Department of Energy
Savannah River Operations Office
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MAY 29 2018

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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
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: Action Memorandum and Responsiveness Summary for the Non-Time Critical Removal Action for the P-Area Groundwater Operable Unit (U), SEMS Number: 81

Pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan [40 CFR Section 300.415(b)(2)(i)] that states removal actions shall be considered when there is "*Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants*", the U.S. Department of Energy (DOE) prepared a Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for Trichloroethylene Plumes Discharging to Steel Creek in P-Area Groundwater Operable Unit (SRNS-RP-2017-00372, Revision 1, March 2018) CERCLIS Number: 81. The scope of this removal action is to treat the P-Area Groundwater (PAGW) Operable Unit (OU) trichloroethylene (TCE) groundwater plume(s) prior to discharging into Steel Creek. The regulatory review of the Revision 0 RSER/EE/CA occurred from October 31, 2017 to December 13, 2017.

The Savannah River Site (SRS) received comments from the South Carolina Department of Health and Environmental Control (SCDHEC) and the U.S. Environmental Protection Agency (EPA) on December 13, 2017. The SRS' responses to the EPA's and SCDHEC's comments were incorporated into the Revision 1 RSER/EE/CA, which was made available for public review and comment from April 10, 2018 to May 10, 2018. Comments received during the public comment period are addressed in the enclosed Responsiveness Summary, which will be made part of the Administrative Record. In addition, a notice will be filed in the Environmental Bulletin within two (2) weeks of submittal of the Action Memorandum and Responsiveness Summary to the Administrative Record File/Information Repository File.

P-Area is located within the central portion of SRS ~4.0-km (2.5 mi) east-southeast of the geographical center of SRS and about 6.4 km (4 mi) west of the nearest site boundary. P-Area consists of a closed nuclear reactor building complex and several support facilities that were characterized and identified as sources to soil and groundwater contamination during facility operations between 1954 and 1991. The PAGW OU encompasses the groundwater beneath P-Area, northwest to Steel Creek, northeast

toward PAR Pond and SRS Road F, and southeast to Meyers Branch. PAGW OU includes a volatile organic compound (VOC) groundwater plume containing primarily TCE with minor quantities of tetrachloroethylene, and a larger tritium groundwater plume. Tritium will be addressed in a separate, future decision and is not addressed as part of this removal action.

The TCE groundwater contamination is primarily exhibited in a narrow band north of the P-Reactor and extends west to Steel Creek. The VOC groundwater plumes can be described in three parts based on location: 1) source area, 2) neck area, and 3) distal area.

- Source Area: The source area represents the majority of the VOC groundwater contamination and is centered north of the P-Reactor within the P Area facility area.

- Neck Area: The neck area defines the location where the VOC groundwater plumes are controlled by a buried geologic feature which is believed to have been a stream bed at one time. This buried geologic feature creates a defined narrowing of the groundwater plumes, located west of the P Area facility area, and acts as a transport corridor between the source area and the distal area of the plumes.

- Distal Area: The distal area defines the area of the plumes that are closest to Steel Creek and is referred to as the "elbow portion".

Alternatives associated with treating the neck and distal areas of the plumes are focused on addressing the higher TCE concentrations (above ~5,000 µg/L).

The objective of the removal action is to protect human health and the environment by reducing the mass and downgradient transport of VOCs present in groundwater. Two portions of the groundwater plumes with elevated TCE concentrations, the neck area and the elbow portion of the distal area, were evaluated to determine the best location for a removal action.

Two technologies, Permeable Reactive Barrier (PRB) and In Situ Chemical Oxidation (ISCO), were evaluated as part of the RSER/EE/CA. The analysis for each of these remedial technologies includes the performance monitoring of the groundwater conditions to evaluate the effectiveness of the treatment. The PRB technology involves the emplacement of zero-valent iron into the subsurface barrier to intercept and treat the TCE and any other associated VOCs as they flow through the zone of iron emplacement. The iron is a reactive medium that degrades the TCE into nontoxic dehalogenated organic compounds and inorganic chloride. ISCO technology involves the injection(s) of a chemical oxidant (sodium persulfate), an activator (if needed), and pH buffer. Sodium persulfate oxidizes the TCE in the groundwater plumes and converts the contaminant to non-toxic compounds. Multiple injections may be necessary for the ISCO based on the effectiveness of the initial treatment.

The cleanup alternatives using these technologies that were evaluated based on effectiveness, ease of implementation, and cost were:

Alternative	Description
Alternative 1	No Action
Alternative 2A	PRB in the Neck Area of the TCE Groundwater Plumes
Alternative 2B	PRB in the Elbow Portion of the Distal Area of the TCE Plumes
Alternative 3A	ISCO Using Sodium Persulfate in the Neck Area of the TCE Plumes
Alternative 3B	ISCO Using Sodium Persulfate in the Elbow Portion of the Distal Area of the TCE Plumes

The selected removal action for the PAGW OU is Alternative 2A, PRB in the Neck Area of the TCE Groundwater Plumes. The installation of a PRB in the well-defined highly permeable sediments in the neck area of the TCE plumes will reduce VOC mass, cut off the source area of the plumes and prevent significant VOC migration in groundwater past the treatment zone. This alternative will not preclude any additional remediation of the PAGW OU and is expected to be consistent with the expected final remedial actions at the PAGW OU. The selected alternative will comply with all action- and location-specific ARARs identified in Table A-1 of the enclosed Responsiveness Summary.

Removal action activities are anticipated to commence by April 30, 2019. Upon conclusion of the removal action, a Removal Action Report that summarizes the work will be prepared and submitted to SCDHEC and EPA to document the completion of the removal action.

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
Area Completion Project

IACD-18-151

Responsiveness Summary

The thirty (30) day public comment period for the *Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for* Trichloroethylene Plumes Discharging to Steel Creek in P-Area Groundwater Operable Unit (SRNS-RP-2017-00372, Revision 1, March 2018) CERCLIS Number: 81, began on April 10, 2018 and ended on May 10, 2018.

Public Comments

No comments were received on the RSER/EE/CA from the public during the thirty (30) day public comment period. However, comments were received from the U.S. Environmental Protection Agency (EPA). The comments and the associated responses are addressed below.

1. The Action Memo and RSER/EE/CA currently state that the remedial action objective (RAO) for the non-time critical removal action is *"to reduce the TCE mass in the groundwater plumes so that the mass flux to Steel Creek will ultimately be reduced to a concentration less than the maximum contaminant level (MCL) (<5 µg/L) in surface water."* The RAO needs to be revised to reflect the state's promulgated chemical-specific ARARs, i.e., the ambient water quality criteria, for protection of surface water. The RAO should be revised to read: *"The remedial action objective (RAO) for the non-time critical removal action is to reduce the TCE mass in the groundwater plumes so that the mass flux to Steel Creek will ultimately be reduced to a concentration less than the ambient water quality criteria (AWQC)(2.5 µg/L) in surface water."* The numeric criteria for the protection and maintenance of all classes of surface waters are adopted and are listed in SC R. 61-68, sections E, G, and the Appendix attached thereto. According to SC R. 61-68.E.14.b., for application of numeric criteria to protect human health, where separate numeric criteria are given for organism consumption, water and organism consumption (W/O), and drinking water Maximum Contaminant Levels (MCLs), the *most stringent* of the criteria shall be applied to protect the existing and classified uses of the waters of the State. Thus, the RAO, for protection of freshwaters (FW) must meet the following numerical water quality standards as listed in the Appendix:

   - Tetrachloroethylene (PCE) = 0.69 µg/L (W/O)
   - Trichloroethylene (TCE) = 2.5 µg/L (W/O)
   - Cis-1,2-dichlroethylene = 70 µg/L (MCL)

   Response: Clarification. Given that the groundwater is the target media where treatment will be applied, the removal action objective will be revised in the Action Memorandum to the following:

   "The objective of the removal action is to protect human health and the environment by reducing the mass and downgradient transport of VOCs present in groundwater."

2. Section 2.3- Land Use. Please revise the last sentence to include the AWQC for surface water (based upon protection of human health, W/O). The sentence should read: *"Land use of the entire PAGW OU area will be controlled as part of a future remedial decision in accordance with the SRS Land Use Control Assurance Plan to prevent use of groundwater that exceed MCLs or surface water that exceeds AWQC."*

   Response: Clarification. Land use controls are not included as part of this removal action and are not discussed as part of the Action Memorandum. Therefore, no changes are necessary to the RSER/EE/CA and/or the Action Memorandum.

3. The RSER/EE/CA should indicate that surface water samples will be measured for compliance with the AWQC (TCE, 2.5 µg/L; PCE, 0.69 µg/L; Cis-1,2-dichlroethylene, 70 µg/L) as referenced in comment #1 above. In sections discussing surface water contamination, please include a surface water data summary table and discussion of surface water sampling data in comparison to the AWQC. Currently, the document only compares surface water sampling data against the groundwater MCL (5 µg/L).

   Response: Clarification. The comparisons of groundwater and surface water data against the MCLs provide the justification for taking action, which will treat the VOC concentrations in groundwater. No changes are necessary to the RSER/EE/CA and/or the Action Memorandum.

4. Please replace the ARARs tables in Appendix A of the RSER/EE/CA with the attached ARARs table prepared by the EPA.

   Response: Clarification. The Applicable or Relevant and Appropriate Requirements (ARAR) table included in Appendix A of the RSER/EE/CA has been reviewed in conjunction with the ARAR table provided by EPA. As the objective of the removal action is to reduce the mass of TCE in groundwater, the potential chemical specific MCLs in SC R.61-58 and water classification standards South Carolina (SC) R.61-68 are considered applicable. However, it is recognized that this removal action will not achieve the MCLs within the groundwater plumes. The intent of the action is to reduce the downgradient transport and mass of the VOC contaminants in the plumes; achieving the MCLs will be part of the final remedial decision goals.

   SRS added potential ARARs related to the fugitive dust and offsite disposal of hazardous waste. ARARs for waste piles are not ARARs since this is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action and all environmental media will remain on unit and will continue to serve as an environmental media. In addition, the environmental media does not contain hazardous waste that would render the environmental media as hazardous if offsite disposal was required; however, Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP)

determinations will be performed in the event offsite disposal is necessary to support process knowledge. The ARAR table does include hazardous waste regulations, since waste determinations for any offsite disposal is applicable. Finally, all necessary administrative permits (Underground Injection Control Permit, well program plan, etc.) will be obtained and the action- and location-specific ARARs identified as applicable or relevant and appropriate will be met by the removal action. The revised Table A-1 is provided below.

5. RSER/EE/CA Section 4.0, for alternatives 2A and 2B, indicates that the method of installation of the PRB will be determined upon review of conceptual designs provided by the vendor, thus it is not yet known whether extensive trenching or excavation will occur. Therefore, the attached ARARs table provided by the EPA includes the requirements for staging piles that may be triggered if installation of the PRB involves trenching and temporary staging of contaminated soils prior to those soils being placed back in the trenched areas.

   Response: Clarification. Waste pile regulations will not be identified as ARARs in the revised Table A-1. Waste piles are not necessary for this removal action for the following reasons:

   - ***The environmental media does not contain listed hazardous waste and does not have RCRA TCLP levels that exceed trigger toxicity levels for characteristic hazardous waste.***
   - ***The environmental media will remain on site under this CERCLA action.***
   - ***The environmental media will continue to serve as an environmental media after the removal action is completed.***

   No changes are necessary to the RSER/EE/CA and/or the Action Memorandum.

6. Revise the first sentence on page 13 to state that the objective is to achieve AWQC in Steel Creek. *"Based on data collected from the monitoring well network, it is assumed that four injection campaigns would be required every three years over the course of 10 years in order to sufficiently reduce the mass of TCE in the groundwater in order to be effective at eventually achieving the ~~MCL~~ AWQC in Steel Creek."*

   Response: Clarification. As the objective of the removal action is to reduce the mass and downgradient transport of the TCE plumes, the reference to achieving concentration-based standards in surface water is not present in the Action Memorandum. Therefore, no changes are necessary to the RSER/EE/CA and/or the Action Memorandum.

7. Page 21, alternative 2 – Installation of PRB. Revise discussion of management of soil cuttings to indicate that soil cuttings generated during installation of the PRB will be managed in accordance with all applicable or relevant and appropriate RCRA waste characterization, storage and disposal requirements.

Response: Clarification. The environmental media does not contain listed hazardous waste and does not have TCE levels that exceed trigger toxicity levels for characteristic hazardous waste. Contaminated environmental media requiring offsite disposal will be managed in accordance with offsite ARARs. No changes are necessary to the RSER/EE/CA and/or the Action Memorandum.

8. Section 6.0 – Preferred Removal Action Alternative. Revise the third sentence to read as follows: *"This alternative will ultimately allow surface water concentrations in Steel Creek to achieve the ~~MCL~~ AWQC once the remnant plumes have attenuated."*

Response: Clarification. As the objective of the removal action is to reduce the mass and downgradient transport of the TCE plumes, the selected removal action justification in the Action Memorandum has been revised to, "The installation of a PRB in the well-defined highly permeable sediments in the neck area of the TCE plumes will reduce VOC mass, cut off the source area of the plumes and prevent significant VOC migration in groundwater past the treatment zone."

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Action-specific ARARs ***General Construction Standards — All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)***			
Managing storm water runoff from land-disturbing activities	Must comply with the substantive requirements for stormwater management and sediment control of *NPDES Construction General (CG) Permit for Stormwater Discharges No. SCR100000, issued under R.122.8 and developed consistent with the conditions in R.61-9.122.41 applicable to all permits.*	Large and small construction activities (as defined in R. 61-9 and SCR100000) of more than 1 acre of land – **applicable**	SCDHEC R. 61-9.122.41 and 122.28(a)(2)(i)
	Coverage under the CG Permit requires development of a stormwater management and sediment control plan which is to be consistent, at a minimum, to the substantive standards listed in SC Regulation 72-300, unless specifically exempted by SC Regulation 72-302.A	Large and small construction activities (as defined in R. 61-9 and SCR100000) of more than 1 acre of land – **TBC**	*NPDES Construction General (CG) Permit for Stormwater Discharges*, Permit No. SCR100000
	The stormwater management and sediment control plan shall contain at a minimum the information provided in the following subsections: • A plan for temporary and permanent vegetative and structural erosion and sediment control measures which specify the erosion and sediment control measures to be used during all phases of the land disturbing activity and a description of their proposed operation; • Provisions for stormwater runoff control during the land disturbing activity and during the life of the facility meeting the peak discharge rate and velocities requirements in subsections (e)1. and (e)2. of this section. **NOTE: Alternatives 2A land disturbance is estimated to be less than 1 acre.**	Activities involving more than two (2) acres and less than five (5) acres of actual land disturbance which are not part of a larger common plan of development or sale – **relevant and appropriate**	SCDHEC R. 72-307 I(3)(d) and (e) – *South Carolina Storm Water Management and Sediment Reduction Regulations*
Managing fugitive dust emissions from land disturbing activities	Emissions of fugitive particulate matter shall be controlled in such a manner and to the degree that it does not create an undesirable level of air pollution. Volatile organic compounds shall not be used for dust control purposes. Oil treatment is also prohibited.	Activities that will generate fugitive particulate matter (Statewide) – **applicable**	SCDHEC R. 61-62.6 Section III(a)- *Control of Fugitive Particulate Matter Statewide* SCDHEC R. 61-62.6 Section III(d)

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Injection of fluids, solids, or mixtures into subsurface	No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 *CFR* Part 142 or may otherwise adversely affect the health of persons.	Underground injection into an underground source of drinking water – **applicable**.	40 40 CFR 144.12(a)
	The movement of fluids containing wastes or contaminants into underground sources of drinking water as a result of injection is prohibited if the presence of the waste or contaminant: • May cause a violation of any drinking water standard under R61-58.5; or, may otherwise adversely affect the health of persons. As defined in R.61-87.2: ''Fluid'' means material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state. ''Well'' means any excavation which is cored, bored, drilled, jetted, dug, or otherwise constructed the depth of which is greater than its largest surface dimension; or, a dug hole whose depth is greater than the largest surface dimension; or, an improved sinkhole; or, a subsurface fluid distribution system.	Underground injection of any fluids into the subsurface or ground waters of the State of South Carolina – **applicable**.	SCDHEC R.61-87.5(A) and (B)
	No person shall construct, use or operate a Class V.A. well for injection in violation of R61-87.5. R.61-87.11(E)(1) - Class V.A. injection wells include: (g) Injection wells used in experimental technologies	Class V.A injection wells [as classified in R.61-87.11(E)(1)] – **applicable**	SCDHEC R.61-87.11(E)(2)(b)
Operation of underground injection wells	At a minimum, the following information concerning the injection formation shall be determined or calculated: 1) Fluid pressure; 2) Estimated fracture pressure; 3) Physical and chemical characteristics of the injection zone.	Operation of Class V.A. wells, [as classified in R.61-87.11(E)(1)] – **applicable**	SCDHEC R.61-87.14(D)
	Shall at all times properly operate and maintain all facilities and systems of treatment and controls which are installed or used.		SCDHEC R.61-87.13(X)

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
	Shall report malfunction of injection system which may cause fluid migration into or between underground sources of drinking water; shall immediately stop injection upon determination that the injection system has malfunctioned and could cause fluid migration into or between underground sources of drinking water; shall not restart the injection system until the malfunction has been corrected.		SCDHEC R.61-87.13(EE)
Monitoring of underground injection wells	An appropriate number of monitoring wells shall be completed into the injection zone and into any underground sources of drinking water which could be affected by the injection operation. These wells shall be located in such a fashion as to detect any excursion of injection fluids, process by-products, or formation fluids outside the injection area or zone. If the operation may be affected by subsidence or catastrophic collapse the monitoring wells shall be located so that they will not be physically affected.	Monitoring of Class V.A. wells, [as classified in R.61-87.11(E)(1)]– **applicable**	SCDHEC R.61-87.14(G)(1)
Closure of Class V underground injections wells	Wells must be closed in a manner that complies with the prohibition of fluid movement in 40 CFR 144.82(a)(l). Also, any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well must be disposed or otherwise managed in accordance with substantive applicable Federal, State, and local regulations and requirements.	Closure of Class V wells [as defined in 40 CFR 144.6(e)] – **applicable**	40 CFR 144.82(b)
Action-specific ARARs ***Monitoring Well Installation, Operation, and Abandonment***			
Installation of Permanent and Temporary Monitoring Wells	All monitoring wells shall be drilled, constructed, maintained, operated, and/or abandoned to ensure that underground sources of drinking water are not contaminated.	Construction of *permanent and temporary* monitoring wells, as defined in R. 61-71B – **applicable**	SCDHEC R. 61-71H.1(b)
Installation of Permanent Conventionally Installed or Direct Push Monitoring Wells	Wells shall be grouted from the top of the bentonite seal to the land surface. Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.	Construction of *permanent conventionally installed or direct push* monitoring wells, as defined in R. 61-71B – **applicable**	SCDHEC R. 61-71H.2.a.(1),(2) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(1),(2) *[direct push wells]*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
	The diameter of the annular space shall be large enough to allow for forced injection of grout through a tremie pipe. All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.		SCDHEC R. 61-71H.2.a.(3),(4) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(3),(4) *[direct push wells]*
Installation of Permanent Conventionally Installed or Direct Push Monitoring Wells (cont'd)	A cement or aggregate reinforced concrete pad at the ground surface of appropriate durability and strength, considering the setting and location of each well, that extends six inches beyond the borehole diameter and six inches below ground surface is required. The pad shall be capable of preventing infiltration between the surface casing and the borehole to the subsurface.		SCDHEC R. 61-71H.2.a.(5) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(5) *[direct push wells]*
	Well Construction and Materials Standards – 1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be composed of material so as to minimally affect water quality analyses. 2) Casing shall have a sufficient diameter to provide access for sampling equipment. 3) A properly hydrated bentonite seal with a minimum thickness of twelve inches directly above the filter pack shall be used, if the well has a filter pack. 4) The monitoring well intake or screen design shall minimize formational materials from entering the well. The filter pack 17 shall be utilized opposite the well screen as appropriate in so that parameter analyses will be minimally affected.		

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
	5) A locking cap or other security devices to prevent damage and/or vandalism shall be used. 6) Monitoring wells completed below grade shall be in a watertight vault with a well cap to prevent infiltration of surface water into the well.	Construction of *permanent conventionally installed or direct push* monitoring wells, as defined in R. 61-71B – **applicable**	SCDHEC R. 61-71H.2.b. *[conventionally installed wells]* SCDHEC R. 61-71H.3.c *[direct push wells]*
	All monitoring wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible and shall identify: 1) company name and certification number of the driller who installed the well; 2) date well was completed; 3) total depth (feet); 4) casing depth (feet); 5) screened Interval; 6) designator and/or identification number.		R. 61-71H.2.c. *[conventionally installed wells]* SCDHEC R. 61-71H.3.d *[direct push wells]*
Abandonment of *Permanent Conventionally Installed* Monitoring Wells	Abandonment of permanent conventionally installed monitoring wells shall be by forced injection of grout or pouring through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation. The well shall be filled with either with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout, from the bottom of the well to the land surface.	Abandonment of *permanent conventionally installed* monitoring wells – **applicable**	SCDHEC R. 61-71H.2.e.
Action-specific ARARs ***Waste Characterization and Storage (e.g., soil cuttings from well and/or PRB installation, monitoring well purgewater, wastewaters)***			
Characterization of solid waste	Must determine if solid waste is a hazardous waste using the following method: Should first determine if waste is excluded from regulation under 40 CFR §261.4; and	Generation of solid waste as defined in 40 CFR §261.2 – **applicable**	40 CFR §262.11(a) SCDHEC R. 61-79 §262.11*(a)*
	Must determine if waste is listed as hazardous waste under 40 CFR Part 261.	Generation of solid waste which is not excluded under 40 CFR §261.4(a) – **applicable**	40 CFR §262.11(b) SCDHEC R. 61-79 §262.11*(b)*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR Part 261 by either: 1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR §260.21; or 2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.	Generation of solid waste which is not excluded under 40 CFR §261.4(a) – **applicable**	40 CFR §262.11(c) SCDHEC R. 61-79 §262.11*(c)*
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste – **applicable**	40 CFR §262.11(d) SCDHEC R. 61-79 §262.11*(d)*
Determinations for management of *hazardous* waste [1]	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 CFR 268 *et seq.*. *Note:* This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 CFR 268.9(a) SCDHEC R. 61-79 268.9*(a)*
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 CFR 268.9(a) SCDHEC R. 61-79 268.9*(a)*
	Must determine if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. *Note:* This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 CFR 268.7(a) SCDHEC R. 61-79 268.7*(a)* (1)

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that: • waste is placed in containers that comply with 40 CFR 265.171-173; and • the date upon which accumulation begins is clearly marked and visible for inspection on each container • container is marked with the words "hazardous waste"; or	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 –**applicable**	40 CFR 262.34(a)(1) and (2) SCDHEC R. 61-79 262.34*(a)* (1) and (2) 40 CFR 264.34(a)(3) SCDHEC R. 61-79 262.34*(a)* (3)
	• container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste or 1 quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation – **applicable**	40 CFR 262.34(c)(1) SCDHEC R. 61-79 262.34*(c)* (1)
Use and management of hazardous waste in containers	If container holding waste is not in good condition (e.g. severe rusting, structural defects), or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers – **applicable**	40 CFR 265.171 SCDHEC R. 61-79 265.171
	Must use a container made or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.		40 CFR 265.172 SCDHEC R. 61-79 265.172
	A container holding hazardous waste must always be closed during storage, except when necessary to add or remove waste. A container holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.		40 CFR 265.173(a) and (b) SCDHEC R. 61-79 265.173*(a)* and *(b)*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Storage of hazardous waste in container area[1]	Area must have a containment system designed and operated in accordance with 40 CFR 265.175(b).	Storage of RCRA hazardous waste in containers ***with free liquids*** – **applicable**	40 CFR 264.175(a) SCDHEC R. 61-79 264.175*(a)*
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that ***do not contain free liquids*** (other than F020, F021, F022, F023, F026 and F027) – **applicable**	40 CFR 265.175(c)(1) and (2) SCDHEC R. 61-79 265.175*(c)* (1) and (2)
Closure of RCRA container storage unit [1]	At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soils containing or contaminated with hazardous waste and hazardous waste residues must be decontaminated or removed. [Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with 40 CFR 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262 through 266 of this chapter].	Storage of RCRA hazardous waste in containers in a unit with a containment system – **applicable**	40 CFR 264.178
Action-specific ARARs ***Waste treatment and disposal — e.g., contaminated soils, wastewaters, monitoring well purge water***			
Disposal of solid waste off SRS	Shall ultimately dispose of solid waste at facilities and/or sites permitted or registered by the Department for processing or disposal of that waste stream.	Generation of solid waste intended for off-site disposal – **relevant and appropriate**	SCDHEC R. 61-107.5(D)(3)
Disposal of RCRA-*hazardous* waste in a land-based unit [1]	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at § 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste – **applicable**	40 CFR 268.40(a) SCDHEC R. 61-79 §268.40*(a)*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Land disposal of RCRA-hazardous waste [1]	All underlying hazardous constituents (as defined in 268.2(i)) must meet the Universal Treatment Standards, found in § 268.48, Table Universal Treatment Standards, prior to land disposal as defined in § 268.2(c).	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **applicable**	40 CFR 268.40(e) SCDHEC R. 61-79 §268.40*(e)*
	Must be treated according to the alternative treatment standards in 268.49(c) **or** must be treated according to the Universal Treatment Standards (UTS) [specified in 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous *soils* – **applicable**	40 CFR 268.49(b) SCDHEC R. 61-79 268.49*(b)*
	To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 CFR 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste. If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 CFR 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified.	Land disposal of RCRA toxicity characteristic wastes (D004-D011) that are newly identified (i.e., wastes or soil identified by the TCLP but not the Extraction Procedure) – **applicable**	40 CFR 268.34(f) SCDHEC R. 61-79 268.34*(f)*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Disposal of RCRA wastewaters into CWA wastewater treatment unit	Wastes that are hazardous only because they exhibit a hazardous characteristic, and which are otherwise prohibited under this part, are not prohibited [from land disposal] if the waste meet any of the following criteria, unless the wastes are subject to a specified method of treatment other than DEACT in §268.40, or are D003 reactive cyanide: (i) The wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under section 402 of the Clean Water Act [SC R.61-9 and R. 61-68]; or (ii) The wastes are treated for purposes of the pretreatment requirements of section 307 of the Clean Water Act [SC R. 61-9 and R.61-68]; or (iii) The wastes are managed in a zero-discharge system engaged in Clean Water Act-equivalent treatment as defined in 268.37(a); and (iv) The wastes no longer exhibit a prohibited characteristic at the point of land disposal (i.e., placement in a surface impoundment).	Restricted RCRA characteristic hazardous wastewaters managed in a wastewater treatment system **—applicable**	40 CFR §268.1(c)(4) SCDHEC R. 61-79 §268.1(c)(4)
Action-specific ARARs ***Transportation of Wastes***			
Transportation of hazardous waste *on-site* [1]	The generator manifesting requirements of §262.20 and §262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in §§263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on public or private right-of-way within or along the border of contiguous property under control of same person **– applicable**	40 CFR §262.20(f) SCDHEC R. 61-79 §262.20*(f)*

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
Transportation of samples (i.e. solid waste, soils and wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • the sample is being transported to a laboratory for the purpose of testing; or • the sample is being transported back to the sample collector after testing. • the sample is being stored by sample collector before transport to a lab for testing.	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition – **applicable**	40 CFR §261.4(d)(1)(i)-(iii) SCDHEC R. 61-79 §261.4*(d)* (1)
	In order to qualify for the exemption in 40 CFR 261.4 (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements. • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging.		40 CFR 261.4(d)(2) 40 CFR 261.4(d)(2) (ii)(A) and (B) SCDHEC R. 61-79 261.4*(d)* (2)(ii)(A) and (B)
Chemical-specific ARARs			
Protection of Groundwater [2]	For organic chemicals, establishes maximum contaminant levels as set forth in R.61-58, State Primary Drinking Regulations.	This regulation classifies all groundwater as GB as a potential drinking water source in the state. – **applicable**	SC R. 61-68, Section H.2. Water Classification SC R. 61-68, Section H.9. - Quality Standards for Class GB Groundwaters

Table A-1: Alternative 2A ARARs and TBC Criteria for TCE Plumes Discharging to Steel Creek in PAGW OU

Action	Requirements	Prerequisite	Citation
	Tetrachloroethylene (PCE) = 0.005 mg/L (5 µg/L) Trichloroethylene (TCE) = 0.005 mg/L (5 µg/L) Cis-1,2-dichlroethylene = 70 µg/L	This regulation defines the maximum contaminant levels for Volatile Synthetic Organic Chemicals for public water systems. –**applicable**	SC R.61-58.5.N(2)(e), MCLs for Volatile Synthetic Organic Chemicals (VOCs)
Location-specific ARARs			
Discharge of groundwater during well drilling operations	Discharges to the ground must not impact or reach waters of the state.	Discharges of water to the ground that will not reach surface waters – **TBC**	SRS No Discharge Permit #ND0072125
Protection of Migratory Birds	No person may take, possess, import, export, transport, sell, purchaser, barter or offer for sale, purchase or barter, any migratory bird, or the parts, nests, or eggs of such bird except as under the terms of a valid permit.	Migratory bird populations may be present in the vicinity – **applicable**	16 *USC* 703-704 – Migratory Bird Treaty Act

1- The requirements for treatment, storage and disposal of RCRA *hazardous* wastes contained in this table will be triggered only if offsite disposal (not within the Area of Contamination) is necessary. All waste will be managed per the SRS Investigation-Derived Waste Management Plan.

2- It is recognized that this removal action will not achieve the MCLs within the groundwater plumes. The intent of the action is to reduce the downgradient transport and mass of the VOC contaminants within the plumes with the long-term goal of achieving the MCLs as part of the final remedial decision goals.

Alt = Alternative
CFR = *Code of Federal Regulations*
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
LDR = Land Disposal Restrictions
MCL = Maximum Contaminant Level under Safe Drinking Water Act
NPDES = National Pollutant Discharge Elimination System
PRB = Permeable Reactive Barrier
RCRA = Resource Conservation and Recovery Act of 1976
SCDHEC = South Carolina Department of Health and Environmental Control
TBC = to be considered
TCLP = Toxicity Characteristic Leaching Procedure
UTS = Universal Treatment Standard