



Department of Energy
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ARF-023081

FEB 11 2021

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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
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 Effectiveness Monitoring Report for the Monitored Natural Attenuation (MNA) at the Chemicals, Metals, and Pesticides (CMP) Pits Operable Unit (OU) (U) April 2019 through March 2020 (SRNS-RP-2020-00291, Revision 0, June 2020) SEMS Number: 24

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) approved the document and the U. S. Environmental Protection Agency (EPA) provided comments on the report on October 15, 2020 and November 13, 2020, respectively. The report will not be revised; however, all comment responses will be included and/or addressed in the next report, as applicable. A Core Team meeting is planned for Spring 2021 to further discuss the responses and the remedy for this unit. 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 Federal Project Director, Karen Adams, at (803) 952-7871.

Sincerely, **Brian T.
Hennessey**

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

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Ms. Susan Fulmer
Mr. Jon Richards

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Enclosure:

SRS Responses to EPA Comments on the Effectiveness Monitoring Report for the Monitored Natural Attenuation (MNA) at the Chemicals, Metals, and Pesticides (CMP) Pits Operable Unit (OU) (U) April 2019 through March 2020 (SRNS-RP-2020-00291, Revision 0, June 2020) SEMS Number: 24

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EPA GENERAL COMMENTS

1. Based on the information presented in the EMR, contingency measures are needed to address unacceptable performance of the selected remedy. Consistent with the EPA MNA guidance document, *“Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites*, Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-17P, April 1999 (EPA MNA Guidance), contingency measures should be implemented if unacceptable performance of the selected remedy should occur. Consistent with the EPA MNA Guidance, the CMP Pits OU groundwater remedy includes 4 of the 5 “trigger” criteria signaling unacceptable performance of the remedy and generally include, but are not limited to, the following:
 - ***Contaminant concentrations in soil or groundwater at specified locations exhibit an increasing trend not originally predicted during remedy selection.*** Lindane concentrations have been increasing since 2016 in well CMP064BU and were slightly above the maximum contaminant level (MCL) in 2019. Tetrachloroethylene (PCE) has been increasing since 2013 in distal plume well CMP8B.
 - ***Near-source wells exhibit large concentration increases indicative of a new or renewed release.*** Recent data in the source area has shown the following:
 - PCE, trichloroethylene (TCE), and /or lindane in well CMP 35D directly north of the CMP Pits have been increasing. Lindane has been increasing since 2013 in CMP35D, and PCE/TCE has been increasing since 2010.
 - PCE concentrations have been increasing in CMP10C since 2013, and TCE has been increasing since 2008.
 - PCE/TCE concentrations have been increasing in well CMP13B since 2001.
 - PCE concentrations have been increasing in well CMP13D since 2009.
 - Increasing trend in PCE/TCE concentrations are noted for well CMP32C since 2001.
 - Increasing trends in PCE/TCE concentrations are noted in well CMP34D since 2008.
 - An increasing trend in PCE concentration is noted for well CMP52C since 2002, and an increasing PCE/TCE concentration trends were observed in CMP52BU since 2005.
 - Finally, an increasing trend in PCE concentration is noted for well CMP058B since 2006.
 - ***Contaminants are identified in monitoring wells located outside of the original plume boundary.*** The EMR indicates modeling did not predict contamination to reach the Gordon Aquifer (GA) above MCLs. Two new monitoring wells were installed in the GA in September 2019, CMP010A and CMP055A. Results from CMP010A indicate that the GA is contaminated above MCLs with PCE, TCE, and also has concentrations of 1,4-dioxane above the USEPA tap water regional screening level (RSL). One well located north of Pen Branch, CMP067B, had detections of PCE and TCE below MCLs during 4Q2019.

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- ***Contaminant concentrations are not decreasing at a sufficiently rapid rate to meet the remediation objectives.*** Remedial timeframe estimates indicate groundwater contamination would remain above MCLs up to another 100 years.

Discussion of contingency measures are needed to address unacceptable performance of the selected remedy is retained as a project need and for future discussions among core team members.

Response: Clarification

Previous modeling conducted to support the CMP Pits ROD had indicated that some increases would occur over time within the CMP Pits plume including LAZ wells and at discharge locations. The estimated cleanup timeframe of 100 years is consistent with what was developed during the first modeling effort and what was identified during the CMS/FS and ROD processes for the CMP Pits groundwater OU.

Contamination below MCLs at well CMP067B that was seen once in 4Q2019 has not been replicated and has been non-detect for all constituents the past 3 sampling events. This well is now being sampled semi-annually instead of annually.

Contamination in Gordon Aquifer (GA) well CMP010A may be due to complications during drilling and well installation. Trends to date show decreasing trends for all contaminants and the vertical profile at the CMP 10 cluster does not support GA contamination.

