



Post-Construction Report Addendum for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U)

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Revision 01 Redline

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LIST OF ABBREVIATIONS AND ACRONYMS

~	approximately
ac	acre
ARP	A-Area Miscellaneous Rubble Pile (731-6A)
ASVE	active soil vapor extraction
cm	centimeter
CMI	Corrective Measures Implementation
CMIR	Corrective Measures Implementation Report
COC	constituent of concern
EC&ACP	Environmental Compliance & Area Completion Projects
<u>ESD</u>	<u>Explanation of Significant Differences</u>
FFA	Federal Facility Agreement
ft	feet
ha	hectare
km	kilometer
LUC	land use control
LUCIP	Land Use Control Implementation Plan
m	meter
MCL	maximum contaminant level
mg/kg	milligram per kilogram
µg/L	microgram per liter
mi	mile
O&M	Operations and Maintenance
OU	operable unit
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PCR	Post-Construction Report
PER	Performance Evaluation Report
PSVE	passive soil vapor extraction
RA	remedial action
RACR	Remedial Action Completion Report
RAIP	Remedial Action Implementation Plan
RAO	remedial action objective
RG	remedial goal
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SR	site restoration
SRNS	Savannah River Nuclear Solutions
SRS	Savannah River Site
SVE	soil vapor extraction
SVEU	soil vapor extraction unit

LIST OF ABBREVIATIONS AND ACRONYMS *(Continued/End)*

T&D	transportation and disposal
TBC	to be considered
TCE	Trichloroethylene
TSCA	Toxic Substance Control Act
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
<u>VOC</u>	<u>volatile organic compound</u>
WSRC	Westinghouse Savannah River Company, LLC
yd³	cubic yard

1.0 INTRODUCTION

1.1 Purpose and Scope

This document serves as an addendum to the Post-Construction Report (PCR) for the closure of the A-Area Miscellaneous Rubble Pile (ARP) (731-6A) Operable Unit (OU). The Revision 1 PCR (Westinghouse Savannah River Company [WSRC] 2004) was approved by the United States Department of Energy (USDOE), United States Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control (SCDHEC) in 2004.

This PCR addendum documents the transition from active soil vapor extraction (ASVE) to passive soil vapor extraction (PSVE). This PCR addendum also documents the soil sampling of the Trenches subunit conducted in July 2018 to demonstrate the progress of the soil vapor extraction (SVE) remedy in reaching the remedial goals (RGs). Revision 1 of the PCR addendum documents agreement by the USDOE, USEPA, and SCDHEC in December 2020 to discontinue operation of the PSVE system permanently. Reporting of groundwater data from selected groundwater wells in five-year remedy review reports will be implemented to support the decision.

The future completion of the remedial action (RA) and other post-construction activities (see Section 7.0) will be reported in the Corrective Measures Implementation Report (CMIR)/Remedial Action Completion Report (RACR) in accordance with the Federal Facility Agreement (FFA) ([1993]).

This report includes the following items:

- A brief description of the OU background, including RA requirements and objectives;
- A chronology of completed events related to remediation of the OU;
- A summary of construction activities performed;

- Deviations from the original design per the approved Corrective Measures Implementation/Remedial Action Implementation Plan (CMI/RAIP);
- Performance standards and quality control inspections, including a summary of performance test results documenting verification of compliance with the acceptance criteria in the CMI/RAIP;
- Certification of construction completion;
- As-built drawings;
- Forecasts of post-construction activities (e.g., operations and monitoring) required for the RA and refers to the CMI/RAIP and the Record of Decision (ROD) (as appropriate); and
- Project costs.

1.1.1 Document Format

This PCR addendum was prepared in accordance with the requirements for submittal of regulatory documents as identified in the FFA (1993) and the latest format for the PCR. The format of this document is consistent with the FFA protocol format approved by the ~~United States Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control (SCDHEC)~~ in March 2003.

~~This~~ The Revision 0 PCR addendum is ~~was being~~ submitted upon completion of the construction of passive operating equipment in June 2017 and after additional characterization of the ash layer and vadose zone soils in July 2018. This Revision 1 PCR Addendum documents agreement to discontinue operation of the PSVE system. A CMIR/RACR will be submitted upon completion of the RA attainment of the RGs.

1.2 Operable Unit Background

The ARP OU is listed as a Resource Conservation Recovery Act 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act Unit in Appendix C of the FFA for the Savannah River Site (SRS).

As shown on Figure 1, the ARP OU is located in the northwest part of the SRS within A Area and immediately east of M Area. It is approximately (~) 1.8 km (1.1 mi) from the nearest Site boundary and 1.1-km (0.7-mi) south-southeast of the intersection of SRS Road 1-A and SRS Road D. The unit covers ~2.35 hectares (ha [5.8 acres {ac}]) and is bounded on the southwest and southeast by outfall drainages that coalesce on the southside of the unit.

The ARP OU has been divided into three subunits: the Piles Area, the Ash Area, and the Trenches Area. The Piles Area (~0.93 ha [2.3 ac]) contains many small mounds (0.61- to 1.52-meters [m {2- to 5-feet} {ft}] high) of construction debris that were disposed of directly on the ground surface. The Ash Area (~0.73 ha (1.8 ac)) contains buried construction debris and an ash layer of ~ 1.22 m (4 ft). The Trenches Area (~0.65 ha [1.6 ac]) contains construction debris and a 2.44- to 3.66-m (8- to 12-ft) deep T-shaped trench. Figure 2 shows the locations of these subunits. Additional details on the history of the waste unit can be found in the ROD (WSRC 2003a). The focus of this PCR Addendum is the volatile organic compound (VOC)(i.e., trichloroethylene [TCE] and tetrachloroethylene [PCE]) contamination in soil at the Trenches Area subunit.

1.3 Remedial Action Requirements and Objectives

1.3.1 Remedial Action Objectives

The remedial action objectives (RAOs) for the ARP OU are based on the human-health risks posed by contaminants in the soil and are presented below as stated in the ROD (WSRC 2003a). The RGs established for the ARP OU are also provided and are included in Table 1 for each refined constituent of concern (COC).

Piles Area

Protect the future industrial worker or resident from exposure to arsenic and lead in the lead hot spot above their respective RGs of 4.4 mg/kg and 400 mg/kg.

- Protect the future industrial worker or resident from exposure to aroclor-1254 (a polychlorinated biphenyl [PCB]) and benzo(a)pyrene (a polyaromatic hydrocarbon [PAH]) in the PCB/PAH waste pile above their respective RGs of 1 mg/kg and 0.052 mg/kg.

