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November 1, 2016

Ms. Tracey Duncan
US Department of Energy
Portsmouth/Paducah Project Site Office
5501 Hobbs Road
Paducah, Kentucky 42053

RE: Submittal of Comments to the Addendum to the Remedial Investigation Report for the Burial Grounds Operable Unit SWMU 4 (DOE/LX/07-0030&D2/R1/A1)
Paducah Site
Paducah, McCracken County, Kentucky
#KY8-890-008-982

Ms. Duncan:

The Division of Waste Management (Division) has completed its review of the *Addendum to the Remedial Investigation Report for the Burial Grounds Operable Unit SWMU 4*, dated August 2, 2016. Please address the attached comments in a revised version of the document.

If you have any questions or require additional information, please contact Gaye Brewer at (270) 898-8468, or e-mail at gaye.brewer@ky.gov.

Sincerely,

April J. Webb, P.E., Manager
Hazardous Waste Branch

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DWM File: #1110-C; Graybar: AIN20160006 (BGOU RI Report SWMU 4 Addendum)

**Kentucky Division of Waste Management Comments pertaining to the
Addendum to the Remedial Investigation Report for the Burial Grounds Operable Unit
Solid Waste Management Unit 4
Paducah Site, Paducah, Kentucky,
DOE/LX/07-0030&D2/RI/A1
October 31, 2016**

Specific Comments:

1. Executive Summary, Page ES1-2:

Please include a brief discussion of the five iterative investigation phases prior to explaining the data gaps. A brief explanation will provide the context framework for the SWMU 4 RI Addendum.

2. Executive Summary, Data Gap 7, Page ES-5:

Based on the boring logs in Appendix A, depth of the base of the waste ranged from 5 to 20 plus feet. Please revise the second sentence that currently states “waste ranges from 8 to 18 ft bgs.”

3. Executive Summary, Data Gap 7, Page ES-5:

Based on the water level measurements in Figure 3.1 and test pit information, the waste is submerged in water *at least* seasonally and probably all of the time for some of the pits. Please revise the statement.

4. Executive Summary, Data Gap 8, Page ES-5 and Section 7.7.7, Page 7-5:

Please expand on the lines of evidence discussion that “there is no evidence that supports the pipeline bedding [material] providing a preferred pathway for contamination at SWMU 4.” Please provide a description of the soil samples utilized and how the conclusion was derived.

5. Executive Summary, Data Gap #9, Page ES-5 and Section 3.2 Hydrogeologic Interpretation, Page 3-2:

Three Slug Tests were conducted at each screened interval from all four MWs (MW-548 to MW-551) yielded results “typically less than 50 ft/day ...” is an inaccurate statement when the overall average was ~16 ft/day and that 50 ft/day was the highest result observed out of 30 slug tests. These slug test results are in sharp contrast (orders of magnitude) different than the value utilized in the PGDP site wide groundwater model at SWMU 4 of 1,046.5 ft/day. Section 3.2 provides the results from an aquifer test conducted a few hundred feet to the north of SWMU 4 where hydraulic conductivities ranged from 53 to 107 ft/day. Despite the C-404 aquifer test to the north (k=53 to 107 ft/day) and the 30 slug tests from

four monitoring wells at SWMU 4 ($k=6$ to 50 ft/day), Section 3.2 concludes “[d]ue to the differences in hydraulic conductivity from the SWMU 4 area to the C-404 area, essentially there is a boundary between the two units that behaves similarly to a “no-flow/low flow” boundary condition. Due to this, groundwater flow directions would be expected to be normal, or perpendicular, to the boundary (giving rise to northward groundwater flow).” Based on the 30 slug test results and the C-404 aquifer test, uncertainty with Data Gap 9 [Hydraulic conductivity of the RGA under SWMU 4, as a measure of groundwater velocity and flow direction, is uncertain.] still remains. In this report the unexpected low hydraulic conductivities that were observed (e.g. 30 slug test results and aquifer test from C-404) are all assumed to be atypical of RGA conditions. What if those low conductivity values are correct? To adequately evaluate options in the FS a wider range of uncertainty surrounding hydraulic conductivity, as a measure of groundwater velocity and flow direction, will need to be considered.

6. Executive Summary, Conclusions, Page ES-8, 3rd Bullet:

This bullet references “the greatest soil concentration of TCE was from a sample collected at a depth interval of 25 to 30 feet beneath Burial Cell 4,” but does not reference the boring or concentration. Please add this information to the bullet.