SRS acknowledges the increases near the CMP Pits source area (trench area) and additional field investigations and sampling are planned for FY21 to further identify vertical contaminant profiles in and around the CMP Pits and to determine any impacts to the GA. These data will be used for further understanding of contaminant conditions at the CMP Pits OU and the need for potential additional characterization/well installation. Discussions on these details and the path forward for CMP Pits will be held with the Core Team in Spring 2021.

Contact: Ashley Shull (803)952-7090 (ashley.shull@srs.gov)

2. The source(s) of contamination is uncertain for the volatile organic compound (VOC) and lindane in the northeast distal groundwater plume. For example, the text in Section 1.2 (Nature and Extent of Contamination), Page 3 of 100, states “Groundwater modeling indicated that the CMP Pits were the source for the main plume. Particle tracking toward and from the northeast plume suggested that its source was different from that of the main plume.” The text presents three hypothesis and/or a combination thereof to explain the current plume(s) geometry and locations relative to potential source areas:
 - A drainage ditch located approximately 361 feet north of the CMP Pits is a possible source area. It is possible that this ditch was used as a dumping location prior to the use of the actual CMP Pits. Additional characterization for the source of the distal plume

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using soil gas surveys indicated that if a source was previously present in the vadose zone, it has been depleted.

- It is also plausible, due to the dry zone areas within the transmissive zone (TZ) and to some degree the middle aquifer zone (MAZ), that one plume separated into two distinct plumes over time.
- Additionally, upwelling of the MAZ as it discharges to the stream most likely brings some contamination up into the TZ.

It is noted that Figure 3, CMP Pits Groundwater OU Conceptual Site Model (CSM), Page 33 of 100, shows a single distinct VOC plume with the CMP Pits as the apparent source of contamination. Additionally, it is noted lindane was detected at a concentration of 0.223 micrograms per Liter ($\mu\text{g/L}$) which exceeds the MCL of 0.2 $\mu\text{g/L}$ in the distal lower aquifer zone (LAZ) plume well MW064BU. However, lindane was not sampled in wells screened in the TZ or MAZ and located in the northeast distal plume area. There is no evidence lindane was disposed of in the drainage ditch. As such, detections of lindane in northeast distal plume wells screened in the TZ and/or MAZ would indicate the CMP Pits is the source of not only lindane contamination but also VOC contamination. **The uncertainty of the source of VOC and lindane contamination, and a current supporting CSM for the northeast distal VOC plume, are retained as data gaps for future core team discussions.**

Response: Clarification

SRS believes the three reasons discussed in the EMR for the distal plume are plausible, adequate, and appropriate for the explanation of the CMP Pits plumes geometry. Further discussions in addition to what is provided in the CMP Pits EMR text associated with the drainage ditch, dry zones, and upwelling near Pen Branch will be discussed with the Core Team during the upcoming Spring 2021 meeting.

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3. **Section 1.2, Nature and Extent of Contamination, Pages 2-4 of 100:** The extent of groundwater contamination is not defined and/or poorly defined for many of the COCs within the upper three runs aquifer (UTRA). For example, a review of the figures indicate the following:

- **Figure 10, 2019 PCE Plume and Groundwater and Surface Water Results for the TZ and MAZ, Page 47 of 102 and Figure 17, 2019 TCE Plume and Groundwater and Surface Water Results in the TZ and MAZ, Page 61 of 100.** Data gaps remain in the horizontal extent of PCE and TCE contamination in the MAZ to the east, as indicated by the dashed plume iso-concentration contours inferring delineation. **The lack of VOC data to delineate the horizontal and vertical extent of contamination in the TZ and MAZ and a supporting CSM will be retained as data gaps for future core team discussion.**

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- **Figure 11, 2019 PCE Plume and Groundwater Results for the LAZ and GA, Page 49 of 100 and Figure 18, 2019 TCE Plume and Groundwater Results for the LAZ and GA, Page 63 of 102:** As seen in the figures, data gaps remain for delineating the horizontal extent of PCE and TCE contamination to the east in the LAZ, as indicated by the dashed plume iso-concentration contours inferring delineation. Additionally, the horizontal and vertical extent of VOC contamination is not defined in the GA, as identified at new GA well CMP10A.
The lack of VOC data to delineate the horizontal and vertical extent of contamination in the LAZ and GA and a supporting CSM will be retained as data gaps for future core team discussion.
- **Figure 12, Cross Section A - A' at the CMP Pits OU Area with 2019 PCE Plume and Results, Page 51 of 100; Figure 25. 2019 Lindane Plume and Groundwater Results for the TZ and MAZ, Page 77 of 100; Figure 26. 2019 Lindane Plume and Groundwater Results for the LAZ and GA, Page 79 of 100; Figure 27. Cross Section A - A' at the CMP Pits OU Area with 2019 Lindane Plume and Results, Page 79 of 100; Figure 28. Cross Section B - B' at the CMP Pits OU Area with 2019 Lindane Plume and Results, Page 83 of 100; and, Figure 29. Cross Section C - C' at the CMP Pits OU Area with 2019 Lindane Plume and Results, Page 85 of 100.** The figures demonstrate lindane is not defined and/or poorly defined horizontally and/or vertically in the TZ, MAZ and LAZ. Additionally, due to the exceedances of VOCs in GA well CMP10A, it is uncertain whether lindane has migrated to the GA.
The lack of lindane data to adequately delineate the horizontal and vertical extent of contamination in TZ, MAZ and LAZ and a supporting CSM will be retained as data gaps for future core team discussion.