Ash Area

- Protect the future industrial worker from exposure to elevated levels of arsenic in the surface soil above the RG of 4.4 mg/kg.

Trenches Area

- Protect the future industrial worker from exposure to arsenic and PAHs in the soil above their respective RGs (4.4 mg/kg for arsenic, see Table 1 for PAHs).
- Prevent leaching of ~~trichloroethylene~~ (TCE) and ~~tetrachloroethylene~~ (PCE) to groundwater above their maximum contaminant level (MCL) (5 microgram per liter [$\mu\text{g/L}$]).

1.3.2 Selected Remedial Action

As stated in the ROD and CMI/RAIP, the selected RA for the ARP OU included the following elements:

- **Piles Area**
 - Removal of the two hot spots and transportation from SRS to a permitted offsite disposal facility
- **Ash Area**
 - Institutional controls, including the installation of access control warning signs around the contaminated area
- **Trenches Area**
 - Placement of a 0.30-m (1-ft) soil cover over the contaminated area
 - Implementation of a ~~soil vapor extraction~~ (SVE) system

- Institutional controls, including the installation of access control warning signs around the contaminated area

1.4 Chronology of Events

A summary of the major milestones and construction activities related to the RA for the ARP OU is provided in Table 2. Refer to Section 7.0 of this PCR addendum for future post-construction activities (e.g., operations and monitoring activities).

In June 2014, the USDOE, USEPA, and SCDHEC discussed transitioning the ASVE remedy selected in the ROD for the Trenches Area subunit to PSVE. Since 2006, there had not been a continuous downward trend of VOC removal indicating that the VOC mass transfer to the air is diffusion limited. In addition, there is a high likelihood that the VOCs are commingled with hydraulic/cutting oils known to be present in the ash that would impede the mass transfer and limit the effectiveness of ASVE. An Explanation of Significant Differences (ESD) submitted in July 2014 documented the transition from ASVE to a PSVE system. Subsequently, the USDOE, USEPA, and SCDHEC determined that a decision document was not required to change the power source for the SVE remedy, and the USDOE retracted the ESD (USDOE 2016).

The USDOE, USEPA, and SCDHEC reached agreement to document the transition from ASVE to PSVE in an addendum to the PCR. In addition, sampling of the soil and ash would be conducted to demonstrate the progress of the SVE remedy in reaching RGs and the data included in the PCR Addendum. The revised strategy resulted in changes to the ARP OU milestones in the FFA. The SCDHEC and USEPA approved the USDOE request on November 4, 2016, and November 8, 2016, respectively (SCDHEC 2016 and USEPA 2016).

On December 16, 2020, the USDOE, USEPA, and SCDHEC reached agreement to discontinue operation of the PSVE system based upon the yearly empirical data reported in previous Performance Evaluation Reports (PERs), as well as the favorable modeling analysis as reported in the *Evaluation of Contaminant Migration and Remedial Goals for the*

A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Trenches Area (U), SRNS-RP-2019-00621, Revision 0 (SRNS 2019a). The PSVE system will be shut down in early 2021 upon USEPA and SCDHEC approval of the SRS response to comments on the Performance Evaluation Report for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit, April 2019 through April 2020 (U), SRNS-RP-2020-00279, Revision 0, July 2020 (SRNS 2020). The final data for the PSVE system will be included in the response to comments. In addition, data from selected groundwater monitoring wells agreed to by the USDOE, USEPA, and SCDHEC will be reported and discussed in five-year remedy reviews for the ARP OU.

Beginning in 2021, annual ARP OU PERs will no longer be required. Appendices D and E of the FFA will be revised to reflect the December 2020 Core Team agreement. The soil cover and Land Use Controls (LUCs) remedy components will remain as described in the Record of Decision Remedial Alternative Selection for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U), WSRC-RP-2001-4197, Revision 1.3 (WSRC 2003b).

2.0 CONSTRUCTION ACTIVITIES

This section provides a summary of the construction activities performed to convert from ASVE to PSVE and the sampling of the Trenches Subunit.

2.1 Operable Unit Construction Team

- The PSVE system was designed by Environmental Compliance & Area Completion Projects (EC&ACP) Engineers.
- The PSVE system was constructed by SRS Construction personnel.
- Sampling of the Trenches Subunit was performed by North Wind, Inc., the EC&ACP environmental services subcontractor.
- The EC&ACP project team provided oversight and supervision of all remediation activities.

2.2 PSVE System

The seven (7) SVE wells that were connected to the 782-3M soil vapor extraction unit (SVEU) were disconnected. These seven (7) SVE wells and the twelve (12) pressure monitoring wells were converted into nineteen (19) PSVE wells. Figure 3 shows a plan view of the nineteen (19) extraction wells. Flow measurement and sample ports were installed on the nineteen (19) PSVE wells. All nineteen (19) PSVE wells are powered by solar power. Figure 4 shows a typical PSVE well.

2.3 Sampling of the Trenches Subunit

Confirmatory sampling of the Trenches Subunit was conducted in accordance with the approved Sampling and Analysis Plan (SAP) (SRNS 2015) to:

- Determine the current concentrations of TCE and PCE in the ash/soil media.
- Determine if hydraulic/cutting oils exist at the site.
- Determine if a correlation exists between the concentrations of ~~volatile organic compound~~ VOCs and hydraulic/cutting oils.
- Determine if ~~volatile organic compound~~ VOCs are partitioned in the hydraulic/cutting oils.
- Determine the effectiveness of the zone of influence for the SVE wells.
- Refine the contaminant migration-~~(CM)~~ modeling assumptions.
- Re-evaluate the COC potential to migrate to groundwater.

Details of the confirmatory sampling and analyses are provided in Sections 4.1 and 4.2.

3.0 DEVIATIONS FROM ORIGINAL DESIGN

3.1 Change Item No. 1

ASVE Transitioned to PSVE

After approximately thirteen (13) years of ASVE operations, diffusion limited the PCE and TCE mass being removed by the ASVE unit. With USEPA and SCDHEC concurrence, seven (7) ASVE wells were disconnected from the SVEU and converted to PSVE wells. Twelve (12) pressure monitoring points were also converted to PSVE wells at that time.

3.2 Change Item No. 2

The SAP called for 64 samples. Only 50 samples were collected.

At Sampling Station 7 and Sampling Station 10, the samplers hit refusal in the cap each time a sample was attempted, including two offsets per station. The refusal was suspected to be caused by rubble. Sample collection was determined to not be feasible at Sampling Stations 7 and 10.

