



December 19, 2023

ENVIRONMENTAL COMPLIANCE &

DEC 19 2023

Ms. Avery G. Hammett, SRS Remedial Project Manager
Remediation and Deactivation & Decommissioning Division
U. S. Department of Energy
Savannah River Operations Office
Post Office Box A
Aiken, South Carolina 29802

AREA COMPLETION PROJECTS

Re: R-Area Groundwater (NBN) Biennial Effectiveness Monitoring Report in Support of R-Area Operable Unit (U) – January 2021 through December 2022, SEMS Number: 95 (SRNS-RP-2023-00758, Revision 0, August 2023) received September 5, 2023.

Dear Ms. Hammett:

The Department has completed its review of the above referenced document pursuant to the Savannah River Site Federal Facility Agreement. The attached comments were generated as a result of this review. These comments must be addressed prior to final approval of the above referenced document. As specified in Section XXII, Review/Comment on Documents, the appropriate technical staff will be available to participate in a joint DOE/EPA/DHEC comment resolution meeting to discuss these comments, if necessary.

To schedule a meeting to resolve the attached comments or to obtain further information, please contact me at (803) 898-4331.

Sincerely,

Susan B. Fulmer

Digitally signed by Susan B.
Fulmer
Date: 2023.12.19 12:42:24 -05'00'

Susan B. Fulmer, P.G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation, Revitalization
Bureau of Land and Waste Management

cc: C. L. Bergren, SRNS-ACP (Signed Original)
Travis Fuss, Aiken Environmental Affairs Office (via email)
Jon Richards, EPA Region IV
Heather Cathcart, BLWM

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General Comments

1. Throughout the document, numerous errors and inconsistencies have been noted, and therefore, impacted the Department's decisions on the recommendations provided by the Project Team. Due to the number of errors, the Department cannot determine if reducing the sampling frequency as recommended in the document is the correct decision at this time. The following specific comments include examples of errors noted during the Department's review and should be addressed in the revised document. However, please note that this is not a comprehensive list of all errors in the document, and a critical peer review of the content of the document should be conducted.
2. Based on the information presented in the document, the Department does not agree with the recommendation to reduce the monitoring frequency to biennial due to increasing TCE concentrations at plume definition well RAG008B. The 2011 EMP requires that RCOC concentrations are stable or decreasing before reducing the sampling frequency to biennial. As stated in the document and discussed in the Department's General Comment 3, TCE concentrations at RAG008B have been increasing since 2010. The TCE concentration at RAG008B was 24.2 µg/L in 2022, which is nearly three times the historical maximum concentration at this well based on the time series plot. Continued annual monitoring of the VOC plume is required to ensure the data quality objectives for MNA continue to be met per the 2011 EMP.
3. The document states that the Eastern VOC plume is bounded vertically and that downward migration of TCE is not occurring at RAG008 based on TCE results below detection limits at RAG008BL. The Department agrees that the VOC plume appears to be vertically defined, but there does appear to be downward migration of TCE between TZ well RAG008DL and LAZ well RAG008B. In 2010, TCE concentrations at RAG008DL and RAG008B were 22.5 µg/L and 7.1 µg/L, respectively. In 2022, TCE concentrations in the two wells have essentially flipped; 2022 concentrations were 7.16 µg/L at RAG008DL and 24.2 µg/L at RAG008B. The decreasing TCE trend at RAG008DL is more attributable to downward migration of the plume rather than natural attenuation. Groundwater monitoring should continue on an annual schedule to ensure that vertical migration of TCE does not continue to deeper aquifers, as required by the 2011 EMP.
4. The Department does not agree that the elevated TCE concentrations and increasing trends at RAG008B are attributable to plume migration from the R-Reactor Building as stated in Section 4.1.1. Based on the information presented in the document, it is more likely that multiple former source areas existed for TCE, including a source area closer to R-Reactor, and a separate source area closer to the RAG008 well cluster.

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This is supported by the historical lack of TCE detections at plume definition well RAG006B, which is located downgradient from R-Reactor and upgradient from RAG008B. RAG006B has been either non-detect or below 2 µg/L for the entire time that RAG008B has been increasing in TCE concentrations. If the increasing/elevated TCE concentrations in RAG008B were caused by plume migration from a source area near R-Reactor, this would have likely resulted in increasing/elevated concentrations at RAG006B prior to being observed in RAG008B. Additionally, if plume migration from R-Reactor to RAG008B is suspected, then DOE should evaluate whether any changes to the monitoring network are needed to ensure the objectives of the MNA remedy continue to be met.