It is noted in order for the scope of the problem to be adequately understood and addressed, complete horizontal and vertical delineation of all groundwater COC plume(s) is necessary to ensure attainment of and compliance with the Government Performance and Results Act of 1993 (GPRA) Corrective Action (CA) Milestones CA725 (Human Exposure Controlled) and CA750 (Groundwater Migration Controlled).

Response: Agree/Clarification

SRS continues to monitor the wells and surface water stations that were agreed to in the approved ROD (2004) and subsequent Effectiveness Monitoring Plan (2006). Multiple groundwater and surface water investigations have since been conducted and additional monitoring wells added to the monitoring program. Overall, the plume configuration has changed minimally with the additions of these new monitoring well locations. Since groundwater flow is towards the north/northwest in the TZ/MAZ and west/southwest in the LAZ (north of the CMP Pits), SRS feels the effort to install additional monitoring wells to the east provides limited or no added value. Surface

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water monitoring in the tributary to Pen Branch will be ongoing as an indicator of plume discharge.

Additionally, the GA contamination seen in the new CMP010A well is suspected to be due to complications during drilling and well installation. Trends to date show decreasing levels for all contaminants. Additionally, the vertical profile at the CMP 10 cluster does not support GA contamination. Semiannual sampling will continue at CMP010A and additional field investigations and sampling are planned for FY21 to further identify vertical contaminant profiles between the CMP Pits and the CMP010A well to help determine if the GA has contamination from the source area.

Originally lindane was analyzed at many wells at CMP Pits; however, it was determined that lindane was not detected at many of the wells. Due to the smaller relative size of the lindane plume and general lower mobility, the monitoring of lindane was reduced to wells bounding the plumes as agreed to by USEPA, SCDHEC, and USDOE in 2012.

SRS's plans for the FY21 field investigations will be discussed with the USEPA, SCDHEC and USDOE during the Spring 2021 meeting. The perceived data gaps identified in this comment can also be further discussed, as well as the inclusion of additional wells for lindane monitoring in future sampling events or inclusion in the monitoring network.

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EPA SPECIFIC COMMENTS

- 1. Section 1.3, Observed Hydrostratigraphy at the CMP Pits OU, Page 4 of 100:** The text describing the confining zones for the tan clay confining zone (TCCZ), tan clay lower confining zone (TCLC), and the green clay confining zone (GCCZ) is not consistent with the confining zones shown on Figure 3, CMP Pits Groundwater OU Conceptual Site Model (CSM). For example, the first paragraph states "The confining zones are hummocky, vary in thickness, and can be almost non-existent or leaky in areas." However, the confining zones depicted in Figure 3 are of equal thickness and contiguous throughout the site. **The uncertainty in the thickness and continuity of the confining units across the site and the need for a supporting CSM are retained as a project need for future discussion among core team members.**

Response: Agree with Clarification.

Figure 3 provides a simplified conceptual site model (CSM) depicting the general elevation, thickness, and extent of the confining layers. The description in the text is

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based on detailed core descriptions as well as the behavior of the plume in the area. This level of detail cannot be provided in a simplified CSM. Figure 4 provides structure contours of the TCCZ and TCLC, which demonstrate the “hummocky” nature of the confining units.

The CSM as agreed to in the approved ROD, with minor changes and additions based on comments and further understanding, is provided in the EMR. A review of the CSM can be explored with the Core Team during the Spring 2021 meeting.

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- 2. Section 1.4, Observed Hydrology at the CMP Pits OU, Page 5 of 100:** The text states “Regional groundwater flow for the UTRA, as depicted in Figure 6, is to the northwest towards Pen Branch from CMP Pits.” However, a review of Figure 6, Regional Water Table Potentiometric Surface, Page 39 of 100, does not depict water table elevation control points for the well locations depicted in the figure. As such, the potentiometric water table contours presented in the figure are not supported by site specific water level data.

The uncertainty in the regional groundwater flow and the necessity of a supporting CSM are retained as data gaps and future discussion by core team members.