At Sampling Stations 5, 11, 14, 15, and 16, soil was encountered at a shallower depth than planned. The sampling interval from the soil beneath the source material was planned to be 3.7 to 3.9 m (12 to 13 ft).

At Sampling Stations 5, 11, 14, and 15, the soil sample was collected at 3 to 3.4 m (10 to 11 ft) and only two ash samples were collected.

At Sampling Station 16, the soil sample was collected at 2.1 to 2.4 m (7 to 8 ft) and only one ash sample was collected.

Table 3 provides a summary of design changes.

4.0 VERIFICATION SAMPLING, TESTING & ANALYSIS, PERFORMANCE STANDARDS, AND CONSTRUCTION QUALITY CONTROL

4.1 Sampling of the Trenches Subunit

Sampling of the Trenches Subunit was performed in accordance with the approved SAP, with deviations documented in Section 3.2 of this PCR Addendum.

Samples were collected from 14 locations interspersed among the existing well network.

Three (3) samples from the ash source material and one (1) sample from the soil beneath the source material were planned from each boring.

Sampling intervals from the ash source material were planned to be 1.2 to 1.5 m (4 to 5 ft), 2.1 to 2.4 m (7 to 8 ft), and 3 to 3.4 m (10 to 11 ft). Depths were adjusted in the field as needed.

The sampling interval from the soil beneath the source material was planned to be 3.7 to 3.9 m (12 to 13 ft). Depths were adjusted in the field as needed.

Sample results are documented in Table 4.

Sampling locations are shown in Figure 5.

4.2 Trenches Subunit Sampling Results

To summarize the results of the PCE and TCE soil sampling, 25 of the 50 samples had both constituents measured above their approved soil RGs. An additional 8 of the 50 samples had either a PCE or a TCE value above its approved soil RG.

Just two samples indicated the presence of hydraulic/cutting oils. One sample was in ash (Sample Location 2; 1.2 to 1.5 m [4 to 5 ft] deep); the other sample was in soil (Sample Location 8; 3.7 to 3.9 m [12 to 13 ft] deep). Sampling showed that PCE and TCE are not co-mingled with the hydraulic/cutting oils.

Data from the confirmatory sampling event ~~will be~~was evaluated ~~further~~ and presented in greater detail in the ~~next Performance Evaluation Report (PER) due in August~~ July 2019 PER (SRNS 2019b).

4.3 Construction Quality Assurance

The construction team for the PSVE system performed routine quality control inspection activities as required by the applicable and approved construction procedures. To ensure compliance with the design, the project's Subcontract Technical Representative provided necessary construction oversight and monitored construction activities. In his oversight and monitoring activities, the Subcontract Technical Representative was assisted by other SRS departments and organizations (Safety and Health, Engineering, Quality Assurance, Project Management, and USDOE). In addition, the project team performed necessary reviews of construction activities. Progress meetings were conducted to maintain communication within the project team.

5.0 CERTIFICATION OF CONSTRUCTION COMPLETION AND FINAL INSPECTION

5.1 Certification of Construction Completion

Construction activities required for the RA, as detailed in Section 2.0, have been completed. The results of the analytical sampling and testing have been documented, and the records are on file at EC&ACP Document Control Center in the project file. In accordance with the ROD and CMI/RAIP, applicable post-closure activities will be performed as described in Section 7.0 of this PCR.

6.0 AS-BUILT DOCUMENTATION

6.1 As-Built Drawings

Figure 3, "*A-Area Misc Rubble Pile Vapor Extraction Well Locations*," has been prepared to document the as-built condition PSVE wells.

Figure 5, “A-Area Miscellaneous Rubble Pile Ash/Soil Sampling Vapor Extraction Well Locations,” has been prepared to document the sampling locations at the Trenches Subunit.

Figure 6, “A-Area Misc Rubble Pile Vapor Extraction Well Process Flow Diagram,” has been prepared to document the mechanical components of a PSVE well.

7.0 POST-CONSTRUCTION ACTIVITIES

Post-construction activities include five-year remedy reviews, maintenance of the access control warning signs, annual inspection of the soil cover and necessary repair, ~~operation and monitoring the PSVE system, submittal of PERs,~~ and submittal of the CMIR/RACR.

7.1 Remedy Reviews

Section 300.430(f)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan requires that a five-year remedy review be performed if hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure remain in the OU. The next five-year review for the ARP OU will occur in 2022.

7.2 Maintenance and Institutional Controls

The Land Use Control Implementation Plan (LUCIP) developed for and approved with the CMI/RAIP includes the final Field Inspection Checklist, inspection frequency, and area under ~~land use controls~~ (LUCs). The LUCIP details how SRS will implement, maintain and monitor the LUC elements for the ARP OU to ensure that the RAs remain protective of human health and the environment. Inspection and maintenance requirements for the signs and soil cover are also detailed in the LUCIP.

The LUCs for the ARP OU include controlled access to SRS, controlled industrial use of the ARP OU, warning signs at the ARP OU, and deed restrictions (upon property transfer) for future use. Maintenance and institutional controls per the LUCIP will be reported during the five-year review of the remedy.

7.3 PSVE Operations and Monitoring

Based upon modeling and empirical data from the ARP OU and as agreed to by the USDOE, USEPA, and SCDHEC in December 2020, PSVE operations will continue to remediate PCE and TCE in the subsurface will be discontinued in early 2021. Monitoring data from groundwater wells AOB1 and MSB31C will be reported in the five-year remedy review reports in support of the decision.

~~Flow rate and vacuum pressure are measured monthly at the nineteen (19) PSVE wells.~~

~~Concentrations of PCE and TCE are measured annually at the nineteen (19) PSVE wells.~~

~~PSVE operations and monitoring will be continued until soil sample results are below the RGs established in the ROD.~~

7.4 Performance Evaluation Report (PER)

As agreed to by the USDOE, USEPA, and SCDHEC in December 2020, the *Performance Evaluation Report for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit, April 2019 through April 2020 (U)*, SRNS-RP-2020-00279, Revision 0, (SRNS 2020) is the final PER for the ARP OU. A PER for the PSVE system will be submitted to USEPA and SCDHEC annually during the RA.

