



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

March 15, 2022

ENVIRONMENTAL COMPLIANCE &

Mr. Brian T. Hennessey
SRS Remedial Project Manager
Infrastructure and Area Completion Division
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

MAR 15 2022**AREA COMPLETION PROJECTS**

**EPA Comments for the Sixth Five-Year Remedy Review Report for Savannah River Site
Operable Units SRNS-RP-2021-04229, REVISION 0, DATED DECEMBER 2021
Savannah River Site, Aiken, South Carolina**

Dear Mr. Hennessey,

The U.S. Environmental Protection Agency, Region 4 (EPA), has reviewed the Fifth Five-Year Review Remedy Report for Operable Units with Geosynthetic or Stabilization/Solidification Cover Systems (U), SRNS-RP-2016-00610, Revision 0; dated December 2016. EPA's comments are attached.

If you have any questions or require additional information, please contact me at (404) 562-8648.

Sincerely,

JON
RICHARDS

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by JON RICHARDS
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Jon Richards
FFA RPM
Superfund & Emergency Management
Division

ec: C.L. Bergren, SRNS-ACP
Susan Fulmer, SCDHEC

GENERAL COMMENTS

1. The Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Geosynthetic or Stabilization/Solidification Cover Systems (U) does not adequately address, for several Operable Units (OUs), whether the remedial action objectives (RAOs) of preventing/mitigating further migration of contaminants to the groundwater are being achieved to ensure the in-situ stabilization/solidification remedy is protective of groundwater. According to the Sixth 5YR Report, RAOs were developed not only to prevent physical exposure to contaminants but to also prevent/mitigate further migration of contaminants from impacting groundwater. Examples include, but are not limited to, the following OUs evaluated in this Sixth 5YR Report:

- Appendix D, C-Area Reactor Seepage Basins (904-066G and 904-68G) Operable Unit;
- Appendix E, D-Area Expanded Operable Unit (U);
- Appendix I, General Separations Area Consolidation Unit;
- Appendix K, K-Area Reactor Seepage Basin Operable Unit; and,
- Appendix P, P-Area Reactor Seepage Basins (904-61G, 904-62G, and 904-63G) (PRSB) Operable Unit.

The Sixth 5YR Report should discuss whether the RAO for in-situ stabilization/solidification remedial action at the respective OUs are being met to ensure the protectiveness of groundwater. *Please revise the Sixth 5YR Report to include additional discussion and lines of evidence (e.g., groundwater monitoring data, flow directions) to confirm that further migration of contaminants to groundwater is being prevented/mitigated to ensure RAOs at these OUs are being met.*

2. The evaluation of emerging contaminants presented in Section VII (Technical Assessment) for each of the OUs is unclear. For example, the Sixth 5YR Report does not list the emergent contaminants that were evaluated as part of the Technical Assessment or provide the rationale to substantiate the assertion that the emerging contaminants are not applicable to the OUs. In addition, it is unclear what fact sheets provided on the United States Environmental Protection Agency (USEPA) webpage were reviewed during the evaluation. *Please revise the Sixth 5YR Report to clarify which emerging contaminants were evaluated, provide the rationale to substantiate why the emerging contaminants are not applicable to the subject OU, and include a reference or link to the specific fact sheets that were reviewed in the evaluation.*
3. Multiple OU site figures presented in the Sixth 5 YR Report do not include relative monitoring well locations, groundwater elevations and/or show the direction of groundwater flow. This issue impacts the evaluation of the RAOs developed for several OUs to prevent/mitigate further migration of contaminants from impacting groundwater. Examples include the following OUs:
 - Appendix C, Figure C-5, Layout of Groundwater Sampling Wells at heavy water components test reactor (HWCTR), Page C-19 of C-34;
 - Appendix D, Figure D-2, Location of the C-Area Reactor Seepage Basins OU in C Area, Page D-14 of D-26;
 - Appendix E, Figure E-2, Layout of the D-Area expanded operable unit (DEXOU) within D Area, Page E-18 of E-36;