Response: Clarification

The contours shown on Figure 6 reflect the TZ potentiometric elevations shown on Figure 7. No wells exist north of Pen Branch within a mile that target the TZ or upper water table aquifer. Therefore, the contours are based on water elevations within the CMP Pits MAZ wells on the north side of Pen Branch (levels slightly above those of MAZ levels) and the surface topography and stream features. Water table wells to the south in northern L-Area (orange circles) were used for data points and contouring of the water table surface. Pen Branch is a gaining stream and the water table aquifer flows towards it. SRS does not believe there is significant uncertainty in the water table flow in the vicinity of CMP Pits.

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- 3. Section 1.4, Observed Hydrology at the CMP Pits OU, Page 5 of 100:** Based on the data, it is uncertain whether contaminants on the southern side of Pen Branch are not flowing underneath the stream to the north, as indicated in the text. For example, the text states “Measurements show that groundwater in the vicinity of Pen Branch flows toward Pen Branch on both the southern and northern side of the stream, further supporting that contaminants originating south of Pen Branch from CMP Pits are not flowing underneath Pen Branch towards the north. Water elevations in the LAZ on the north side of Pen Branch are higher than elevations on the south side of Pen Branch.” However, according to Figure 8, 2019 Potentiometric Surface for the LAZ and GA, Page 43 of 100, the water level for LAZ well CMP067B located north of Pen Branch was 195.8 feet (ft) mean sea level (msl) and

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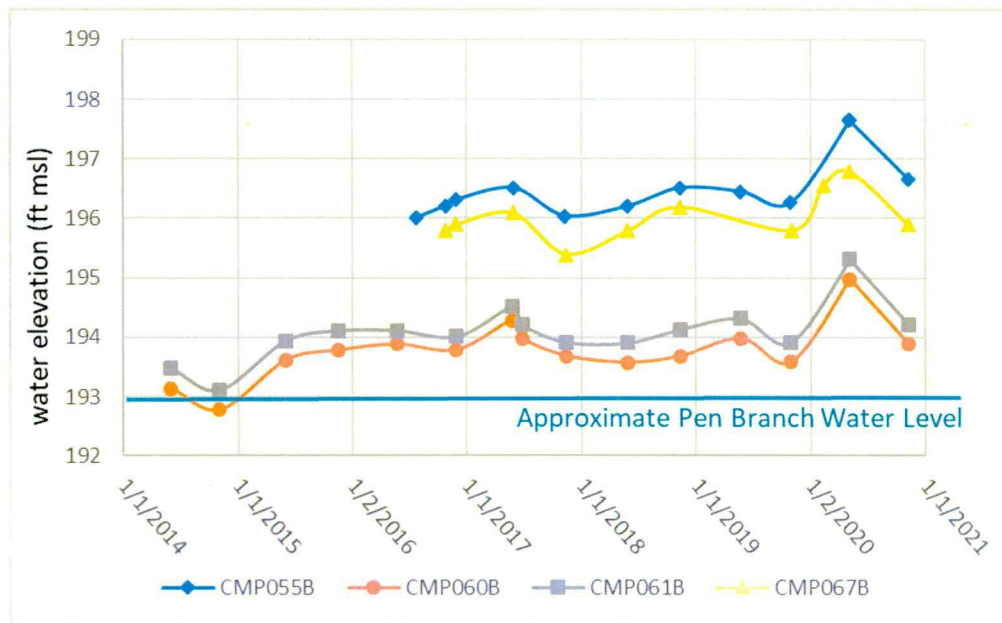
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lower than the 196.26 ft msl water level measured for LAZ well CMP055B located southeast of CMP067B and south of Pen Branch indicating potential flow to the northeast.

The uncertainty of whether contaminants on the southern side of Pen Branch are flowing underneath the stream to the north and a necessity of a current supporting CSM are retained as project needs and for future core team discussion.

Response: Disagree

SRS believes the depiction of the LAZ water table elevation is accurate, especially with the additional well installations over the last 5 years. The gradient between wells CMP055B and CMP067B shown on Figure 8 is 0.46 feet over 800 feet, whereas the gradient between CMP055B and CMP061B to the southwest is 2.35 over 300 feet, indicating flow is about parallel to Pen Branch. Additionally, the water elevation of the Pen Branch stream between well CMP055B and CMP067B is lower than the elevation of the water table (see graph below), which supports flow on both sides of the stream towards the Pen Branch. SRS will continue to monitor the wells on the north side of Pen Branch (CMP067B and CMP066B) on a semiannual basis (Also see response to General Comment #1).



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- Section 2.2.2.1, Groundwater Aquifers, Page 12 of 100:** Total dissolved mass estimates were not presented for each COC over time (e.g. 2008 through present) for each aquifer zone. As such, an evaluation could not be performed on whether the total estimated dissolved masses over time are declining for each COC (i.e., horizontally and vertically), and if the

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total mass is being reduced for each aquifer zone as a supporting line of evidence for natural attenuation, consistent with the EPA MNA Guidance.

