STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Remediation - Oak Ridge
761 Emory Valley Road
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Mr. Roger Petrie
Oak Ridge Office of Environmental Management
U.S. Department of Energy
Post Office Box 2001
Oak Ridge, Tennessee 37831

TDEC Comment Letter for Bear Creek Valley Mercury Sources Remedial Site Evaluation Sampling and Analysis Plan (SAP) Oak Ridge, Tennessee (DOE/OR/01-2958&D1)

Dear Mr. Petrie

The Tennessee Department of Environment and Conservation (TDEC), Division of Remediation-Oak Ridge Office, received the above referenced submittal on October 10, 2023. The document has been reviewed pursuant to the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). The following comments are relevant to the review of this document:

General Comments

1. Section 1 or Section 2 should introduce the point that this Remedial Site Evaluation (RSE) is driven by the Environmental Management Disposal Facility (EMDF) Record of Decision (ROD). This important context is not presented until Section 7.1. As described in the EMDF ROD, the effective implementation of this RSE is required to identify mercury methylation areas in Bear Creek which currently prevent the creek from being in compliance with applicable water quality standards.

2. Please clarify the objective. Section 1.1 states the objective "is to evaluate potential sources of mercury and methylmercury within the Bear Creek Valley (BCV) Watershed." However, the EMDF ROD states the RSE will "evaluate mercury methylation in Bear Creek..." These objectives do not directly align as the first implies finding any mercury within the watershed while the second implies evaluating only those sources contributing to the water quality of Bear Creek. The

proposed sampling aligns with the objective stated in the ROD (e.g., only sampling to a depth of 0.5 ft. when there is a potential for mercury at greater soil depths), not the watershed-wide objective stated in this SAP. The FFA parties should discuss and be in agreement on the objective of this effort.

3. The sampling plan seems to ignore bank soils along the sides of the stream channel that are not within the top 0"-6". Sampling bank soils midway between the stream bottom and the floodplain top may shed some light on the potential for mercury/methylmercury to be migrating/leaching out of the soils and into the stream. Additionally, sampling of pore water within the shallow soils or mid-stream bank should be considered as part of a full effort to characterize mercury within the watershed.

4. While there are sampling locations identified in upper Bear Creek that are both co-located and independent of beaver dams, that does not appear to be the case in lower Bear Creek. Consider adding some sampling locations in lower Bear Creek that are not co-located with beaver dams. This was discussed as part of the SAP Data Quality Objectives (DQO) meeting.

Specific Comments

1. **Page 3, Section 2.2.1, last sentence.** Revise the text to indicate when the BCV Phase I ROD addendum is projected to be submitted.

2. **Page 7, second paragraph, last sentence.** Data provided in Table 4.13 of the 2023 Remediation Effectiveness Report (RER) do not align with this statement. Even the averages often exceed the fish tissue criterion. Delete this sentence and instead provide the range of mercury levels in rock bass and redbreast sunfish sampled in Bear Creek.

3. **Page 12, Section 3.4, last bullet and Page 27, Section 7.2.** As appropriate, revise the text to update the sampling and data evaluation/reporting schedules.

4. **Page 15, Section 4.2, first bullet & sub-bullets.** Revise the text to define upper and lower. Based on Figure 4.2, it appears these intervals are 0 to 3 inches and 3-6 inches (0 to 0.25 ft and 0.25 to 0.5 ft, respectively).

5. **Page 22, Section 5.3, second paragraph, last sentence.** Revise the text as follows: "For surface water samples collected, analytical results will be compared with Ambient Water Quality Criteria (AWQC)." The text encourages confusion by implying AWQC are not required screening levels when they will almost certainly be

Applicable or Relevant & Appropriate Requirements (ARARs) in the forthcoming BCV ROD.

6. **Page A-6 [DQO Meeting Minutes], Transect Sampling (Slide 38), Bullet 3.** As stated in a follow-up note in the meeting minutes, TDEC recommends including hyporheic zone/shallow groundwater sampling in the RSE scope. There are two reasons for this recommendation.

   First, it is important to develop a more complete conceptual site model of mercury in Bear Creek to identify sources of mercury or methylmercury. U.S. Department of Energy (DOE) research in a similar setting on the ORR finds that although the observed increase in methylmercury concentration and flux from upstream to downstream is related to instream methylation by periphyton and other biological activity (Watson, et al., 2016), this is not the only source of mercury and methylation in the stream. The researchers hypothesize methylmercury may be produced in hyporheic zones where anoxic, reducing geochemical environments may be conducive to methylation, resulting in dissolved methylmercury concentrations in groundwater up to 10x greater than in surface water (Watson et al. 2016). More recent research supports that hypothesis, finding "additional sources of dissolved mercury inputs to East Fork Poplar Creek (EFPC) at baseflow during this study predominantly arise from the hyporheic zone," with up to 1/3 of downstream mercury discharging from hyporheic zone shallow groundwater and riparian inputs (Demers et al. 2018). The shallow/hyporheic zone groundwater "shows a strong, positive correlation between dissolved Mercury (Hg) and dissolved Methylmercury (MeHg)," whereas, historically, there has been a poor correlation between the two in surface water (Watson et al. 2016).

   Second, the purpose of the mercury management strategy in the EMDF ROD that drives this RSE is to support the potential need to offset future mercury discharges from EMDF. Failure to identify and remove or treat sources of mercury or methylmercury to offset EMDF discharges carries a risk the parties will be unable to develop the substantive equivalents to load allocations and waste load allocations, as envisioned in the EMDF ROD. This has the potential to impact TDEC's ability to approve mercury discharge limits for mercury that meet DOE's waste disposal and wastewater treatment needs while preventing discharges that do not "cause or contribute" to further violation of the methylmercury standard.

   Demers, J.D., Blum, J.D., Brooks, S.C., Donovan, P.M., Riscassi, A.L., Miller, C.L., Zheng, W., Gu, B., 2018, *Hg isotopes reveal in-stream processing and legacy inputs in East Fork Poplar Creek, Oak Ridge, Tennessee, USA*, Environmental Science: Processes & Impacts, 20(4), p. 686-707; https://pubs.rsc.org/en/content/articlelanding/2018/em/c7em00538e.

Watson, D., et al., 2016, *Evaluation of Lower East Fork Poplar Creek Mercury Sources*, ORNL/TM-2016/134; https://info.ornl.gov/sites/publications/files/Pub62121.pdf.

TDEC looks forward to working with DOE to revise the subject document in order to gain FFA approval of this critical project plan. Review of this document has been expedited and meets the review cycle protocol of 90 days. Questions or comments concerning the contents of this letter should be directed to Cody Juneau at the above address or by phone at (865) 314-2328.

Sincerely

Randy C. Young
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