~~This report will provide the results and analysis of the PSVE operations from the previous year.~~

7.5 Corrective Measures Implementation Report (CMIR)/ Remedial Action Completion Report (RACR)

~~Data from sampling and process and performance monitoring will be used to establish guidelines for shutdown criteria of the PSVE system. Shutdown of the system will be based on soil samples collected from cone penetrometer testing borings at the trenches area. The PSVE system will be shut down when soil sample results for TCE and PCE are below the RGs established in the ROD. The RG for TCE is 0.0877 mg/kg and the RG for PCE is 0.656 mg/kg. The CMIR/RACR will be submitted within 90 days after shutdown~~

of the PSVE system the agreement by the USDOE, USEPA and SCDHEC that the RGs for the ARP OU have been met and that only LUCs are required.

7.6 Post-Construction Schedule

Post-construction activities, as discussed herein, and other activities not addressed in this report, are included in the forecasted implementation schedule provided in Figure 7.

8.0 PROJECT COSTS

Project costs are provided for the PSVE system (Table 5). PSVE was not included in the ROD; therefore, the Cost Delta cannot be calculated. Actual operation~~ing~~ and maintenance (O&M) costs ~~are not available at this time as the PSVE system has been operating for just over one year~~ for the ARP OU are reported in the five-year remedy review reports.

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9.0 REFERENCES

FFA, 1993. Federal Facility Agreement for the Savannah River Site, Administrative Docket No. 89-05-FF (Effective Date: August 16, 1993)

SCDHEC, 2016. Letter, S. B. Fulmer (SCDHEC) to B. T. Hennessey (DOE), *Re: Retraction of the U. S. Department of Energy Signed Explanation of Significant Differences (ESD) for the Revision 1.3 A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Record of Decision (U) (SRNS-RP-2014-00443, Revision 0, July 2014), Removal of the Issue ESD Milestone, and Changes in Regulatory Document Submittals, CERCLIS Number: 30, dated October 31, 2016 and received November 1, 2016, dated November 4, 2016*, S. C. Department of Health and Environmental Control, Columbia, SC

SRNS, 2015. *Sampling and Analysis Plan for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U)*, SRNS-RP-2015-00007, Savannah River Nuclear Solutions, Savannah River Site, Aiken, SC

SRNS, 2019a. *Evaluation of Contaminant Migration and Remedial Goals for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Trenches Area (U)*, SRNS-RP-2019-00621, Revision 0, Savannah River Nuclear Solutions, Savannah River Site, Aiken, SC

SRNS, 2019b. *Performance Evaluation Report for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit, April 2018 through April 2019 (U)*, SRNS-RP-2019-00331, Revision 0, July 2019, Savannah River Nuclear Solutions, Savannah River Site, Aiken, SC

SRNS, 2020. *Performance Evaluation Report for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit, April 2019 through April 2020 (U)*, SRNS-RP-2020-00279, Revision 0, July 2020, Savannah River Nuclear Solutions, Savannah River Site, Aiken, SC

USDOE, 2016. Letter, B. T. Hennessey (DOE) to S. B. Fulmer (SCDHEC) and R. H. Pope (EPA), *Retraction of the U.S. Department of Energy Signed Explanation of Significant Differences (ESD) for the Revision 1.3 A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Record of Decision (U) (SRNS-RP-2014-00443, Revision 0, July 2014), Removal of the Issue ESD Milestone, and Changes in Regulatory Document Submittals, CERCLIS Number: 30, IACD-17-108, dated October 31, 2016*, Department of Energy, Aiken, SC

USEPA, 2016. Letter, R. H. Pope (EPA) to B. T. Hennessey (DOE), *Retraction of the U.S. Department of Energy Signed Explanation of Significant Differences (ESD) for the Revision 1.3 A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Record of Decision (U) (SRNS-RP-2014-00443, Revision 0, July 2014), Removal of the Issue ESD Milestone, and Changes in Regulatory Document Submittals, CERCLIS Number: 30, dated October 31, 2016, dated November 8, 2016, United States Environmental Protection Agency, Atlanta, GA*

WSRC, 2003a. *Corrective Measures Implementation/Remedial Action Implementation Plan (CMI/RAIP) for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U)*, WSRC-RP-2002-4067, Revision 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2003b. *Record of Decision Remedial Alternative Selection for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U)*, WSRC-RP-2001-4197, Revision 1.3, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2004. *Post Construction Report (PCR) for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit(U)*, WSRC-RP-2004-4088, Revision 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