Documented reduction in total contaminant mass over time in each aquifer zone is retained as a project need and for future core team discussion and inclusion future reporting efforts.

Response: Clarification

The documented removal of total contaminant from remedial efforts had been reported in the annual EMRs since the approval of those remedial efforts. However, an estimate of the total dissolved mass has not been calculated for each COC over time in general and specifically not for each aquifer zone. Qualifiable evidence of a reduction of mass is presented with the general trends discussed and presented in the reports, as well as, estimates in the modeling that has been performed to better understand the distribution and dissolution of the plume. As such, a discussion of the project need for a mass estimate is welcomed.

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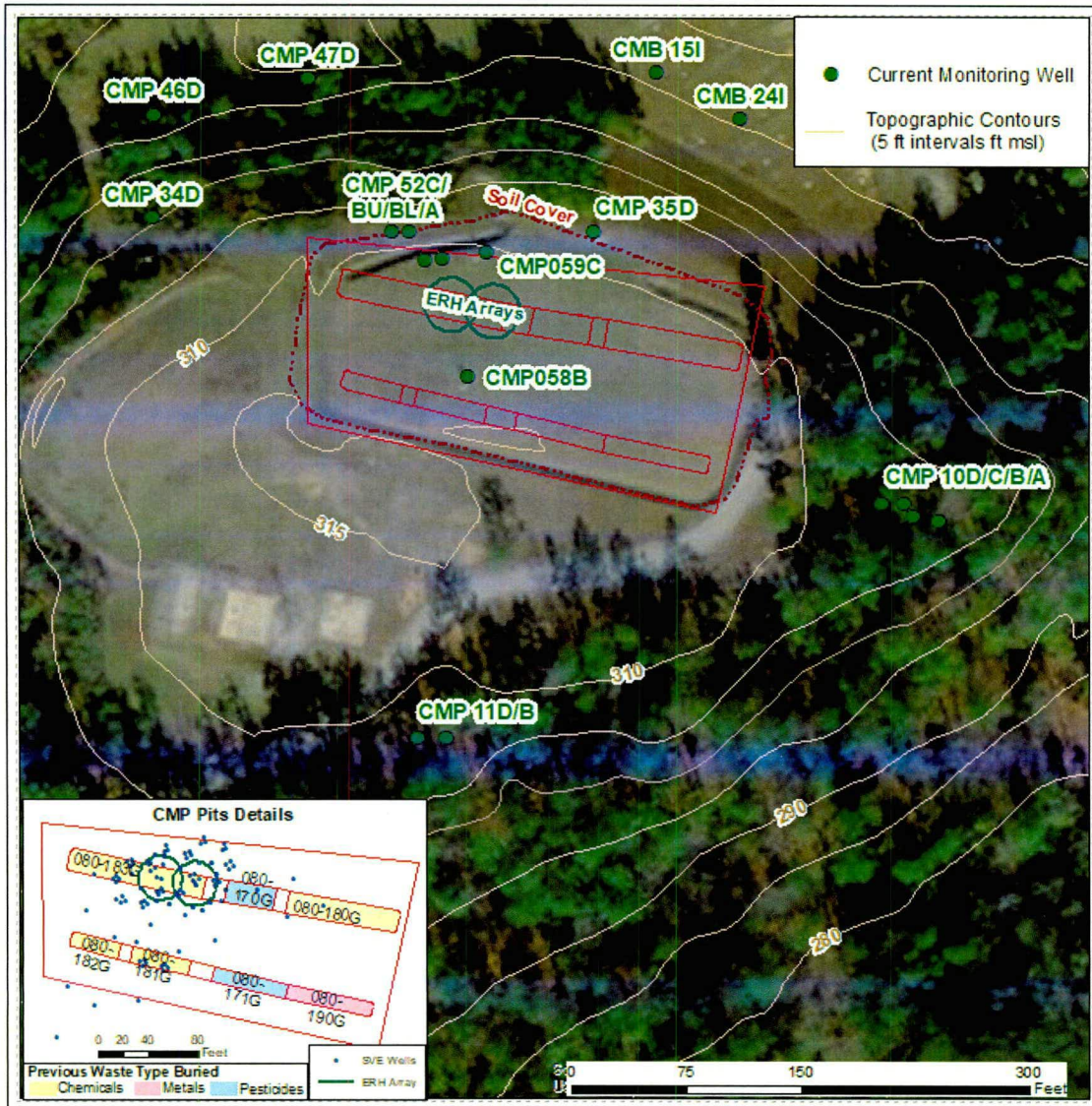
5. **Section 2.2.2.1, Groundwater Aquifers (Transmissive Zone:), Page 12 of 100:** The text incorrectly states a low permeability cap was installed at the CMP Pits that may retard infiltration. A similar statement is made on Page 20 of 100. According to the Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Groundwater Remedies (U) SEMS Number: 00 SRNS-RP-2019-00511 Revision 1 Aiken, South Carolina, July 2020, only a vegetative cover is installed at the CMP Pits.
The uncertainty of whether an engineered cap versus a vegetative cap is installed over the CMP Pits and a need for a supporting CSM are retained as data gaps for future core team discussion.