Specific Comments

1. Table of Contents, page iii. The section titles for Section 4.0, Reporting, and Section 5.0, Summary and Recommendations, do not match the formatting used for other sections in the table of contents.
2. List of Abbreviations and Acronyms, page v. The three aquifer zones (UAZ, MAZ, and LAZ) are capitalized when spelled out on page 2 of the document but are all lowercase in the list of acronyms.
3. List of Appendices, page iv. Appendix A is titled "RAGW Data 2019-2020," but Appendix A shows that the data were collected in 2021 and 2022.
4. List of Abbreviations and Acronyms, page v. Please move the acronym "amsl" to the beginning of the list of acronyms so that they are in alphabetical order.
5. List of Abbreviations and Acronyms, page v. The acronym EQL is used in Table A-1 and should be added to the list of acronyms.
6. Section 3.1, RAGW Monitoring, page 2. The last sentence of the third paragraph states, "Any maintenance work that changes any of the well information (e.g., reference elevation) will be discussed in the next report." Please explain whether there is any planned upcoming maintenance work that is expected to change any of this information, since the meaning of this sentence is unclear in this context.
7. Section 3.3, Groundwater Flow Directions, page 5. The second paragraph states that potentiometric surfaces were not mapped for the MAZ due to the limited number of wells in the aquifer. Appendix E, Figure E-2 is titled "R-Area MAZ Well Water Elevations 2022" and appears to show groundwater contours and groundwater flow path based on MAZ well groundwater elevations. Please clarify.

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8. Section 3.3, Groundwater Flow Directions, page 5. The last paragraph on page 5 describes the radial flow pattern in the TZ and cites Figure 2, which shows potentiometric surfaces from 1996. The text of the report should also cite the relevant figure in Appendix E that shows the most recent groundwater contours based on the most recent data.
9. Section 4.1.1, Eastern VOC Plume, page 8. The first paragraph states, "VOCs are constrained vertically to the UAZ...but TCE results above the MCL (5 µg/L) have been confirmed in the LAZ of the UTRA at plume definition well RAG008B." This statement does not make sense. If TCE is above the MCL and at its maximum concentration in an LAZ well, then VOCs are not constrained vertically to the UAZ. Please explain and revise the statement appropriately.
10. Section 4.1.1, Eastern VOC Plume, page 9. The fifth paragraph on the page ("Plume definition well RPS004C...") contains multiple errors. Please see the examples below.
 - a. The first sentence describes RPS004C as a plume definition well. This differs from how the well is described in Table 1 ("Source Area Monitoring Well, ISD Source Well") and Table A-1 ("ISD Source and VOC Well"). Please explain which is correct and revise the document appropriately.
 - b. The first sentence describes the other well as RSP004DUR, which appears to be a typo based on Table 1 and should be revised.
 - c. The last sentence of the paragraph misspells RPS004C as RSP004C; please revise.
 - d. Please explain why a time series plot was generated and referenced in the paragraph for RPS004C and not for RPS004DUR.
11. Section 4.1.4, Former Northern Tritium Plume, page 13. It is inaccurate to say that "All Mill Creek surface water stations continue to remain well below the MCL," if MCSW-03 was dry and could not be sampled. Please revise.
12. Table A-1, RAOU EMR Monitoring Wells, pages A-3 through A-6. For some of the wells in the table, the Sampling Event Water Elevation column indicates that water level was not measured, but most of these wells have potentiometric surface values and were apparently used to construct the potentiometric surface maps in Appendix E. Please explain and revise the table/figures appropriately.