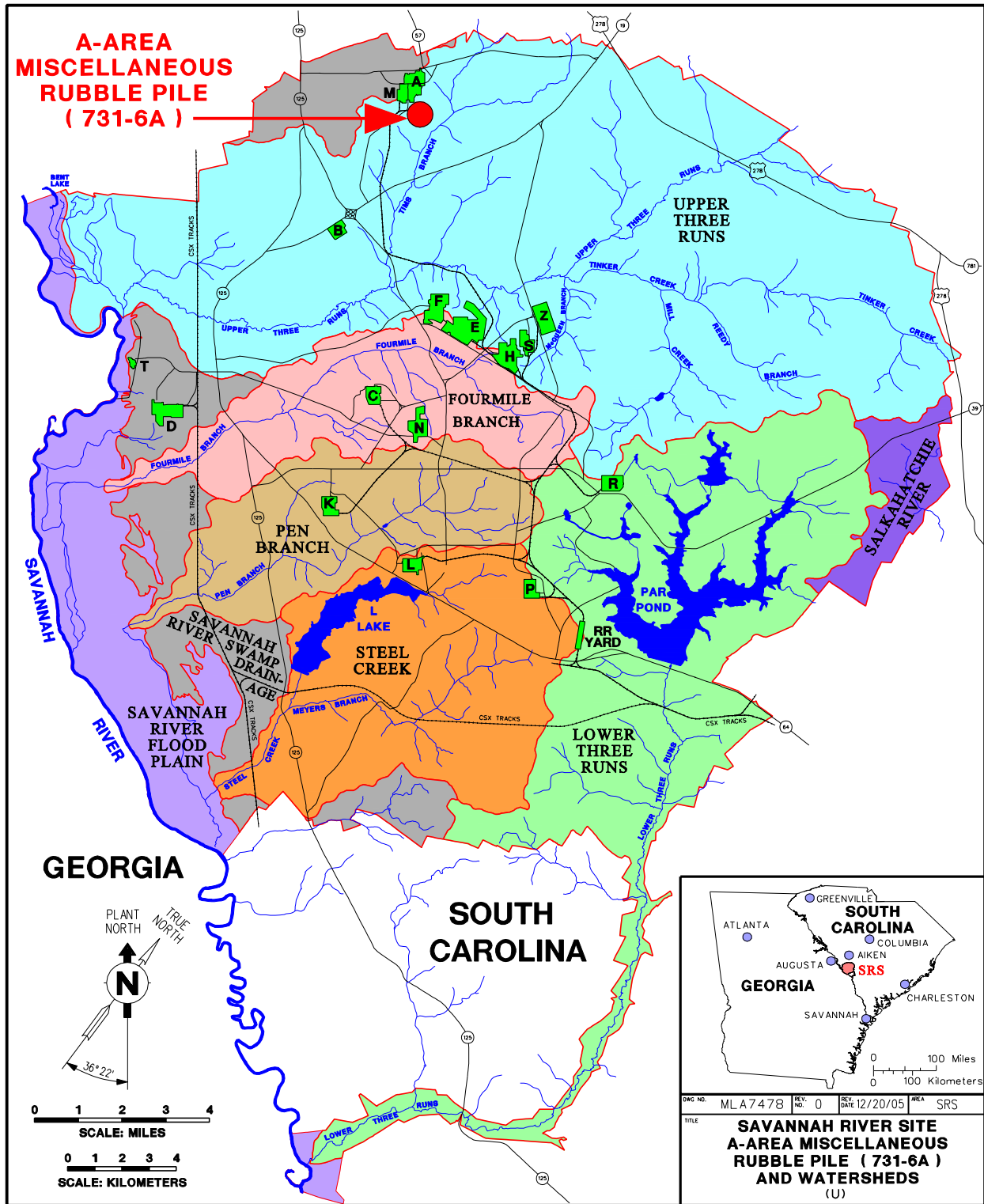


Figure 1. Location of the ARP OU at SRS

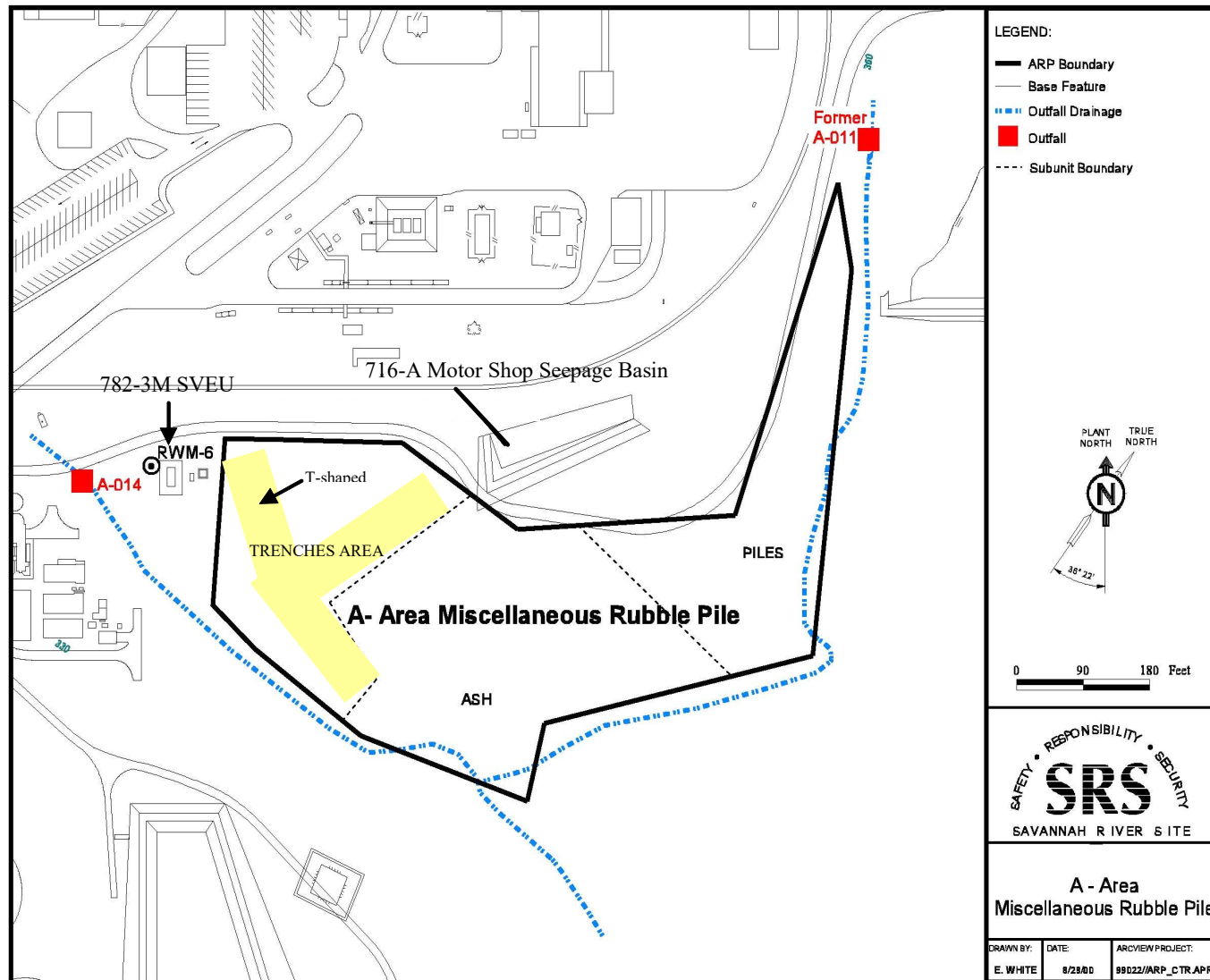


Figure 2. ARP OU (731-6A)