Response: Clarification

The two main lines of trenches include a synthetic membrane, but does not extend far past the trench footprints and likely doesn't provide any infiltration protection for soils at depth (the vadose zone is 90-100 feet thick). The synthetic membrane was not part of any specific remedy or ROD. As a result, previous borings, ERH installations, and SVE wells have gone through the membrane and were abandoned (grouted) afterwards. A soil cover is installed over the entire area as is depicted below.

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6. **Section 2.2.2.1, Groundwater Aquifers (Transmissive Zone:), Page 12 of 100:** The significance of the non-detect result ($< 50 \mu\text{g/L}$) for TCE in well CMP34D with respect to the elevated detection limits for TCE analysis was not discussed in this section. For example, the text states “The 2Q2019 results were 1,940 $\mu\text{g/L}$ for PCE and non-detect ($<50 \mu\text{g/L}$) for TCE. The 4Q2019 sample results decreased to 1,440 $\mu\text{g/L}$ for PCE and non-detect ($<50 \mu\text{g/L}$) for TCE.” As such, it is uncertain whether TCE concentrations would be detected in CMP34D if appropriate detection limits were achieved. It is unclear why the detection limits for TCE were elevated for these samples as no explanation was provided in the text.
 - a. Please provide information within the document text to address this concern.

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The lack of a representative TCE data from CMP34D is retained as a data gap for future core team discussion.

Response: Agree/Clarification

The high detection limits for TCE are a result of the analytical labs and how they run the samples. Since the PCE result is elevated, the labs use different higher standards that subsequently cause higher detection limits. In the future, SRS will request that the labs run the TCE separately since the levels are usually much lower than the PCE concentrations. Also, data from the 2020 sampling events have been able to achieve lower detection limits and have allowed detections at concentrations that provide non-estimated results. Recent results will be presented to the Core Team in the Spring 2021 meeting.

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7. **Section 2.2.2.1, Groundwater Aquifers (Transmissive Zone:), Page 12 of 100:** Based on the data, it is not clear whether TCE is a parent chlorinated compound and/or a daughter product of tetrachloroethylene (PCE). This issue potentially impacts the cleanup timeframe estimated for restoration of VOC groundwater contamination. For example, the text discusses a complex source composition/history is indicated by the significantly different PCE/TCE ratio between the wells CMP34D and CMP35D.

- a. Please provide information within the document text to address this concern.

The uncertainty of whether TCE is a parent and/or daughter product of PCE and how this impacts estimated cleanup timeframes for groundwater restoration is retained as a data gaps and a future discussion among core team members.

Response: Clarification

It has been documented that both PCE and TCE were disposed of in the area based on reports of those two solvents being inventoried prior to burial in the trenches and/or during excavation of the trenches. With the lack of a robust reductive environment in the upper reaches of the area, the working assumption has been that TCE is a parent product with the most notable exception being that it is also a daughter product in the distal portion of the plume as it enters the wetlands area, which is highly reductive. The modeling efforts included both PCE and TCE. Neither modeling efforts accounted for any reductive degradation of VOCs in the aquifer as a conservative assumption. A discussion of how this impacts the estimated cleanup timeframes has been presented in the modeling efforts for the area and can be discussed with the Core Team in the Spring 2021 meeting.

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8. **Section 2.2.2.1, Groundwater Aquifers Monitored Natural Attenuation Remedy (Lower Aquifer Zone:), Page 15 of 100:** The detection of PCE and TCE in well CMP67B located north of Pen Branch indicates potential groundwater flow from the south under Pen Branch to the north. For example, the text indicates during fourth quarter 2019 (4Q19) well CMP067B measured PCE and TCE below MCLs at concentrations of 1.5 µg/L and 2.47 µg/L, respectively. To confirm the 4Q19 results, CMP067B was resampled in first quarter 2020 (1Q20) and VOC concentrations were all non-detect. However, it is noted the LAZ water level in CMP067B was 0.76 ft higher during 1Q20 than during 4Q19 potentially impacting fate and transport of contaminants and groundwater concentrations. **The uncertainty of whether contaminants on the southern side of Pen Branch are flowing underneath the stream to the north and the necessity for a current supporting CSM are retained as project needs and for future core team discussion.**

Response: Clarification/Disagree

Contamination at well CMP067B that was seen once in 4Q2019 below MCLs has not been replicated and has been non-detect for all constituents in the past three sampling events. This well is now sampled semi-annually instead of annually to provide additional data. As previously discussed in the response to Specific Comment #3, SRS does not believe underflow of Pen Branch is occurring.