7. Section 2.1.2, Page 2-5, Middle of the Page:

Boring logs from the Phase II show the white clay cap is absent in several borings. Please include a discussion that reflects that information, draw generalizations regarding where and why the cap is absent (e.g. across the southern portion of the SWMU and in borings 004-14P2, 004-007P2 and 004-004P2), and the effect the clay cap had on the soil vapor sampling.

8. Section 2.3, Pages 2-9 through 2-10:

Although assumptions and deviations that occurred were captured in a revised SAP during Phases I through III, it would be insightful to discuss what they were in this section of the RI addendum. Please revise this section or Table 2.1 to reflect and incorporate these changes.

9. Section 2.4.1 and Table 2.2, Page 2-12:

Please revise Table 2.2 to break out lab-based samples from field-screened samples to be able to better assess and represent the adequacy of QC sample collection for field blanks and equipment rinse samples. The frequency for equipment rinses and field blanks is approximately 1 in 30 (as depicted) whereas the target frequency was 1 in 20.

10. Section 3.2, Page 3-7 Parenthetical Reference, Middle of the Paragraph:

What does the reference FPDP 2016 Draft refer to? There is no citation in the bibliography or further explanation, other than a connection with the PGDP sitewide groundwater model. Please clarify.

11. Tables 4.6 through 4.11, Pages 4-23 through 4-57:

The inclusion of Phase 4 borings with no values in these tables is confusing. It is also confusing that on Table 4.6, 1,2-dimethylbenzene is ND at the depths of 60-65 and 65-120 feet for borings 004-002P4, 004-003P4 and 004-009P4. This is the only chemical that references the 60-65 and 65-120 foot depths on any of these tables. Phase 4 borings should have soil samples at the top and bottom of each boring. Please consider a more informative table description that identifies the Phases being depicted along with the media. The only indication the reader is looking at soil or water values is from the units, which are hidden in the centers of the entire length of the table and are easily overlooked. Please clarify.

12. Section 4.3, Page 4-62:

In the discussion of passive gas sampling, it is worth noting that the locations with detects in cell 4 and cell 3 did not show the white clay layer in adjacent borings. Consider adding this information to the text.

13. Table 4.12, Table 4.13 and Table 4.14, Pages 4-68, 70, 71 and 73:

Uranium metal and the uranium isotopes are not listed in tables 4.12 and 4.14. Uranium metal is not listed in Table 4.13. Please revise as appropriate.

14. Section 6.2.4.3, Page 6-11 First Bullet:

There appears to be some duplication in this list. Please revise as appropriate.

15. Section 6.2.4.3, Page 6-11 Second Bullet:

Please replace the word “Systematic” with the word “Systemic”.

16. Section 7.1.1, Page 7-5, Data Gap 10 2nd Paragraph:

Please consider revising the last sentence of the paragraph since the sentences preceding it discuss PCB exceedances of the industrial worker NAL (and AL) in surface soil. The sentence could be revised to something like “Total PAH was the only *other* organic detected above....”

17. Appendix A.2, Page A2-3:

Because the test pits provided a unique opportunity to view and characterize actual waste in SWMU 4, a more in depth description of the sampling and findings is needed. Please include a description of the excavation for each of the test pits, including such information as the depth waste was encountered, the depth water was encountered, whether the white clay cap was visible, types of waste encountered, the depth of the bottom of the waste, etc. Also include a discussion of the supplemental test pit sampling guidelines referenced in Dave Dollins’ February 2, 2016 e-mail, which were agreed on by the FFA parties. This includes the triggers for collecting samples and the agreed-to characterization activities.

18. Appendix A.2, Table A.2.1, Page A2-7:

Table A.2.1 is missing a title in one of the columns. Please revise.

19. Appendix A.2, Table A.2.1, Page A2-8:

Please include in the description of the liquid that was mistakenly emptied into the excavator bucket the fact that it was an unknown liquid.

20. Appendix A.2:

Please include Appendix A.2 in the printed portion of the document because it includes contamination characterization information that is not captured elsewhere in the document. It is not back-up data but is new information that should not be relegated to a disk, which can be overlooked and deemed supplemental information by a reader.

**Kentucky Risk Assessment Section Comments pertaining to the
Addendum to the Remedial Investigation Report for the Burial Grounds Operable Unit
Solid Waste Management Unit 4
Paducah Site, Paducah, Kentucky,
DOE/LX/07-0030&D2/RI/AI
September 21, 2016**

Specific Comments:

1. Table 4.3 Screening Values for Groundwater:

The Child Resident AL for chromium is listed as 3.24E-01 mg/L, which should be corrected to 6.24E+01 mg/L.