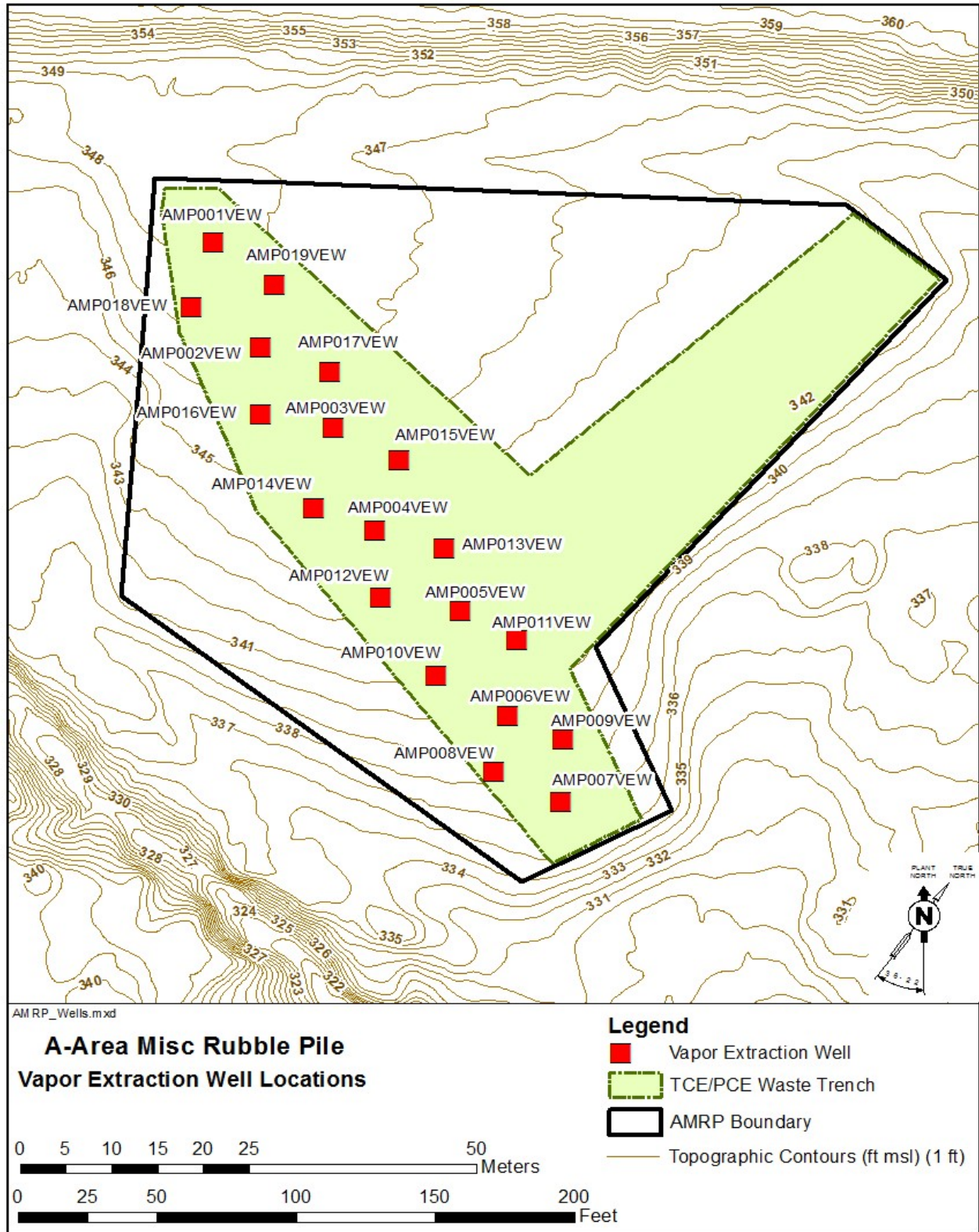


Figure 3. ARP OU Extraction Well Locations



Figure 4. Typical PSVE Well

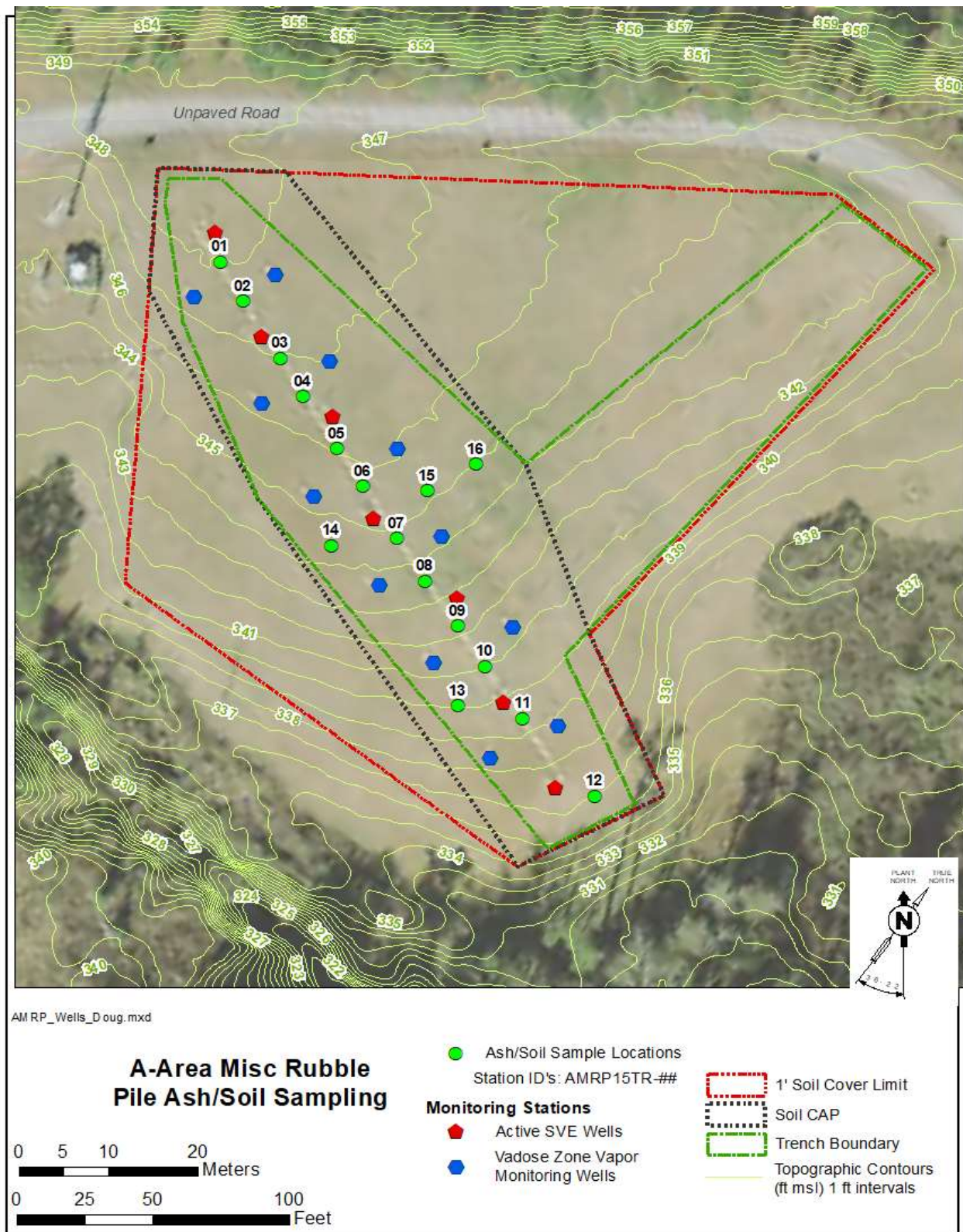


Figure 5. A-Area Miscellaneous Rubble Pile Ash/Soil Sampling Vapor Extraction Well Locations