- Appendix G, Figure G-2, Location of the F-Area Retention Basin OU within the F-Area at SRS (the basin and monitoring wells are located within the green box), Page G-16 of G-30;
- Appendix H, Figure H-2, Layout of the General Separations Area, Page H-18 of H-32;
- Appendix I, Figure I-2, General Separation Area Consolidation Unit Four Primary Subunits, Page I-18 of I-34;
- Appendix J, Figure J-2, Layout of the General Separations Area, Page J-16 of J-30
- Appendix K, Figure K-2, Site Layout for K-Area Reactor Seepage Basin, Page K-14 of K-26;
- Appendix M, Figure M-2, Layout of LRSB OU, Page M-18 of M-32;
- Appendix O, Figure O-5, Location of Groundwater Wells Monitoring the P-Reactor Building (105-P), Page O-25 of O-42;
- Appendix P, Figure P-2, Plan View of P-Area Reactor Seepage Basins, Page P-14 of P-28.

Please revise the Sixth 5YR Report to include the groundwater flow directions for the noted OUs to facilitate adequate assessment of whether the RAOs developed to prevent/mitigate further migration of contaminants from impacting groundwater are being met.

4. For several OUs, the Sixth 5YR Report does not include photo documentation or cite references to where this information can be found. As such, current site conditions are not documented and confirmation that the deficiencies identified were adequately addressed is uncertain. Examples include, but are not limited to, the following OUs:
 - a. Appendix C, B-Area Operable Unit, Attachment C-1, Five-Year Review Site Inspection Checklist – B-Area Operable Unit (continued), Page C-30 of C-34: Under VII. Landfill Cover/Containment, the text includes a statement that there is hairline cracking evident throughout the concrete cover; however, photos were not provided of the inspection to document the cracks of the concrete cover. Therefore, it is unclear if the widths of the cracks require corrective action.
 - b. Appendix D, C-Area Reactor Seepage Basins (904-66G and 904-68G) Operable Unit, Attachment D-1, Five-Year Review Site Inspection Checklist – C-Area Reactor Seepage Basins (904-66G and 904-68G), Section VI, General Permit, Subsection B, Other Site Conditions, Page D-24 of D-26: The checklist states, “Site inspections conducted during FY [Fiscal Year] 2017 through FY2021 identified signs that needed to be replaced, active ant mounds, overgrown vegetation, and hog damage. These findings were resolved soon after discovery.” However, photos were not provided, to document site conditions and confirm the findings were addressed and repaired.
 - c. Appendix F, E-Area Low Level Waste Facility (643-26E) Operable Unit, Attachment F-1, Five-Year Review Site Inspection Checklist – E-Area Low Level Waste Facility (643-26E) (Slit Trench Disposal Units 1 - 5), Section I, Perimeter Ditches/Offsite Discharge, Subsection 4, Discharge Structure, Page F-36 of F-38: The checklist states, “Small cracks were observed in the concrete drainage channels on the perimeter of the covers. The cracks were repaired with a concrete epoxy.” However, photos were not provided to document site conditions and confirm the cracks were repaired.
 - d. Appendix G, F-Area Retention Basin (281-3F) Operable Unit, Attachment G-1, Five-Year Review Site Inspection Checklist – F-Area Retention Basin (281-3F) OU, Section

VI, General Site Conditions, Subsection B, Other Site Conditions, Page G-28 of G-30: The checklist states, “Scheduled annual site inspections performed from FY2017 through FY2021 identified active ant mounds, and a non-visible concrete marker in the southwest corner. These findings were resolved by O&M [Operation and Maintenance] staff soon after discovery.” However, photos were not provided to document site conditions and confirm the findings were resolved by the O&M staff soon after discovery.