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9. **Section 2.2.2.1, Groundwater Aquifers (Lower Aquifer Zone:), Page 16 of 100:** There is no supporting data or lines of evidence to show that the LAZ discharges to Pen Branch at the CMP Pits OU. For example, the text states “Some upward vertical water elevation heads are present in the LAZ closer to Pen Branch (i.e., CMP064BU and CMP064B) which supports that the LAZ is discharging into Pen Branch.” However, the text in Section 1.3, Observed Hydrostratigraphy at the CMP Pits OU, states the LAZ is incised by Pen Branch on the western portion of the stream. It is noted the upward vertical water elevation heads measured at distal plume wells CMP064BU and CMP064B are based on the potentiometric surface (i.e., the level water will rise in a well) of the LAZ. As such, due to the presence of the TCLC, it is not certain whether LAZ discharges to Pen Branch in this area. For example, the TCLC unit depicted in Figures 11 and 12 is not incised and appears uniform in thickness beneath Pen Branch and to the north. **The uncertainty of whether contaminants on the southern side of Pen Branch are flowing underneath the stream to the north and the necessity for a current supporting CSM are retained as project needs for future core team discussion.**

Response: Clarification

SRS agrees that there is uncertainty regarding LAZ discharge to Pen Branch in the eastern portion of the study area, as the top of the TCLC appears to be below the stream elevation. The CSM and cross sections are generalized and the TCCZ, TCLC, and GCCZ can be comprised of sandy clay, silty clay, or clay, and can also consist of

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multiple clay layers. It is possible for contaminants to move through the confining layers in sections comprised of greater sand content. Additionally, due to Pen Branch migration and stream erosion, the soils near and around Pen Branch have been reworked over time and wetland vegetation (root intrusion) can result in preferential vertical transport into the stream. However, four monitoring wells north of the northeastern section of the VOC plume and north of Pen Branch are screened in the MAZ (CMP 56D and CMP 57D) and LAZ (CMP 56B and CMP 57B). These wells were monitored between 2002 and 2017 and never had any detections of VOCs.

The cross section shown in Figure 12 crosses Pen Branch to the east of the portion of Pen branch where the TCLC and LAZ sediments outcrop into the stream channel. At location CMP 60B, the elevation of the top of the TCLC is ~220 feet msl, which is about 30 feet higher than at CMP 55C and CMP 41D. This can be seen on Figure 4. The potentiometric heads at wells CMP 67B and CMP 60B are higher than the stream level at CMP-SW-10, which supports discharge in the western area. (Also see response to Specific Comment #3 and #8).

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10. **Section 2.2.2.12, Lindane, Page 20 of 100:** Based on the data, it is not known whether there is a co-solvency effect between VOC contamination and lindane pesticide contamination. For example, the text states “The VOC solvent plumes have likely mobilized lindane to some degree and/or the contaminant may have originated from a previous alternate dumping spot such as the drainage ditch, if it was used.” There currently is no evidence presented that lindane was disposed of in the drainage ditch. As such, it appears the detection and presence of lindane concentrations indicate facilitated transport due to co-solvency effects with the VOCs directly impacting the fate and transport of lindane. The number of wells sampled for lindane contamination is limited and therefore, the magnitude and extent of lindane contamination may be underestimated, particularly at wells exhibiting relatively high concentrations of PCE and/or TCE and not analyzed for lindane. **The uncertainty associated with the co-solvency effects for PCE/TCE wrt to lindane impact the fate and transport and known magnitude and extent of the dissolved lindane contamination and the necessity for a current supporting CSM are retained as project needs for future core team discussion.**

Response: Clarification

Originally lindane was analyzed for at most of the wells at the CMP Pits OU; however, lindane was not detected at many of the wells. Due to the smaller relative size of the lindane plume and general lower mobility, the monitoring of lindane was reduced to the wells bounding the plumes with USEPA, SCDHEC, and USDOE approval in 2012.

SRS’s plans for the FY21 field investigations will be discussed with the USEPA, SCDHEC and USDOE during the Spring 2021 meeting. The perceived data gaps identified for lindane can also be further discussed, as well as the inclusion of

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additional wells for lindane monitoring in future sampling events or inclusion in the monitoring network.