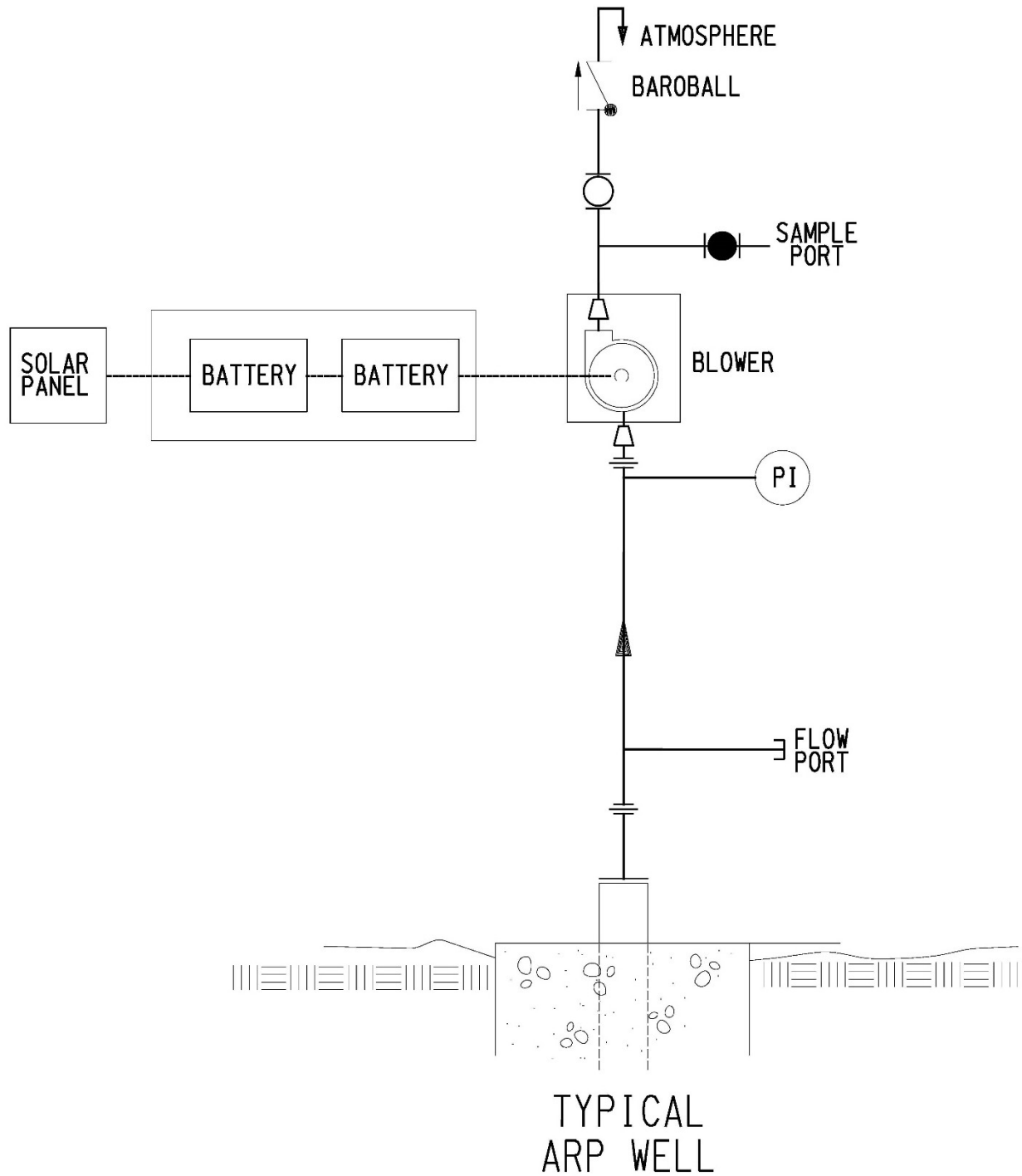


Figure 6. A-Area Miscellaneous Rubble Pile Vapor Extraction Well Process Flow Diagram

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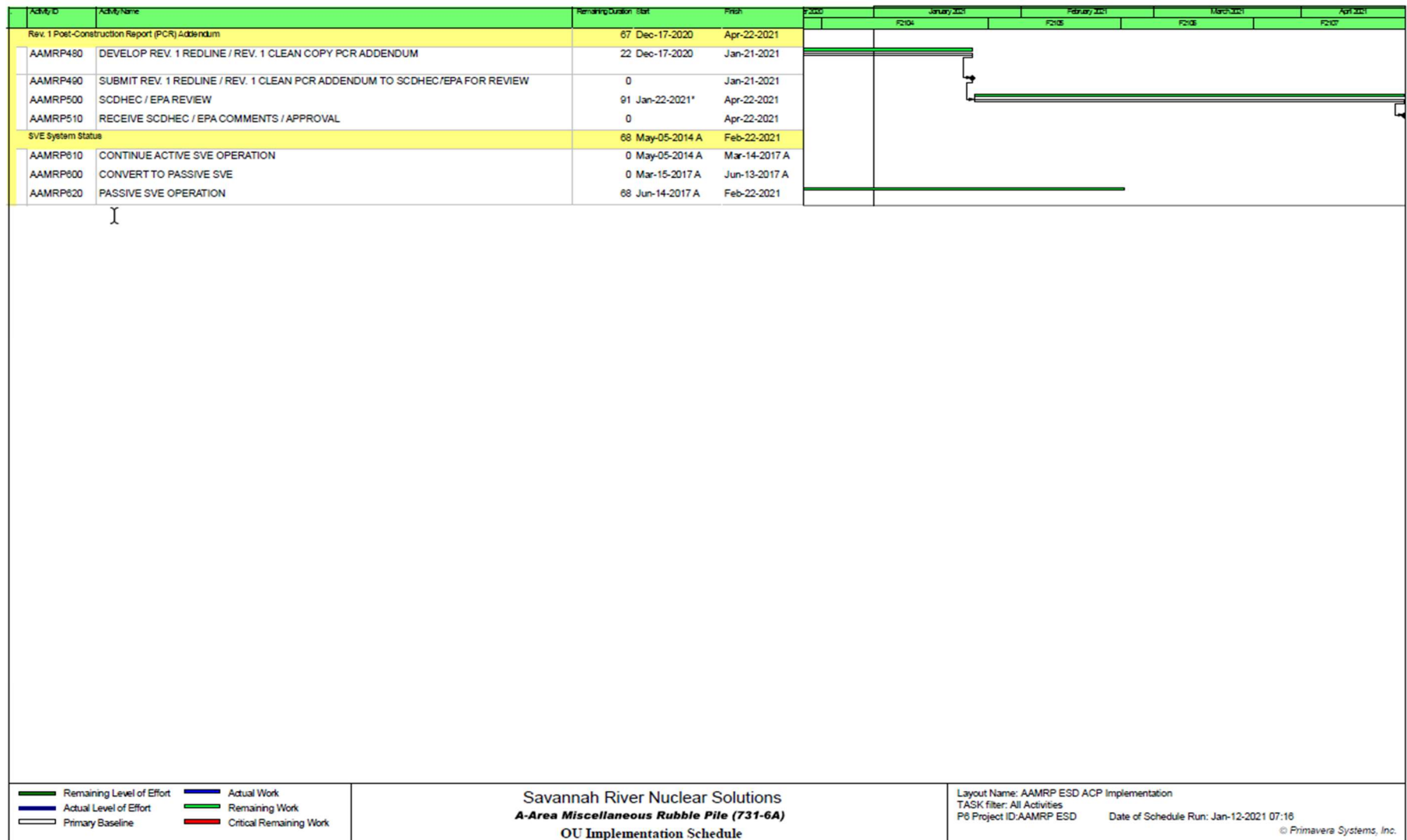