- e. Appendix H, F-Area Tank Farm Operable Unit, Attachment H-1, Five-Year Review Site Inspection Checklist – FTF OU (Waste Tanks 5, 6, 17, 18, 19, and 20), Section XI, Overall Observations, Subsection B, Adequacy of O&M, Page H-32 of H-32: The checklist states, “Site inspections indicate that the conditions discussed in Section VI. Five-Year Review Process, Summary of Inspections and Interviews, are satisfactory, but they are being monitored to verify that the conditions do not worsen to an extent that would compromise the stabilization and containment of residual waste in the tanks.” However, photos were not provided to document site conditions and confirm that the degradation of the engineered barriers of the F-Area Tank Farm (FTF) waste tanks is being monitored and maintained to meet the satisfactory requirement.
- f. Appendix I, General Separation Area Consolidation Unit, Attachment I-1, Five-Year Review Site Inspection Checklist - General Separation Area Consolidation Unit (GSACU) OU including Old Radioactive Waste Burial Ground (643-E) and Old Solvent Tanks (650-1E through 650-22E), Section VI, General Site Conditions, Subsection B, Other Site Conditions, Page I-30 of I-34: The checklist states, “Site inspections for the HRB (H-Area Retention Basin), ORWBG [Old Radioactive Waste Burial Ground (643-E)], HP-52 Ponds, and Warner’s Pond conducted from FY2017 through FY2021 identified active ant mounds, evidence of hog damage, overgrown vegetation, thinning vegetation on slope, erosion around the drainage channel on the north and south side and a few downed trees as issues. These findings for all these units were resolved soon after discovery.” However, photos were not provided to document site conditions and confirm the findings were resolved soon after discovery.

Please revise the Sixth 5YR Report to include photo documentation of site conditions and the noted repairs or, at a minimum, provide a reference to where this information can be found.

SPECIFIC COMMENTS

1. **Section II, Response Action Summary, Page 7 of 42:** It is unclear whether the environmental database that is used to track sampling and analysis is available for public access via a web link. The text states, “Technical and administrative protocols have been established to promote the consistent implementation of USEPA guidance at OUs across SRS. An environmental database is used to track sampling, analysis, and results of environmental characterization and monitoring.” However, no discussion was presented regarding public access to the environmental database. *Please revise Section II to discuss whether the public has access to the environmental database or whether the access is limited (e.g., only available to the Department of Energy [DOE] and/or their contractors).*
2. **Table 4, Operation and Maintenance Cost Comparison for SRS OUs with Geosynthetic or S/S Cover Systems (continued), Page 34 of 42:** It is unclear why the actual costs for maintaining the covers is not available for the H-Area Tank Farms Operable Unit as noted in

Table 4. *Please revise Table 4 to provide a footnote at the end of the table explaining why the costs are not available.*

3. **Appendix C, B-Area Operable Unit, Section VI, Five-Year Review Process, Data Review, Page C-9 of C-34:** The text does not provide the turbidity levels recorded for the associated wells to support the assertions in the text. The text states, “The gross alpha results obtained since 2009 correlate with elevated turbidity in the wells;” however, the turbidity levels were not presented and an assessment of the correlation between elevated turbidity and elevated gross alpha results could not be adequately assessed. *Please revise this section to include the turbidity level measurements for the associated wells so that an adequate assessment can be made regarding the assertion that there is a correlation between elevated turbidity and elevated gross alpha results in groundwater.*
4. **Appendix C, B-Area Operable Unit, Section VIII, Issues, Page C-12 of C-34:** It is unclear why the text states that there are no active issues associated with the protectiveness of this OU when Table C-4 (Recommendations and Follow-up Actions for the B-Area Operable Unit) includes the elevated gross alpha concentrations in groundwater samples as an issue. *Please revise Section VIII to clarify whether the elevated gross alpha concentrations are not an issue, due to the apparent discrepancy with the information presented in Table C-4.*
5. **Appendix I, General Separations Area Consolidation Unit, Section VII, Technical Assessment, Is the Remedy Functioning as Intended by the Decision Document?, Page I-12 of I-34:** This section does not include monitoring data or a reference citation to support the assertions in the text that the low permeability cap has greatly reduced the tritium migration and appears to have impacted other plumes to a lesser extent. For example, the text states, “The low permeability cap has significantly reduced the tritium migration from the ORWBG vadose zone to the Southwest Plume of the MWMF [Mixed Waste Management Facility]. This has resulted in a tritium reduction within the plume of approximately 40%. The low permeability cap appears to have impacted the other plumes associated with the ORWBG (Northwest and Southeast Plumes) to a lesser extent.” However, monitoring data, or a reference citation to where this information is located, was not provided as a supporting line of evidence regarding cap performance. *Please revise Section VII to provide monitoring data or reference where this information can be found (e.g., Resource Conservation and Recovery Act MWMF groundwater monitoring reports) to support assertions in the text regarding the cap performance.*
6. **Appendix K, Section VI, Five-Year Review Process, Data Review, Page K-7 of K-26:** The text does not present the results of the annual sampling for known groundwater contaminants at the six wells and seven surface water locations discussed in the text. Additionally, since K-Area Reactor Seepage Basin (KRSB) OU groundwater is being investigated under the K-Area Groundwater (KAGW) OU, it is unclear whether the annual sample results for the six wells and seven surface water locations are also reported in the KAGW OU monitoring reports. *Please revise Section VI to include a discussion of the most recent sample results at the six wells and seven surface water locations and include a reference citation to the most recent annual groundwater data report where this information is located.*
7. **Appendix L, Section VI, Technical Assessment, Page L-8 of L-28:** It is unclear what groundwater data was used to support the technical evaluation conducted to substantiate that the well abandonment and soil stabilization are preventing the migration and leaching of