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13. Table A-1, RAOU EMR Monitoring Wells, page A-3. RAG008DL is identified as a MAZ well in Table A-1, but Table 1 identifies it as a TZ well.
 14. Table A-1, RAOU EMR Monitoring Wells, page A-4. Table A-1 includes 2022 VOC analytical results for ISD wells RAG003DU, RAG003DL, and RPS004DUR. Table 1 does not identify these wells as Eastern VOC Plume wells, and Section 3.2 of the document indicates that ISD wells are generally sampled every five years for carbon-14, chlorine-36, iodine-129, and tritium. It is unclear why select ISD wells were sampled for VOCs in 2022. Please explain.
 15. Table 1, RAGW Monitoring Stations, pages 37 and 38. Please add two columns to the table with top of screen and bottom of screen for each well measured in feet below ground surface (bgs).
 16. Figures 1 through 7, pages 19 through 26. Multiple figures show an area to the east of R-Area, near the RAG008 well cluster, with three long, thin rectangles. The legend in Figure 3 identifies these as existing buildings, but there were no buildings visible in a satellite GIS image dated 10/6/22. Please explain what this area is, and revise figures as needed if no buildings are present. If this area was significant to previous operations at R-Area, please identify it in future figures.
 17. Figure 1, RAOU Location, page 19. The legend for the figure is very low resolution and difficult to read. Please revise the figure appropriately.
 18. Figure 2, RAGW Groundwater Plumes (2010) and LUC Boundary, page 20. The text of the document cites Figure 2 when describing the radial flow pattern observed in the TZ (see Specific Comment 6), but the figure does not indicate which aquifer zone the potentiometric contours were drawn based on.
 19. Figure 3, RAGW Monitoring Stations and 2022 Groundwater Plumes, page 21. Figure 3 shows the Western Tritium Plume as two distinct plume areas centered around RDB 005C and RDB 3. In Figures 4 and 5, the two plume areas are differentiated as the Western Tritium Plume around RDB 005C and the ISD C-14 & Tritium Plume around RDB 3. The text of the document discusses the two plume areas separately in Section 5. If the report text and Figures 4 and 5 are correct in differentiating between the two plumes, then Figure 3 should be revised to be consistent with the rest of the document.
 20. Figure 3, RAGW Monitoring Stations and 2022 Groundwater Plumes, page 21. The figure appears to be missing a well ID label for RPC 2CL, which is presumably located

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near RPC 2D and RPC 2CU based on the UTM-N and UTM-E locations provided in Table 1.

21. Figure 6, RAGW Eastern VOC Plume 2010 Data, page 25. The legend identifies the circles on the figure as monitoring well locations, but the concentrations are provided in units of $\mu\text{g}/\text{kg}$ instead of $\mu\text{g}/\text{L}$. Please revise the figure appropriately.
22. Figures 8 through 11, Cross Sections, pages 27 through 30. Please add a cross section of the Western Tritium Plume along A-A'.
23. Figures 8 through 11, Cross Sections, pages 27 through 30. Please change the units on the axes from meters amsl to feet amsl so that they match the units used in Table 1 to describe well construction details.
24. Figures 8 through 11, Cross Sections, pages 27 through 30. In addition to monitoring well locations, the cross sections include what appear to be lithology borings or other borings that are not monitoring wells (e.g., Figure 8, Cross Section A-A', boring RCP1A). Please clarify what these borings are. Please revise the cross sections to identify what these locations represent.
25. Figures 8 through 11, Cross Sections, pages 27 through 30. For monitoring well clusters with multiple screen zones, the cross sections do not clearly indicate which screen zone and contaminant concentration corresponds to which well. For example, Figure 8 labels the RAG008 cluster at the top of the figure as "RAG008B, BL & DL," but does not indicate which well is which in the cross section. In the above example for RAG008, there is no clear pattern to the way the wells are listed (i.e., they are not in order of "shallow, intermediate, deep," or "deep, intermediate, shallow"). Please revise the cross sections so that well clusters are clearly labeled.
26. Figure 8, R-Area Cross Section with RAGW Eastern VOC Plume 2022, page 27. The cross section includes a TZ well labeled as RAG006DU which is also shown on Figure 3, but there are no additional details about this well elsewhere in the document, including Table 1 with RAGW well details, Table A-1 with 2021 and 2022 analytical results, and Figure C-29 with the time series plot for TCE for RAG006. The cross section in Figure 8 includes a TCE concentration of $1.40 \mu\text{g}/\text{L}$ for RAG006DU. If this well exists, please add it to the relevant places in the document where it is missing.
27. Appendix C, Time Series Plots. For time series plots of contaminants with an MCL, the legend includes a gray line showing the GWPS or MCL. The lines that are used are difficult to see and differentiate from the regular lines in the plot. Please change this to a large, dashed line or other more obvious marker for the MCL.

