



March 27, 2023

SRMC-ESH-2023-00042
RSM Track #: 10667

Ms. Susan Fulmer
Federal Remediation Section
Bureau of Land and Waste Management
South Carolina Department of Health and
Environmental Control
2600 Bull Street
Columbia, South Carolina 29201-1208

Dear Ms. Fulmer:

**2022 ANNUAL GROUNDWATER MONITORING REPORT FOR THE F- AND H-AREA
RADIOACTIVE LIQUID WASTE TANK FARMS**

The Industrial Wastewater Consolidated General Closure Plan for F-Area and H-Area Waste Tank Systems (SRR-CWDA-2017-00015, Revision 1) requires the Savannah River Site to conduct groundwater monitoring during the interim period from the time the individual waste tanks are removed from service up to final closure of the F-Area and H-Area Operable Units, in accordance with the corresponding F-Area and H-Area Groundwater Sampling and Analysis Plans that have been approved by your agency. Please find the enclosed 2022 Annual Groundwater Monitoring Report for the F- and H-Area Radioactive Liquid Waste Tank Farms and the SRS responses to comments from the Environmental Protection Agency (EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) on the 2021 Annual Groundwater Monitoring Report for the F- and H-Area Radioactive Liquid Waste Tank Farms.

If you have any questions, please contact Keith Liner of my staff at (803) 208-6466.

Sincerely,

A handwritten signature in blue ink that reads "Joel R. Cantrell".

Joel R. Cantrell, Director
Environment, Safety, Health, and Quality
Savannah River Mission Completion, LLC

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- Attachments:
1. *2022 Annual Groundwater Monitoring Report For the F-and H-Area Radioactive Liquid Waste Tank Farms (U)*, SRNS-RP-2022-01106, Revision 0, March 2023
 2. SRS Responses to United States Environmental Protection Agency Comments on:*2021 Annual Groundwater Monitoring Report For the F-and H-Area Radioactive Liquid Waste Tank Farms (U)*, SRNS-RP-2022-00076, Revision 0, March 2022
 3. SRS Responses to South Carolina Department of Health and Environmental Control Comments on:*2021 Annual Groundwater Monitoring Report For the F-and H-Area Radioactive Liquid Waste Tank Farms (U)*, SRNS-RP-2022-00076, Revision 0, March 2022

c: J. Richards, EPA Region 4, Atlanta,GA
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J. Dawson, Atlanta, GA
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C.L. Bergren, SRNS, 730-4B
A.J. Meyer, 730-4B
V.E. Millings III, 730-4B
T.P. Killeen, 730-4B
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Records Administration, 773-52A
DOEECAT

GENERAL COMMENTS

1. Section 3.0 (Groundwater Monitoring at F-Area Tank Farm, Nonvolatile Beta, Page 5 of 34) states the nonvolatile beta observed at FTF 28, FTF 19, and FTF 12R appears to be attributed mainly to technetium-99; further this section notes that the Tc-99 results are greater than the nonvolatile beta results due to volatilization that occurs during the drying step in the nonvolatile beta analysis. The potential loss of any radionuclide during the drying step of the nonvolatile beta analysis calls into question the accuracy of the method. Accordingly, please provide the following information: 1) a description of how accurate the nonvolatile analysis is if some of the nonvolatile radioactivity is lost during the drying step; 2) the analytical methods and associated means of detection used for nonvolatile beta and technetium-99 analyses; and 3) additional information about how it can be confirmed that the nonvolatile beta analysis is not causing the loss of other potential beta-emitting radionuclides, such as strontium-90 or any other potential fission product radionuclides.

Response: Clarification

SRS uses the term “Nonvolatile Beta” rather than “Gross Beta” to indicate volatile beta-emitting radionuclides are lost during the analysis. This distinction is primarily done because SRS has tritium groundwater plumes, and 100% of the tritium will be lost during the nonvolatile beta analysis. Other radionuclides (e.g., I-129, Tc-99 and Radon) are also evaporated during this analysis. If any volatile radionuclides are expected in a groundwater plume then those radionuclides are analyzed by different analytical methods (e.g., liquid scintillation, gamma spec, Lucas cell).