COCs to the groundwater. For example, the text states, “The technical evaluation of the groundwater data indicates that the well abandonment and soil stabilization in LAOCB [L-Area Oil and Chemical Basin] are preventing the migration and leaching of COCs [Contaminants of Concern] to the groundwater (SRNS 2010, SRNS 2012);” however, it is unclear what groundwater data was used to support the technical evaluation. *Please revise Section VI to discuss what groundwater data was used to determine that the migration and leaching of COCs to the groundwater at the LAOCB is being prevented due to well abandonment and soil stabilization in LAOCB.*

8. **Appendix M, Section VI, Five-Year Review Process, Page M-9 of M-32:** This section does not include a reference citation to where the groundwater results can be found to support the assertions in the text regarding cover system performance. For example, the text states, “Groundwater monitoring well LSB-4 is sampled once every five years for strontium-90 to assess the effectiveness of the LRSB cover system in preventing contaminants from migrating to the groundwater above MCLs [Maximum Contaminant Limit]. LSB-4 was sampled and analyzed for strontium-90 in the fourth quarter of 2020. The strontium-90 result was below the detection limit.” However, there is no reference citation to the 2020 analytical results for LSB-4. *Please revise Sections VI to cite a reference to where the 2020 analytical results can be found and include a table of the 2020 analytical results to confirm that strontium-90 was below the detection limit.*
9. **Appendix O, P-Area Operable Unit, Section VII, Technical Assessment, ISD of the P-Reactor Building (105-P) Complex, Page O-16 of O-42:** It is unclear how increases in tritium over time are correlated with a rise in rainfall and water table rises. The text indicates sampling results, since 2017, are shown to have concentration increases for tritium, due to the potential rise in rainfall present in the unsaturated zone that has also increased the water table levels. However, no rainfall or water table level data is presented to support the assertions in the text. *Please revise Section VII to provide the rainfall and water table level data to support the assertion that increased tritium concentrations are correlated with increased rainfall.*

ORC comments

ORC Comment #1: Table 7 – E-Area Low Level Waste Facility contains issues/recommendations carried forwarded from previous five-year review. A milestone date is recommended to timely address the recommendation and to ensure future remedy protectiveness or performance is not impacted.

ORC Comment #2: Table 8 – Short-term protectiveness statements listed for E-Area Low Level Waste Facility, H-Area Tank Farm, and F-Area Tank Farm should be revised to include actions needed to ensure long-term protectiveness. EPA’s guidance OSWER Directive 9200.2-111 “Clarifying the Use of Protectiveness Determinations for [CERCLA] Five Year Reviews,” Sept. 13, 2012, recommends the following format for short-term protectiveness statements:

Recommended Language for a Protectiveness Determination of “Short-Term Protective”

“The remedy at OU X currently protects human health and the environment because (describe the elements of the remedy that protect human health and the environment in the short-term). However, in order for the remedy to be protective in the long-term, the following actions need to be taken (describe the actions needed) to ensure protectiveness.

