



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

March 5, 2016

Ms. Tracey Duncan
Federal Facility Agreement Manager
United States Department of Energy
Portsmouth/Paducah Project Site Office
5501 Hobbs Road
Kevil, KY 42053

RE: U.S. EPA Region 4 Comments on: **Addendum to the Final Characterization Report for Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant (DOE/LX/07-1288&D2/A1), Paducah, Kentucky**, Issued December 11, 2016 (PPPO-02-3218324-16B), EPA ID KY8890008982, McCracken County, KY

Dear Ms. Duncan,

The U. S. Environmental Protection Agency (EPA) Region 4 has reviewed Appendix H, the *Addendum to the Final Characterization Report* for Solid Waste Management Units 211-A (C-720- TCE Spill Site Northeast) and 211-B (C-720 TCE Spill Site Southeast) volatile organic compound sources (VOCs) for the Southwest Plume at the Paducah Gaseous Diffusion Plant. This report documents the results of Regional Gravel Aquifer (RGA) sampling in the area of the C-720 Maintenance and Stores Building. Comments generated as a result of this review are provided as an enclosure to this letter in support of discussion and document revision. Overall, EPA's review indicates potentially significant problems with the quality and representativeness of the data collected due to a sample collection protocol deviation by DOE that is reasonably expected to result in loss of significant amounts of VOCs from these samples in the field. As a consequence, the usability of the Appendix H data to assess the magnitude of the impact of SWMUs 211-A and 211-B to dissolved TCE levels in the RGA, and to distinguish between remedial alternatives for the west and east areas of the 211-A area of contamination, is uncertain.

If you have any questions about this correspondence, please do not hesitate to contact me at (404) 562-8547 or via electronic mail at corkran.julie@epa.gov.

Sincerely,

A handwritten signature in blue ink that reads "Julie L. Corkran".

Julie L. Corkran, Ph.D.
Federal Facility Agreement Manager
Superfund Division

Enclosure

Electronic copy with Enclosure:

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United States Environmental Protection Agency (EPA)
Region 4 Comments on:

**Addendum to the Final Characterization Report for
Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources
for the
Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant,
(DOE/LX/07-1288&D2/A1), Paducah, Kentucky
EPA ID KY8890008982, McCracken County, KY**

General Comments

Comments submitted by: Eva Davis, Ph.D., USEPA National Risk Management Research Laboratory, Ground Water and Ecosystems Restoration Division, Ada, OK.

1. Deviation from the VOC sampling protocol.

DOE deviated from the VOC sampling protocol for VOCs, resulting in the generation of volatile organic compound (VOC) data of unknown quality, representativeness, and usability. Section H.4, in the sixth paragraph, states:

“In a few cases where the entrained sediment load was greatest, the discharged groundwater was first collected in a precleaned, stainless steel cup and then poured into the sample vials. Prior to sample collection, field parameters were measured in a cup sample with a Hydrolab water quality meter.”

During the time that the sample sat in the stainless steel cup, and while it was subsequently poured into the sample vial, significant losses of all the volatile organic compounds (VOC) in the groundwater is likely to have occurred. Trichloroethene (TCE) has an evaporation half-life of approximately 21 minutes at 25°C (Dilling, W. L., N. B. Tefertiller, and G. J. Kallos, Evaporation Rates and Reactivities of Methylene Chloride, Chloroform, 1,1,1-Trichloroethane, Trichloroethylene, Tetrachloroethylene, and Other Chlorinated Compounds in Dilute Aqueous Solutions, Environmental Science & Technology, 9(9):833-838, 1975). Other VOCs of interest here, 1,1-dichloroethene (1,1-DCE), *cis*-1,2-dichloroethene (*cis*-1,2-DCE), *trans*-1,2-dichloroethene (*trans*-1,2-DCE) and vinyl chloride, all have similar evaporation half-lives. Pouring water from one container to another will aerate the water and allow VOCs to vaporize much like an air stripper. Thus, it is very likely that at least half of the VOCs contained in the groundwater were lost by the time the water reached the sample vial.

Further, it is not clear from the report how many samples were collected in this manner, as the report only states, “...where the entrained sediment load was greatest”. The table in the Attachment (*Field Measurements and Barometric Pressure*) shows that 24 of the 42 samples maxed out the turbidity instrument. Without knowing which samples were handled according to the sampling protocol deviation, the data presented in the report cannot be considered

representative of contaminant conditions in the RGA or usable for remedial alternative discussions.

- Revise Section H.4 (*Investigation*) to document whether the sample collection protocol was approved by EPA and KY for this investigation effort prior to field implementation.
- Revise Section H.7 (*Uncertainty Evaluation*) of the report to describe scope and magnitude of the sample collection protocol deviation on the representativeness and usability of the VOC data.
- Revise the report to include an Attachment that provides the field notes documenting which samples were handled according to the sampling protocol deviation. This will allow the reviewers to evaluate which and how many of the sample results should be disregarded.
- Revise Section H.6 (*Data Assessment and Verification*) and also Table H.2 (*Volatile Organic Compound Analyses*) to include the appropriate data qualifiers to reflect which samples are impacted by the sampling protocol deviation.
- Revise Section H.9 (*Conclusions*) to incorporate the uncertainty analysis into DOE's application of the decision rules.

2. Variability in general water quality parameter data within the same borehole.

Review of the Attachment, *Field Measurements and Barometric Pressure*, suggests that general water quality data collected during the SWMUs 211-A and 211-B characterization exercise may be compromised.

- Half of the turbidity readings appear to be reported at the upper limit of the instrument (5999) – the lowest reading listed is 200 NTU
- The reported temperatures can vary as much as 15C over 5 ft. (for example, 211-B-021).
- DO also is shown to vary significantly over 5 ft intervals, particularly in 211-A-048 (unless the datum reported at 75 ft. is a typographical error).
- A couple of the ORPs are out of line with the others.