- 1) **The nonvolatile beta analysis accuracy is best measured by the laboratory matrix-spiked QC samples, which typically use Sr-90 or Cs-137 as the standards. Though if the planchet needs to be heated to a dull-red to convert nitrate salts to oxides in order to prevent water adsorption by the salts, then Sr-90 should be used, as some Cs-137 could be volatilized at high heats. Over the past 20 years, different labs have used slightly different methods, but overall the average percent recovery is about 99%. The averages range from about 95% to 114%.**

**SRS Responses to United States Environmental Protection Agency Comments on:
2021 ANNUAL GROUNDWATER MONITORING REPORT FOR THE F- AND H-AREA
RADIOACTIVE LIQUID WASTE TANK FARMS (U), SEMS Numbers: 23 and 89 – Aiken, South
Carolina (SRNS-RP-2022-00076, Revision 0, March 2022)
Received May 20, 2022, electronically.**

METHOD	ANALYTE	UNIT S	# of Analysis	Min % Recovery	Ave % Recovery	Max % Recovery	Ave Spike Conc.	Spike Units
EPA900.0	NONVOLATILE BETA	%	114	33.00	106.78	125	813.35	pCi/L
EPA900.0MOD	NONVOLATILE BETA	%	309	64.00	100.43	145	154.22	pCi/L
L3.21-10001	NONVOLATILE BETA	%	322	65.70	95.21	134	391.27	pCi/L
L3.21-10008	NONVOLATILE BETA	%	1307	69.50	97.75	133	393.56	pCi/L
RADA-001	NONVOLATILE BETA	%	600	48.00	102.10	132	4479.63	pCi/L
RADA-001B	NONVOLATILE BETA	%	4	109.00	114.25	118	1980.00	pCi/L
Overall			2656	33.00	99.15	145	1308.90	pCi/L

- 2) **The nonvolatile beta analyses are evaporated onto metal planchets and then analyzed using a gas flow proportional counter. In contrast, Tc-99 in groundwater samples is first separated using anion exchange resin, eluted from the resin, and then analyzed using a liquid scintillation counter. However, some labs may use ICP-MS to count Tc-99.**

- 3) **As noted above all tritium and gaseous radionuclides will be lost during the evaporation process, and some radionuclides will be partially evaporated during the evaporation process. These losses/limitations are noted in the analytical procedures (e.g., EPA method 900), and are based on an elements physical characteristics (melting & boiling points) and compounds the elements may form in groundwater (e.g., TcO4).**

Contact: Terry Killeen, (803) 952-6850, Terry.Killeen@srs.gov

SPECIFIC COMMENTS

1. **Section 3.0, Groundwater Monitoring at F-Area Tank Farm, Page 3 of 34:** Section 3.0 states, “In 2022, Savannah River Site (SRS) installed a new well (FBG002D) to monitor background water concentrations in the Upper Aquifer Zone (UAZ) at the F-Area Tank Farm (FTF);” however, this section does not describe how it was determined that GW well FBG002D will sufficiently fill the data gap from FBG001D as a background well since according to Figure 8, it is located on the opposite side of the Upper Three runs Aquifer (UTRA) Groundwater Divide compared to location of FBG001D. Please revise the text to include a discussion on how it was determined that the location of FBG002D will sufficiently fill the data gap as a background well based on the current location across the groundwater divide.

Response: Agree

Despite above average rainfall and an overall increasing water elevation from 2012 to 2020 the water in the UAZ, in the area of well FBG001D, is thin. Even though the well screen is located at the top of the tan clay, at the bottom of the UAZ, not enough water is present to collect for sampling. FBG001D is located on the north-west side of a groundwater divide where water flows to Upper Three Runs. On this side of the divide, the water table quickly dips below the tan clay and exists in the LAZ as you move away from the divide. FBG001D is essentially located where the water table begins to drop into the LAZ and the UAZ becomes unsaturated.

South of the groundwater divide, water flows to Fourmile Branch and the water table exists in the UAZ. FBG002D was placed on the south-west side of the FTF to monitor the FTF where the water table does exist in the UAZ.