ORC Comment #3: Protectiveness determinations cannot be fully evaluated by EPA for each

OU in the absence of sufficient discussion and inclusion of needed groundwater lines of evidence (see General comment #1) in the Five-Year Review Report to determine whether the RAO of preventing/mitigating further migration of contaminants to the groundwater for each applicable OU with this RAO have been met or are being met.

5. The Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Geosynthetic or Stabilization/Solidification Cover Systems (U) SRNS-RP-2021-04229, Revision 0, dated December 2021 (Sixth 5YR Report) does not adequately address, for several Operable Units (OUs), whether the remedial action objectives (RAOs) of preventing/mitigating further migration of contaminants to the groundwater are being achieved to ensure the in-situ stabilization/solidification remedy is protective of groundwater. According to the Sixth 5YR Report, RAOs were developed not only to prevent physical exposure to contaminants but to also prevent/mitigate further migration of contaminants from impacting groundwater. Examples include, but are not limited to, the following OUs evaluated in this Sixth 5YR Report:

- Appendix D, C-Area Reactor Seepage Basins (904-066G and 904-68G) Operable Unit;
- Appendix E, D-Area Expanded Operable Unit (U);
- Appendix I, General Separations Area Consolidation Unit;
- Appendix K, K-Area Reactor Seepage Basin Operable Unit; and,
- Appendix P, P-Area Reactor Seepage Basins (904-61G, 904-62G, and 904-63G) (PRSB) Operable Unit.

The Sixth 5YR Report should discuss whether the RAO for in-situ stabilization/solidification remedial action at the respective OUs are being met to ensure the protectiveness of groundwater. Please revise the Sixth 5YR Report to include additional discussion and lines of evidence (e.g., groundwater monitoring data, flow directions) to confirm that further migration of contaminants to groundwater is being prevented/mitigated to ensure RAOs at these OUs are being met.

EPA HQ comments:

#	Page	Comment	Category 1
1	28	"SRS recommended reevaluation of the installation and maintenance activities for stormwater runoff covers for the E-Area Low-Level Waste Facility (LLWF). Interim stormwater runoff covers at the E-Area LLWF slit trench disposal units are showing signs of wear that are likely to result in higher than anticipated maintenance costs and installation modifications for new covers in the future. Continued discussion with the USEPA and SCDHEC of how these activities impact future covers is needed and the recommendation was carried forward to the Sixth Five-Year Remedy Review Report." Has a schedule been set for these discussions between USEPA and SCDHEC? What is the anticipated solution?	Ground Water

2	28		
3	28	No community interviews were listed in the document. Confirm if community representatives were included in the interviews. If no community representatives were interviewed, they should be considered for the next five-year review.	Community involvement and Interviews
4	31	"SRS recommends redeveloping the BMW wells at BAOU prior to the next sampling event in order to decrease the turbidity in the wells and provide more accurate groundwater measurements, followed by filtering of samples and speciation as needed for radionuclides." What is the timeline for redeveloping the BMW wells?	Ground Water
5	31	"Interim stormwater runoff covers at the E-Area LLWF slit trench disposal units are showing signs of wear that are likely to result in higher than anticipated maintenance costs and installation modifications for new covers in the future. Continued discussion with USEPA and SCDHEC of how these activities impact future covers is needed." Has a schedule been set for these discussions between USEPA and SCDHEC?	Ground Water
6	31	The document states that the geosynthetic covers are not expected to meet 25 year design. Is there an estimate for the life expectancy? Is the protectiveness impacted by the reduced life-expectancy of the cover? Consider the effectiveness and protectiveness of this remedy if the erosion issues persist.	Protectiveness Statement
7	57	F-Area Tank Farm- The "Short-term protectiveness" appears to be related to the interim remedy and the LUCIP being deferred until the final closure, correct? Do you have an anticipated timeframe you can add?	Protectiveness Statement
8	108	"Well development, as required by the fifth five-year remedy review (SRNS 2018), was inadvertently delayed until after submittal of the Revision 0 of this document. Once redevelopment is completed, new groundwater samples will be collected, and the Revision 1 document will be updated accordingly. The current remedy is functioning as intended." Is there a plan in place to share the results of the planned post-well redevelopment groundwater sampling with EPA?	Ground Water

9	108	Regarding the B-Area OU, we suggest reviewing the site related contaminants once the wells are redeveloped. If the data holds up following redevelopment, according to figure C-5, the plume would not be delineated below the MCL and concentrations are generally increasing in 003D.	Ground Water
10	Figure C-5	Recommend overlaying the GW monitoring well locations on groundwater contours (if available)	Ground Water
11	Figure O-5	Recommend overlaying the GW monitoring well locations on groundwater contours (if available)	Ground Water
12	Multiple		

5YR Coordinator comments:

General SEMS OUs: 16, 17, 23 (FRB), 32, 43, 48, 55, 60, 65, 66, 67, 94 and 96.	In accordance with the <i>Recommended Evaluation of Institutional Controls: Supplement to the 'Comprehensive Five-Year Review Guidance'</i> , the Institutional Controls (ICs) Review Section should include the IC Summary Table, the status of the ICs and ICs Overlay Map(s) (may use current figures). SRS did a good job with including most of this information. However, ICs Overlay Maps should be included prior to finalizing the Report. Specifically, ICs Overlay Maps (depicting the boundaries of the land use controls) for each of the following SEMS OUs: 16, 17, 23 (FRB), 32, 43, 48, 55, 60, 65, 66, 67, 94 and 96. You may access this FYR guidance document and review examples of the IC Maps at the following website: http://semspub.epa.gov/src/document/HQ/175441	ICs Evaluation in FYRs
Table 5 and Table 8	The format of the Protectiveness Statements should follow the format provided in the <i>Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews Guidance</i> . Although I would like to review the revised Report prior to concurring on the current Protectiveness Determinations and Statements, Appendices C – R, Section X of each SEMS OU includes an appropriate format for the Protectiveness Statement. Please use this information when revising Tables 5 and 8. You may access this FYR guidance document at the following website: https://semspub.epa.gov/work/HQ/174829.pdf	Selecting the Protectiveness Determinations and Preparing the Protectiveness Statement

Table 6	<p>This Table “OU(s) without Issues/Recommendations Identified in the Five-Year Review” should include all SEMS OUs that <i>do not</i> have Issues/Recommendations that affect ‘current’ or ‘future’ protectiveness. As an example, if all of the SEMS OUs captured in the final Report are <u>Protective</u> (indicating that there are no Issues/Recommendations that affect ‘current’ or ‘future’ protectiveness), all of the SEMS OUS should be listed in this Table.</p> <p>Please access the <i>Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews Guidance</i> to evaluate and select the Protectiveness Determination</p>	Identifying SEMS OUs to include in Table 6
General SEMS OUs: 23, 48, 55, 60 and 86.	In accordance with 2016 FYR Template (Five-Year Review Recommended Template, OLEM Directive 9200.0-89), the RAOs and the components of the Remedy should be listed in the final Report. SRS did a good job with doing this for most of the SEMS OUs. However, SRS should list the Remedy components for the following SEMS OUs: 23, 48, 55, 60 and 86.	Including the ROD Components
General	Issues and Recommendations that <i>do not</i> affect ‘current’ or ‘future’ protectiveness should be included in the ‘Other Findings’ Section. This group of Issues and Recommendations will not be tracked in SEMS. However, it would be helpful to all parties (EPA, SCDHEC, DOE) to have mutual deadlines for completion of each Recommendation documented. Please refer to Page 10 of the 2016 FYR Template for more information.	Information for the ‘Other Findings’ Section