for sample selection will be provided in the Phase 2 report for the samples collected during Phase 2.	