Differences between borings can be expected for each of these parameters, even when they are in the same aquifer, but the above-noted differences seem surprising within the same borehole, the same aquifer, and only 5 ft apart.

- Revise Section H.5 (*Data Evaluation*) of the report to evaluate and discuss the variability in each of the general water quality parameters reported in the Attachment.
- Revise Section H. 7 (*Uncertainty Evaluation*) of the report to discuss the likely reason(s) for the observed variability, and whether/how the variability in the groundwater water quality parameter data impacts DOE's assessment of the representatives of the VOC data presented in the report.

General Comments

Comments submitted by: TechLaw, EPA Region 4 ROC Contractor

3. Uncertainty in the direction of groundwater flow at SWMUs 211-A and 211-B.

The decision rules and guidelines for evaluating the groundwater results include a comparison of the trichloroethylene (TCE) concentrations detected in groundwater downgradient of the source area(s) (i.e., 211-A and 211-B) versus the TCE concentrations detected in groundwater upgradient of the source area(s). As such, the groundwater flow direction(s) at SWMU 211-A and 211-B is assumed to be well understood and certain. However, based on the information presented in Appendix H, there is uncertainty in the direction of groundwater flow at Solid Waste Management Units (SWMUS) 211-A and 211-B.

For example, Section H.2., *Conceptual Site Models*, indicates the general groundwater flow is northward in the areas of SWMUs 211-A and 211-B. The upgradient side is anticipated to be the south side of SWMUs 211-A and 211-B: the downgradient side is anticipated to be the north side of SWMUs 211-A and 211-B. Additionally, as stated in the Addendum to the Remedial Design Work Plan (RDWP) (DOE 2015) five locations around SWMU 211-A and one location within SWMU 211-B were selected for sampling based on perceived upgradient and downgradient relationships. Furthermore, the text in Section H.8.1, *TCE Analyses* states the relationships are assigned with the assumption that groundwater flows northerly, consistent with the broader site trends. As such, the basis of the current interpretation of the groundwater flow direction is “anticipated”, “perceived” and “assumed” and therefore, is uncertain.

The *Appendix H, Addendum*, does not present a potentiometric surface/groundwater elevation flow map that (i) supports the sampling locations chosen were adequate for determining TCE concentrations in groundwater upgradient and/or downgradient of the source area(s) or (ii) supports data interpretation for consideration of remedial alternatives.

- Revise the report to present a potentiometric surface/groundwater elevation flow map and narrative explanation that supports that the sampling locations chosen were adequate for determining TCE concentrations in groundwater upgradient and/or downgradient of the source area(s) and for use in evaluating the proposed remedial alternatives for 211-A and 211-B. (This information may be available in the *DOE 2015 Sampling and Analysis Plan Addendum* for incorporation into this report.)

4. The groundwater results should be considered as screening level data only

The sampling and analysis plan identified the use of direct push technology (DPT) to collect the groundwater samples, unless proven ineffective. A small-diameter, hollow-stem auger (HSA) system was the back-up sampling approach. Based on the information presented in Section H.3, *Groundwater Sampling Strategy*, and Section H.4., *Investigation*, the sampling efforts for the SWMU 4 investigation previously had documented that DPT was ineffective for sampling groundwater through the regional gravel aquifer (RGA) and therefore, the SWMUs 211-A and 211-B investigation (as well as the SWMU 4 investigation) used HSAs to access the planned sample depths. The text in Section H.7, *Uncertainty Analysis*, states DPT was the preferred

drilling system primarily due to the expectation that the drilling method would minimally disturb the RGA at the point of sampling. However, based on the methods utilized for groundwater sampling, the following issues impacting the quality of groundwater results were identified:

- drilling to sample depth and collecting the groundwater sample through the HAS;
- targeted purge volume of three times the flooded volume of the augers was not met;
- potentially agitating of the water column the depth of the pump/packer setting was adjusted during sampling based on field experience to minimize the entrained sediment load of the purge water and minimize the effective flooded volume of the augers; and
- high entrained sediment content prevented use of a flow cell for field measurements: the measurements were made in a cup sample, potentially biasing field measurements.

Therefore, it appears that the method of groundwater sampling has disturbed the formation and impacted the quality of the results. As such, although data verification, validation, and assessment were performed for the project data, the groundwater results should be considered as screening level data only for decision making purposes.

- Revise Section H.7, *Uncertainty Evaluation*, to reflect the bulleted concerns and state that *“although data verification, validation, and assessment were performed for the project data, the groundwater results should be considered as screening level data only for decision making purposes.”*

5. IDW not addressed in the report

The Appendix H Addendum does not discuss the disposition of the investigation derived wastes (IDW) generated during the field effort.

- Text is needed in Appendix H to address IDW management from this investigation.

6. Assumptions regarding groundwater flow direction and decision rule application

Table H.1. SWMUs 211-A and 211-B Sample Borings indicates the location of sample boring 211-A-045 is upgradient of the SWMU 211-A source area. However, based on the flow direction and boring locations depicted in Figure H.1., *Sample Boring Locations*, the location of boring 211-A-045 appears to be cross-gradient of the SWMU 211-A source area. Additionally, the TCE detection of 260 micrograms per liter ($\mu\text{g/L}$) at a depth of 95-feet in upgradient well 211-A-048, was not considered in the groundwater decision rules evaluation. As such, it is not certain whether the characterization results for well 211-A-048 would impact the results of the decision rule evaluations.

- Additional data and information are needed in the report to address and manage this uncertainty.