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28. Appendix C, Time Series Plots. The legends included at the bottom of the time series plots are incomplete. The legends for the time series plots in this document generally show plots for individual wells with squares indicating the result for a specific sampling date, but there are other shapes included in the plots, including circles and triangles. In other SRS documents, different shapes in the time series plots may correspond to sampling results below the PQL, results qualified as J values, or detections above the PQL.
29. Appendix C, Time Series Plots. For previous sampling events where an RCOC was not detected above the method detection limit (MDL), the result is plotted on the time series plot at the PQL. For the 2021 and 2022 sampling results, similar results appear to be plotted at the MDL rather than the PQL, despite the analytical results in Table A-1 reporting the results as "<EQL (1)" or similar. For example, see Figure C-24, Time Series Plot for cis-1,2-DCE for RCS003. Results from 2014 through 2021 are plotted at 1 µg/L. The 2022 result was plotted slightly above 0.3 µg/L, even though Table A-1 reports both the 2021 and 2022 results as <EQL (1). This is an inaccurate representation of current and historical analytical data, and all affected plots should be revised.
30. Appendix E, Potentiometric Surfaces, pages E-1 through E-8. There are multiple errors and deficiencies in the Appendix E figures that need revision. Please see the following comments regarding the figures in Appendix E and ensure all errors are addressed. The comments below include examples of errors in the figures but may not be a comprehensive list of all errors.
- a. There are multiple references to 2020 water elevations in the figure titles and legends.
 - b. Monitoring well locations on the figures are labeled with groundwater elevation and the aquifer zone where the well is screened, but well IDs are not labeled. Please revise these figures to include well IDs for the monitoring wells shown on each figure.
 - c. Figure E-1, R-Area TZ Well Water Elevations 2022, page E-3. Please see the following comments.
 - i. Multiple TZ wells are marked with orange squares, but the legend indicates that purple squares represent TZ wells.

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- ii. The legend indicates that a red pentagon marks seepage locations, but seepage locations MCS002 and JBS005 are marked with green triangles and orange squares, respectively.
 - iii. Many of the symbols marking well locations are obscured by the groundwater elevation labels.
 - iv. There are two A/AA wells to the southeast, outside of the LUC boundary, that are not labeled with groundwater elevations.
 - v. Figure E-1 depicts groundwater elevations for approximately 43 locations, plus the two unlabeled A/AA wells to the southeast, for a total of approximately 45 wells on the figure. Table 1 only identifies 32 of the RAGW wells as either A/AA or TZ wells, meaning there are approximately 13 wells on the figure not included in Table 1 as A/AA or TZ wells. Please clarify what these extra points on the figure are.
 - vi. The groundwater elevation contour intervals used in the figure are inconsistent and the figure should be revised with consistent intervals. The figure includes the following contours in ft amsl: 285, 280, 270, 265, 260, 250. Please revise the figures to include consistent 5-ft or 10-ft contour intervals.
 - vii. Please explain why the 250 ft amsl contour ends abruptly at the R-Area Discharge Canal. There are wells to the west of the canal with groundwater elevations between 250 and 260 ft amsl.
 - viii. Please explain why additional contours were not drawn to the northeast of R-Area downgradient from the 250 ft amsl contour. The potentiometric surface towards Joyce Branch decreases from approximately 244 ft amsl at the two unlabeled wells near the 250 ft amsl contour, to 219.6 ft amsl at seepage locations to the west of Joyce Branch.
 - ix. The potentiometric contours are inaccurate based on the groundwater elevations and well locations presented on the figure, and over half of the monitoring points on the figure are not within the correct contours. Please re-draw the contours to reflect the groundwater elevations measured in 2022.

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- d. Figure E-2, R-Area MAZ Well Water Elevations 2022, page E-5. Please see the following comments.
- i. MAZ wells are marked with purple stars which are not included in the legend. The legend indicates that MAZ wells are marked with orange stars.
 - ii. The figure includes RAM009C and a well from the RAG008 cluster, but Table 1 does not identify any of these wells as MAZ wells.
 - iii. RAG014 is identified as a MAZ well but was not used to draw the contours as there is no 270 ft amsl contour on the figure.
31. Figure E-3, R-Area LAZ Well Water Elevations 2022, page E-7. The figure includes groundwater elevation values for LAZ wells RPC 2CL (247.15 ft amsl) and RPC 2CU (256.17 ft amsl). Despite being adjacent to each other and both being screened in the LAZ, there was nearly a ten-foot difference in groundwater elevation between the two wells in 2022. It appears that the groundwater elevation from RPC 2CU was used to construct the potentiometric contours due to the well being located between the 260-ft amsl and 250-ft amsl contours. Please explain why the RPC 2CU groundwater elevation was used rather than RPC 2CL and ensure this is made clear in figures of future documents.