SRS will continue to attempt to sample FBG001D in future sampling events so that we can sufficiently monitor the UAZ on the north-west side of the groundwater divide should the water elevation rise enough that there is enough water in the UAZ for well FBG001D to provide sufficient water for a sample. Otherwise, FBG001C will serve as the water table background well for the FTF.

This information will be included in the 2023 submittal of the tank farms groundwater monitoring report. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

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Page 4 of 4

Section 4.0, Groundwater Monitoring at H-Area Tank Farm, Cadmium and Chromium, Page 9 of 34: The number of cadmium results is unclear. The text in the Cadmium and Chromium subsection states, “Out of 100 samples, 97 results for cadmium were non-detect. The five remaining results were qualified as ‘J’;” however, the total number of samples do not add up to 100. As stated, if there are 100 samples and 97 are non-detect, then three samples should be remaining. Please revise this section to include the correct number of non-detect and remaining samples for cadmium results.

Response: Agree

The text should have stated that there were three remaining wells as opposed to five. Future submittals of this report will take care to avoid typographical errors such as this. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

**SRS Responses to South Carolina Department of Health and Environmental Control Comments
on:
2021 ANNUAL GROUNDWATER MONITORING REPORT FOR THE F- AND H-AREA
RADIOACTIVE LIQUID WASTE TANK FARMS (U), SEMS Numbers: 23 and 89 – Aiken, South
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Received April 28, 2022, electronically.**

Page 1 of 3

General Comment

1. In the legend for Figures 4, 6 - 8, 12 - 14 and 16, a symbol for "Current Tank Grouting" is noted. This symbol is not applicable to this report since no grouting of tanks occurred in CY2021 in the tank farm; however, it will be beneficial in future reports when grouting does occur. Rather than removing the symbol from the legend, a statement should be made in the document stating that no grouting occurred during the calendar year.

Response: Agree

A statement clarifying whether or not there were tanks grouted during the reporting period will be added to future submittals of this report. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

Specific Comment

1. Section 2.0, Setting, page 2, 1st paragraph, 3rd sentence. Aquifer is incorrectly spelled. Please correct.

Response: Agree

The spelling will be corrected in future submittals of this report. Care will be taken to avoid typographical errors such as this. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

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Page 2 of 3

2. Section 4.0, Groundwater Monitoring at H-Area Tank Farm, page 9, Cadmium and Chromium, 2nd sentence. If cadmium results were non-detect in 97 out of 100 samples, would there not be three remaining wells as opposed to five? Please clarify.

Response: Agree

The text should have stated that there were three remaining wells as opposed to five. Future submittals of this report will take care to avoid typographical errors such as this. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

3. Figures 4 - 8, 10, 12 - 14 and 16. Please add legend symbols and descriptions for the grayish-colored shading located within, and sometimes contiguous to, the borders of the "F-Area Tank Farm" and the "H-Area Tank Farm".

Response: Agree

The grayish-colored shading with the blue dashed border located around the tank farm facilities indicates the SRS Facility Area boundary and shows the boundary of the facility areas for F and H Area around each tank farm, respectively. The legend symbol will be included in future submittals of this report. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

4. Figure 8, Nonvolatile Beta Results (pCi/L) for FTF in 2021, page 21. Please add a legend symbol and description for the red dashed lines.

Response: Agree

The yellow shading with red dashed lines shows the areal extent of the nonvolatile beta plume that is greater than or equal to 50 pCi/L. A legend symbol and description will be added in future submittals of this report. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

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Page 3 of 3

5. Figure 16, 2021 Tritium Results (pCi/mL) for the UTRA at the HTF, page 29. Please add a legend symbol and description for the lavender-colored shading and clarify the significance of the "Tritium - 20 pCi/ml" (red text overlay) located within that shading.

Response: Agree

The lavender-colored shading shows the areal extent of the tritium plume that is greater than or equal to 20 pCi/mL. A legend symbol and description will be added in future submittals of this report. No changes are proposed for the 2021 report.

Contact: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov