**Department of Energy**
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

MAR - 5 2019

Ms. Susan B. Fulmer, P.G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Jon Richards
Acting Savannah River Site Remedial Project Manager
Superfund Division
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Savannah River Site's Responses to the Regulatory Comments on the 2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2018-00573, Revision 0, June 2018) SEMS Numbers: 21, 29

In accordance with the terms of the Federal Facility Agreement, the U. S. Department of Energy (DOE) is submitting the subject comment responses for your review. The South Carolina Department of Health and Environmental Control (SCDHEC) and the U. S. Environmental Protection Agency (EPA) provided comments on the report on October 23, 2018 and December 10, 2018, respectively. The report will not be revised; however, all comment responses will be included and/or addressed in the next report, as applicable. Please review these responses and provide your approval thirty (30) days from receipt. The time and effort that the SCDHEC and the EPA have given on the subject operable unit are greatly appreciated.

Questions from you or your staff may be directed to me at (803) 952-8365, or the DOE Program Manager, Mr. Philip Prater, at (803) 952-9333.

Sincerely,

Brian T. Hennessey
SRS Remedial Project Manager
Infrastructure and Area Completion Division

IACD-19-131

Enclosures:
1. SRS Responses to the USEPA Comments on the 2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2018-00573, Revision 0, June 2018) SEMS Numbers: 21, 29
2. SRS Responses to the SCDHEC Comments on the 2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2018-00573, Revision 0, June 2018) SEMS Numbers: 21, 29

cc w/o encl:
D. Scaturo, SCDHEC-Columbia
S. French, SCDHEC-Columbia
M. Reece, SCDHEC-Columbia
G. K. Taylor, SCDHEC-Columbia
G. O'Quinn, SCDHEC–Aiken Environmental Affairs Office
R. H. Pope, EPA-Atlanta

cc w/ encl:
D. Lloyd, EPA-Atlanta
M. McRae, TechLaw, Inc.

**SRS Responses to USEPA Comments on the**
**2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U), CERCLIS Number: 21, 29, SRNS-RP-2018-00573, Revision 0, Dated June 2018, Savannah River Site, Aiken, South Carolina**



**Comments Received December 10, 2018**

EPA COMMENTS:

1. In the Executive Summary, Current Remedial Action, Page ES-2 of ES-8, the text states "Trichloroethylene concentrations are less than the maximum contamination level in all wells in the treatment area, and reductive conditions are present in the treatment area. Trichloroethylene concentrations exceeding the maximum concentration level are located downgradient of the edible oil treatment area in the distal groundwater plume." However, the text in Section 5.4 Analytical Results, Page 20 of 58, indicates the monitoring wells used during the 2015 edible oil injection (i.e., TBG 3, TBG 4, TBG 5, TRW 3, TRW 4R, and TVM 1M) have been experiencing foamy samples causing above normal method detection limits and sample quantitation limits for laboratory analyses. As such, many of the detection limits or estimated quantitation limit (EQL) noted for volatile organic compound (VOC) analyses were greater than the respective maximum contaminant levels (MCLs). Please revise the text in the Executive Summary to address this issue and identify the uncertainty with the VOC analytical results in the treatment area.

   **Response: Clarification.**

   **The Executive Summary correctly stated that trichloroethylene (TCE) concentrations are less than the maximum contaminant level (MCL) in all wells in the edible oil treatment area and exceeded the MCL downgradient of the treatment area. The text in Section 5.4 discussed the laboratory notification of foaming issues associated with 1,4-dioxane analysis at well locations TBG 3, TBG 4, TBG 5, and TRW 3 during the fourth quarter of 2017. Samples from the 2017 fourth quarter sampling event were diluted to improve the integrity of the laboratory instrumentation resulting in above normal method detection limits and sample quantification limits. Foaming was only an issue for one sampling event. Data before and after the fourth quarter of 2017 confirms that reduction conditions are present and TCE concentrations are less than the MCL in the treatment area.**

   **SRS will be more diligent in future annual reports to provide more detailed discussion of constituents and associated wells with EQLs greater than the MCL. No changes are proposed to the 2017 annual report.**

   **Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

2. The last sentence in the Executive Summary, Current Remedial Action, Page ES-2 of ES-8 states "SRS estimates that all trichloroethylene concentrations will be less than the maximum concentration level in two to three years." However, the text in Section 8.1, Summary on Page 53 of 58 states "SRS estimates that TCE concentrations will be less than the MCL in four years." Revise the text in each section to address and explain this discrepancy in the estimated number of years that TCE concentrations will be less than MCLs.

**Response: Agree.**

**The mass calculation presented Section 7.2 estimates that the average concentration of the TCE plume will be less than the MCL in 2020. SRS will continue to calculate the mass of TCE in the plume but will no longer estimate a time to reach MCLs. See response to comment 7 for more details. No changes are proposed for the 2017 annual report.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

3. In the Executive Summary, Groundwater Monitoring, Page ES-3 of ES-8 the last paragraph states "1,4-Dioxane was sampled in 2017 at all monitoring wells during the second and fourth quarter. 1,4-Dioxane was detected in two monitoring wells in 2017." The text in Section 6.7, 1,4-Dioxane, Page 38 of 58, states the laboratory EQL for 1,4-dioxane analysis was elevated and greater than the respective regional screening level for drinking water of 0.46 micrograms per liter (µg/L) in all wells sampled. As such, it is recommended the text be revised in the Executive Summary of the Annual Report to recognize this issue and identify the uncertainty with the 1,4-dioxane analytical results.

**Response: Agree.**

**Please see the response below to comment 3a. SRS will discuss the uncertainty associated with the 1,4-dioxane analysis in future reports as applicable.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

   a. EPA notes again in this TNX EMR as was noted in the previously conditionally approved TNX EMR: 1,4-Dioxane sample quantitation limits remain above the regional screening level (RSL) for 1,4-Dioxane of 0.46 µg/L. EPA maintains a 1,4 dioxane fact sheet that outlines some analytical options that may be useful: https://www.epa.gov/sites/production/files/2014-03/documents/ffrro_factsheet_contaminant_14-dioxane_january2014_final.pdf. Please provide assurance that this RSL will be met in future sampling events.

   **Response: Clarification**

   **There is currently no SC certified laboratory that has detection limits for 1,4-dioxane that can meet the USEPA tap water RSL of 0.46 µg/L. However, SRS is currently in the contractual process of acquiring a laboratory that will be able to run EPA Method 522 to achieve detection limits below the 1,4-dioxane**

**RSL. EPA Method 522 will be implemented for future sampling events when available. In the interim, SRS will provide discussion of the uncertainties associated with the detection limit and/or sample quantitation limit if applicable.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

b. Page 53 of 58, 4th paragraph: report notes "….there does not appear to be a discernable/consistent plume with respect to 1,4 dioxane." EPA suggests that lower detection limits for 1,4 dioxane would provide additional clarity and information if the sampling quantitation limits met the RSL potentially enabling better plume delineation for 1,4 dioxane.

**Response: Agree.**

**Please see the response to comment 3a.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

4. The treatment zone is not clearly defined in Figure ES-3. Comparison of Trichloroethylene Concentration in the Treatment Zone in 2007 and 2017, Page ES-7 of ES-8. For example, the text in the Executive Summary, Current Remedial Action, Page ES-2 of ES-8, states "Trichloroethylene concentrations are less than the maximum contamination level in all wells in the treatment area, and reductive conditions are present in the treatment area. Trichloroethylene concentrations exceeding the maximum concentration level are located downgradient of the edible oil treatment area in the distal groundwater plume." As such, it is uncertain whether monitoring well TRW 2 depicted in the Figure ES-3 with a November 2017 TCE concentration of 24 µg/L is located within the treatment zone or in the distal groundwater plume area since the TCE concentration is greater than the MCL. Revise the report to address this issue.

**Response: Clarification**

**The treatment zone does not include monitoring well TRW2. The treatment zone includes the area immediately around the wells (i.e., TBG 3, TBG 4, TBG 5, TNX 3D, TRW 3, TRW 4R, TVM 1M, TVX002L, TVX003L, TVX004L, TVX005L, and TVX006L) that have been used for edible oil injection. TRW 1 and TRW 2 are located on the T-Area OU cap but are downgradient of the treatment zone. Distal plume**

**definition wells are all located downgradient of the T-Area OU cap. A polygon will be added to the appropriate figures in the 2018 annual report to define the treatment zone.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

5. The last paragraph in Section 2.0, Site Hydrogeology, Page 7 of 58 states "Particle tracking from the groundwater model (WSRC 2000) illustrates westerly flow from TNX source areas to the Savannah River with some water discharging to the X-08 Ditch and wetlands (Figures A-6 and A-7)." In Figure A-13. TNX Area Water Table Elevation Fourth Quarter 2017, Page A-18 of A-50, the groundwater flow path direction depicted near TNX 8D and TNX 36D show a southerly flow path, and away from the X-08 Ditch and Savannah River. The southerly flow path would explain the VOC detections in TNX 8D, TNX 35D and TNX 37D. As such, it is uncertain whether the results of the 2000 groundwater modeling are still valid based on current groundwater flow direction observations and analytical results. Revise the Annual Report to address and explain this issue.

   **Response: Clarification.**

   **Figure A-6 and A-7 of the 2017 annual report were created based on potentiometric data from 1990 to 1996, pre-pump-and-treat conditions, by the 2000 groundwater flow model for the TNX OU. From 1990 to 1996, water elevations were generally 1 to 3 ft higher than in 2017 which might have created a stronger gradient toward the X-08 Ditch during that time. With water elevations lower in 2017, discharge into the X-08 Ditch continues to occur but may be limited to groundwater directly adjacent to the X-08 Ditch, whereas groundwater near TNX 8D, TNX 35D and TNX 37D may be more influenced by the head of the Savannah River. Therefore, the results of the 2000 groundwater flow model are still valid with respect to the hydrogeologic conceptual model for the TNX OU.**

   **Section 2.0 the 2018 annual report will add a statement similar to the following;**

   > **"The flow paths from the 2000 model are based on potentiometric data from 1990 to 1996 and are provided in this report to help support the hydrogeologic conceptual model for the TNX OU."**
   >
   > **Current interpretations of the potentiometric surface and groundwater flow will be provided in appropriate sections and figures.**

   **Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

6. The text in Section 5.4, Analytical Results, Page 20 of 58 states "The monitoring wells used during the 2015 edible oil injection (i.e., TBG 3, TBG 4, TBG 5, TRW 3, TRW 4R, and

TVM 1M) have been experiencing foamy samples. The foam is likely a by-product of the edible oil and the complex biogeochemistry that is occurring in the subsurface." One of the remedial action objectives listed in Section 3.1, Objectives on Page 8 of 58 is to "Return groundwater to beneficial uses." The Annual Report mentions but does not discuss how the production of foam and the complex biochemistry occurring in the subsurface in the treatment area will impact the returning the groundwater to beneficial use, particularly if concentrations of groundwater contaminants of concern (COCs) have attained respective MCLs.

a. Revise the report to provide further clarification and explanation regarding the foam which is hypothesized to be a by-product of edible oil and the complex biogeochemistry in the subsurface.

**Response: Clarification.**

**The foam was only observed during the fourth quarter 2017 sampling event. The laboratory has not reported any foaming issues for the 2018 samples. The foam may have been a temporary by-product of the edible oil or it may be something that resurfaces periodically. SRS expects issues associated with foaming to diminish as carbon introduced into the system has been utilized. Once active remediation of the groundwater has been completed, beneficial reuse of the groundwater can be achieved.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

b. Revise the Annual Report to address the issue of ensuring that groundwater is returned to beneficial use within in the TNX treatment area.

**Response: Clarification.**

**As stated in Section 3.1, one of the objectives of the groundwater remedial action is to return all of the TNX OU groundwater to beneficial use. The geochemistry of the TNX OU groundwater will continue to change until all carbon introduced into the system has been utilized. Discussion will be added to future reports to explain that beneficial reuse of the groundwater will not be achieved until active remediation of the groundwater is complete.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

7. The text in Section 8.1, Summary on Page 53 of 58 states "SRS estimates that TCE concentrations will be less than the MCL in four years." However, based on the time-series plots for TCE at several wells, the remedial cleanup timeframe for TCE is uncertain. For

example, the time-series plot presented for TCE in monitoring well TNX 28D on Page E-256 of E-274 shows an overall increasing trend for TCE concentrations. The second and fourth quarter 2017 TCE concentrations in TNX 28D measured 7.2 µg/L and 12 µg/L, respectively. Additionally, the time-series plot for TCE at monitoring well TRW 2 indicates a non-steady trend currently above the MCL. The second and fourth quarter 2017 TCE concentrations in TRW 2 measured 21 µg/L and 24 µg/L, respectively. As such, it is uncertain whether TCE concentrations will be less than the MCL in all site wells in four years. Revise the Annual Report to address this issue.

**Response: Clarification.**

**The area of the plume and the average concentration of TCE will continue to fluctuate on a year to year basis changing the estimated time reach an average TCE concentration that is less than the MCL. The results in Table 7-8 show that over the last ten years, the plume area and the average concentration of TCE have declined indicating that the edible oil remedial action has been effective at treating VOCs. In 2017, the estimated mass of the TCE plume increased and therefore the estimated time to reach MCLs increased. SRS does not believe that any new mass of TCE has been introduced into the aquifer. The increase in the estimated mass of TCE is likely an artifact of the TCE groundwater plume being displaced during the 2015 edible oil injections. Independent of the calculation, SRS will make all decisions based on empirical data rather than estimated results. Since the estimated time to reach MCLs will likely vary from year to year, SRS will no longer calculate the estimated time to reach MCLs. SRS will continue to calculate the estimated mass of the TCE in the plume, recording the results in Table 7-8 and on Figure A-31 to track changes in the plume with time.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

8. The text in Section 8.1, Summary on Page 53 of 58 states "SRS estimates that TCE concentrations will be less than the MCL in four years." However, the Annual Report does not provide a similar estimate for cleanup of radionuclide contamination. Based on the time-series plots for total recoverable uranium for monitoring wells TBG 4 and TCM 5, Pages E-272 and E-273 of 274 respectively, the remedial cleanup timeframe is uncertain. Please discuss associated remedial cleanup time frames for radionuclides and revise the Annual Report to address this issue.

**Response: Clarification.**

**An estimate for the time to clean up radionuclide contamination is not provided because the agreed to remedial action for radionuclide contaminated groundwater is**

**institutional controls. Institutional controls continue to be an applicable remedy for uranium contaminated groundwater because there is no discernible contaminant plume for uranium, which exists naturally in fluvial sediments in the TNX flood plain making it difficult to differentiate between natural uranium and TNX process derived uranium.**

**Based on 2017 results, there is still no discernible groundwater plume for uranium. Uranium in TNX OU groundwater exceeds the MCL at 2 of 42 monitoring wells, TBG 4 and TCM 5. The recent uranium concentrations at TGB 4 are thought to be associated with increased pH associated with the edible oil injections and the sodium bicarbonate buffer. The high pH conditions are anticipated to be temporary and should return to background conditions as the edible oil is removed from the system. The uranium concentrations at TCM 5 have a longer history of exceeding the MCL. The source of uranium at TCM 5 is unknown. The new monitoring well, XSB006R, agreed to by the Core Team, should help identify if there is an upgradient source of uranium. This well will be installed during 2019.**

**SRS will continue to monitor for uranium at the 42 monitoring wells and XSB006R. If conditions change, then SRS will discuss those changes with the Core Team to determine an appropriate path forward.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

9. In Figure A-13. TNX Area Water Table Elevation Fourth Quarter 2017, Page A-18 of A-50, two groundwater flow paths are depicted in the figure. In the figure one flow path arrow is bounded by the letters A - A' and the other is bounded by the letters B - B'. However, the figure legend does not define or explain the use of the A – A' or B – B' notations. For clarity, revise the figure to address this issue.

**Response: Clarification.**

**The A-A' and B-B' notations on Figure A-13 of the 2017 annual report identify two separate flow paths. A flow rate is calculated for each flow path in Section 5.2. The figure legend will be revised in the 2018 annual report to clarify the significance of the notations.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

**This page intentionally left blank**

**SRS Responses to SCDHEC Comments on the 2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U), CERCLIS Number: 21, 29, SRNS-RP-2018-00573, Revision 0, Dated June 2018, Savannah River Site, Aiken, South Carolina**



**Comments Received October 23, 2019**

General Comments

1. Section 4.1.1 discusses sampling issues at monitoring wells TNX 72S and 72M due to dry conditions. The final paragraph indicates these wells were installed to observe any potential groundwater contamination discharging into the wetlands, and that the conditions of the wetland sediments make it difficult to sample them. This well cluster is approximately 400 feet downgradient from monitoring well TNX 28D, which according to Section 5.4 has a history of TCE detects which have recently exceeded the MCL (7.2 µg/L 2Q, 12 µg/L 4Q). Based on this information, the Department recommends an additional monitoring well installation adjacent to the wetlands border directly between monitoring wells TNX 72S/M/D and TNX 28D, consistent and in line with the layout of wells TNX 16D, 15D and 13D. Section 8 should be updated to include this recommendation.

   **Response: Clarification.**

   **The well cluster at TNX 72 has three screened intervals. The two shallower wells (i.e., TNX 72S and TNX 72M) are not reliable to provide water samples. The deepest well, TNX 72D, has a screen interval at similar elevations as other distal wetland wells and provides a representative groundwater sample downgradient of TNX 28D.**

   **The increase in TCE concentration at TNX 28D has been observed for less than two years. SRS believes it is premature to install a new well at this time. If TCE concentrations continue to be elevated above the MCL at TNX 28D for three consecutive years, SRS will initiate discussions for installation of a new monitoring well as suggested by SCDHEC. No changes are proposed to the 2017 annual report.**

   **Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

Specific Comments

1. Table 4-1, TNX Monitoring Well Network, page 17. Monitoring well TVR 1A is listed twice at the bottom of this table, with different parameters. Please correct.

   **Response: Clarification**

   **Monitoring well TVR 1A is a multi-screened well that was originally installed as a recirculation well. TVR 1A was not successful as a recirculation well and was converted to a monitoring well in 2008. When this well is sampled, groundwater**

**has the potential to enter through the upper and lower screen intervals which is why both sets of screen intervals are included on Table 4-1. No changes are proposed to the 2017 annual report.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

2. Table 7-1, Well Construction and Operation for TNX SVE Wells, page 43. The last column of this table should be updated to include 2017 for all MicroBlower™ wells that operated last year.

**Response: Agree.**

**Table 7-1 will be updated in the 2018 annual report to include all MicroBlowers™ wells that operated during 2018.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

3. Tables 7-2 through 7-6, Monthly SVE Well VOC Mass Removal (2017), pages 45 through 49. The layout and data presented in these tables is confusing. It is not clear why these are not one combined table. Additionally, for each month in each table, the measured VOC concentrations at each Microblower™ well is the same. For the months of November and December, there are several inconsistencies between the measured contaminant concentrations and operating hours; i.e., several wells show 0 operation hours; yet, there are measured VOC concentrations listed for these wells during these months. References to Table 7-3 on page 40 and 7-4 on page 42 indicate that Table 7-2 was probably mistakenly segmented by page, and as a result the corresponding data for each month was skewed. Please correct.

**Response: Agree.**

**A formatting error occurred during publication of the 2017 annual report. Table 7-2 was designed as a single table that spanned multiple pages; however, auto formatting divided Table 7-2 into four separate tables (i.e., Table 7-2 through Table 7-6). Therefore, references to tables throughout the document were incorrect (i.e., Table 7-3 became Table 7-7 and Table 7-4 became Table 7-8). This error will be corrected for the 2018 annual report.**

**Table 7-2 will be restructured so all 12 months are on one table for each SVE well. The revised Table 7-2 will provide monthly and annual mass removal totals for individual wells.**

**The text in Section 7.1 will also be edited to clarify that SVE sampling is conducted quarterly, and the mass removal calculation assumes that VOC concentrations and flow rates are constant for the entire quarter.**

**Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov**

**This page intentionally left blank**