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11. **Section 2.2.3, Surface Water Sampling Results, Page 22 of 100:** The buffering and attenuation capacity of the aquifer(s) is insufficient to reduce the COCs in groundwater to below MCLs prior to discharge into Pen Branch. For example, the 2018 Additional Data from Independent Analysis performed by South Carolina State College (SCSC), indicated the maximum concentrations of PCE, TCE, cis-1,2-dichloroethylene and vinyl chloride in groundwater samples measured 81 µg/L, 42 µg/L, 99 µg/L and 98 µg/L, respectively. The SCSC groundwater samples collected were a combination of samples taken from beneath the Pen Branch stream bed and locations immediately adjacent to the stream bed using passive diffusion bags (PDBs) and shallow wells. It is noted surface water samples collected for the EMR did not exceed MCLs. However, the SCSC screening level data results offer the best indication of the flux of groundwater contamination just prior to discharge to Pen Branch. The EMR indicates advection and dispersion are the main MNA processes occurring at CMP Pits, with some biodegradation (near Pen Branch). The EMR also states the modeling results show an expected VOC discharge to Pen Branch above MCLs. It is evident from the data that in order to improve the efficacy of the MNA, additional actions will be necessary to ensure the subsurface geochemistry, biochemistry and microbial evidence in the aquifers(s) are sufficient to support complete reductive dechlorination(e.g., bioaugmentation, nutrient amendments, etc.).

The lack of subsurface aquifer geochemistry, biochemistry and microbial data as an additional line of evidence to support complete reductive dechlorination per the EPA MNA guidance along with the need for a supporting CSM and geochemical, biochemical and biological data will be retained as a project need for future core team discussion.

Response: Clarification

It has been previously reported that the upper reaches of the CMP OU do not have a robust environment for reductive dichlorination. The lower reaches of the plume do have that documented in research conducted by SC State University, which has been reported in previous EMRs for the area. That data, although screening level, has indicated a reductive environment in the wetlands and can be discussed with the Core Team at the Spring 2021 meeting. Regardless, MNA was selected in the ROD with an understanding that complete reductive dichlorination was not occurring. The combination of physical and biological attenuation mechanisms and VOC degradation in the wetlands are robust enough to result in minimal, if any, surface water impacts.

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12. **Figure 8, 2019 Potentiometric Surface for the LAZ and GA, Page 43 of 100:** It is not certain whether an easterly flow exists in the GA as indicated in the figure. For example, Figure 8 shows the 180-foot potentiometric contour line turning to the north from CMP 12A to CMP055A and CMP 8A and indicating groundwater flow to the east. However, there are no GA groundwater wells installed between CMP 12A, CMP055A and CMP 8A to provide control of the 180-foot contour. **The uncertainty in the flow direction(s) in the GA along with GA water levels and supporting CSM are retained as a project need and data gaps for future core team discussion.**

Response: Agree/Clarification

As noted in the EMR, the GA is very flat relative to the UTRA as the wells across the CMP Pits area vary in water elevations by less than 2 feet. SRS will prepare a more regional GA potentiometric surface that will be discussed with the Core Team at the Spring 2021 meeting.

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EPA has summarized the list of data gaps and project needs for future team discussions and looks forward to a core team member meeting in early 2021:

1. Discussion of contingency measures are needed to address unacceptable performance of the selected remedy is retained as a project need;
2. The uncertainty of the source of contamination and a current supporting CSM for the northeast distal VOC plume are retained as data gaps;
3. The lack of VOC data to delineate the horizontal and vertical extent of contamination in the TZ and MAZ and a supporting CSM will be retained as data gaps;
4. The lack of VOC data to delineate the horizontal and vertical extent of contamination in the LAZ and GA and a supporting CSM will be retained as data gaps;
5. The lack of lindane data to adequately delineate the horizontal and vertical extent of contamination in TZ, MAZ and LAZ and a supporting CSM will be retained as data gaps;
6. The uncertainty in the thickness and continuity of the confining units across the site and a supporting CSM are retained as a project need;
7. The uncertainty in the regional groundwater flow and supporting CSM is retained as data gaps;
8. Documented reduction in total contaminant mass over time in each aquifer zone is retained as a project need;
9. The uncertainty of whether an engineered cap is installed over the CMP Pits and a supporting CSM are retained as data gaps;
10. The lack of a representative TCE data from CMP34D is retained as a data gap;
11. The uncertainty of whether TCE is a parent and/or daughter product of PCE and how this impacts estimated cleanup timeframes for groundwater restoration are retained as project needs;

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12. The uncertainty of whether contaminants on the southern side of Pen Branch are flowing underneath the stream to the north and a current supporting CSM has been retained as a project need;
13. The uncertainty of whether co-solvency effects impact the fate and transport and known magnitude and extent dissolved lindane contamination and a current supporting CSM are retained as project needs;
14. The lack of subsurface aquifer geochemistry, biochemistry and microbial data as an additional line of evidence to support complete reductive dechlorination per the EPA MNA guidance will be retained as project need, and the need for geochemical, biochemical and biological data and a current CSM are retained as a data gaps; and,
15. The uncertainty in the flow direction(s) in the GA is retained as a project need and GA groundwater levels and supporting CSM are retained as a data gap.

Response: Agree

SRS acknowledges the above concerns and is preparing a presentation and materials to support Core Team discussion of these issues in the Spring 2021 meeting.

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