2. Section 4.4.4 Potential Trichloroethylene Dense Nonaqueous-Phase Liquid:

The estimated soil cleanup level (based on the cleanup level calculated for TCE sources near the C-720 building) is 0.075 mg/kg.

For comparison, the residential soil RSL for TCE = 0.94 mg/kg.

For comparison, the industrial soil RSL for TCE = 6.0 mg/kg.

For comparison, the soil screening level (based on the MCL) for TCE = 0.0018 mg/kg.

This is a comparison, no action is needed.

3. Section 6.1.5 Risk Screening Uncertainties:

It is stated that “the XRF data correlated better with the laboratory data for many constituents. This discrepancy provides an uncertainty.” The XRF data correlated better with the laboratory data than what? What discrepancy? Does this uncertainty likely lead to an overestimate or an underestimate of risk? Please clarify.

4. Tables 6.6, D.1, D2.1 and D2.2:

All tables list 15.6 mg/kg as the maximum detection or ½ maximum detection limit for cadmium. Based on the soil data set in Appendix B, this is incorrect. Please either explain or correct.

**Kentucky Radiation Health Branch Comments pertaining to the
Addendum to the Remedial Investigation Report for the Burial Grounds Operable Unit
Solid Waste Management Unit 4
Paducah Site, Paducah, Kentucky,
DOE/LX/07-0030&D2/RI/A1
October 27, 2016**

Specific Comments:

1. Page ES-3, "Data Gap 4", 1st Paragraph:

It is acknowledged in the document that Tc-99 is a migration risk, and that it was detected in soils at concentrations exceeding the screening value for RGA protection. It is then stated that since there have been no "Tc-99-containing source materials" found, therefore Tc-99 is not a Principle Threat Waste (PTW).

The first potential flaw in that statement is that, per *A Guide to Principal Threat and Low Level Threat Wastes (page 2)*, "contaminated soil and debris" is a source material. It is understood that Tc-99 is highly mobile and moderately toxic. Soil data with Tc-99 contamination is present, and it is not expected that additional soil contamination (of an unknown activity concentration) exists.

The second potential flaw in that statement is that, even if significantly Tc-99-contaminated materials or intact Tc-99 containers (for example) were found, an absence of evidence is not evidence of absence. There is ample evidence of a groundwater plume, to which SWMU 4 is a contributor, as well as the expectation that Tc-99-contaminated magnesium fluoride sludge may exist in the SWMU (the original mass and how much of that has been made available for transport being unknowns). All the available evidence makes a far better case than is captured in this section for considering Tc-99 to be a potential PTW at this SWMU.

That said, it is important to note the relatively low concentrations of groundwater contamination were observed. Tc-99 is present and even if considered a potential PTW, the general rule from EPA guidance is that at 10^{-3} risk treatment should be performed. Even using current drinking water methodologies, this level of risk is not approached from Tc-99 contamination in groundwater moving away from the SWMU. So while it may be prudent to consider Tc-99 a potential PTW, this does not in any way place a requirement on this project for mandatory treatment of this waste material.

Please revise the document to include Tc-99 as potential PTW, or provide additional justification for not including Tc-99 as potential PTW.

2. **Page ES-3, "Data Gap 4", 3rd and 4th Paragraphs:**

The document states that uranium source material records, such as those in SWMUs 2 and 3, were not observed during the investigation at SMWU 4, but also states that potential uranium source materials were identified. It also makes clear that uranium is of low mobility and low toxicity. This appears to be intended to show a clear difference between this SWMU and other SWMUs where buried uranium is considered PTW, but does not sufficiently make that case. Please revise the document to better describe the differences between the uranium sources that are potentially contained at this SWMU and the uranium sources deemed PTW (while having the same toxicity and mobility) at other SWMUs in order to justify the position that uranium is not a PTW at this SWMU.

Additionally, the document notes that extremely high concentrations of uranium contamination were found in cells 2 and 4. This is accurate, however, the conclusion that finding it in only two places means that it will only be found in those two places is flawed. Due to the lack of burial records, there is no way to correlate the observed uranium waste with what was expected, so there would be no way to logically conclude that uranium waste is not present outside of the locations it was found. The intent was to locate the test pits slightly outside of suspected disposal areas (Figure 2.3), so that waste could be approached laterally without excavating directly in the burial areas. The reality was that an unexpected amount of waste was present in the chosen test pit locations. It is clear that there is a still great deal of uncertainty in the amount and location of any uranium wastes. Please revise the last sentence in the 3rd paragraph to remove "and, therefore, narrow the areas in which uranium PTW could be present."

- - End of Kentucky Comments - -