Figure 7. A-Area Miscellaneous Rubble Pile (731-6A) OU Implementation Schedule

Table 1. Remedial Goals

Subunit	Refined COC	Remedial Goal (mg/kg)	Basis
Piles Area			
<i>Lead Hot Spot</i>	Arsenic	4.4400	2X average background
	Lead		USEPA TBC ³ criteria
<i>PCB/PAH Hot Spot</i>	Aroclor-1254	1	TSCA ⁴ action level
	Benzo(a)pyrene	0.052	1 x 10 ⁻⁶ risk level ¹
Ash Area	Arsenic	4.4	2X average background
Trenches Area			
<i>Soil</i>	Arsenic	4.4	2X average background
	Benzo(a)anthracene	2.56	1 x 10 ⁻⁶ risk level
	Benzo(a)pyrene	0.256	1 x 10 ⁻⁶ risk level
	Benzo(a)fluoranthene	2.56	1 x 10 ⁻⁶ risk level
	Dibenzo(a,h)anthracene	0.256	1 x 10 ⁻⁶ risk level
<i>Groundwater</i> ²	Tetrachloroethylene	0.656	Contaminant migration soil
	Trichloroethylene	0.0877	cleanup level

¹The 1x10⁻⁶ risk level is based on a resident scenario, consistent with unrestricted use in the Piles Area.

²Soil RGs were established to meet the RAO to prevent leaching above MCL of 5 µg/L.

³TBC - to be considered.

⁴TSCA - Toxic Substance Control Act.

Table 2. Chronology of Events

Description of Activity	Start Date
Shutdown of Active Soil Vapor Extraction Unit (ASVE) Unit	March 14, 2017
Operation of PSVE system	June 14, 2017
Additional Characterization of ash layer and vadose zone soils	July 16, 2018
<u>USDOE, USEPA, SCDHEC agreed to discontinue operation of the PSVE system.</u>	<u>December 16, 2020</u>

Table 3. Summary of Design Changes

Item	Change	Reason
1	ASVE was transitioned to PSVE.	Diffusion limitations observed in the data for approximately eight (8) years, slow mass removal, and the cost and maintenance required to operate an ASVE system with limited benefit.
2	The SAP called for 64 samples. Only 50 samples were collected.	Two locations hit refusal and no samples were collected. At five locations, soil was reached at a shallower depth than planned, thereby reducing the number of ash samples.

Table 4. Results of Trenches Subunit Sampling

Sample	Depth	Media	PCE	TCE	Oil and Grease
	(ft)				
AMRP15TR-01	4-5	Ash	334	50.9	6,620 (U)
AMRP15TR-01	7-8	Ash	2,080	551	6,660 (U)
AMRP15TR-01	10-11	Ash	3,780	1,460	6,570 (U)
AMRP15TR-01	12-13	Soil	496	157	2,550 (U)
AMRP15TR-02	4-5	Ash	0.917 (J)	0.333 (J)	196,000
AMRP15TR-02	7-8	Ash	1,150	1,050	6,660 (U)
AMRP15TR-02	10-11	Ash	1,350	1,240	6,650 (U)
AMRP15TR-02	12.5-13.5	Soil	971	862	8,270 (U)
AMRP15TR-03	4-5	Ash	33.8	4.86	6,620 (U)
AMRP15TR-03	7-8	Ash	941	674	6,620 (U)
AMRP15TR-03	10-11	Ash	3,380	3,760	6,640 (U)
AMRP15TR-03	15-16	Soil	3,890	2,550	23,800 (U)
AMRP15TR-04	4-5	Ash	211	165	44,500 (J)
AMRP15TR-04	7-8	Ash	1,000	783	6,640 (U)
AMRP15TR-04	10-11	Ash	2,960	4,170	6,650 (U)
AMRP15TR-04	15-16	Soil	4,390	2,970	4,880 (U)
AMRP15TR-05	4-5	Ash	1,100	514	6,610 (U)
AMRP15TR-05	7-8	Ash	2,450	2,320	6,650 (U)
AMRP15TR-05	10-11	Soil	3,550	4,220	6,660 (U)
AMRP15TR-06	4.5-5.5	Ash	685	226	6,660 (U)
AMRP15TR-06	7-8	Ash	2,010	1,220	6,630 (U)
AMRP15TR-06	10-11	Ash	3,270	1,560	6,660 (U)
AMRP15TR-06	12-13	Soil	0.522 (J)	0.421 (J)	4,630 (U)
AMRP15TR-08	4-5	Ash	233	42.9 (J)	6,610 (U)
AMRP15TR-08	7-8	Ash	1,200 (J)	281 (J)	6,640 (U)
AMRP15TR-08	10-11	Ash	1,070	325	4,260 (U)
AMRP15TR-08	12-13	Soil	7.38	0.891 (J)	157,000
AMRP15TR-09	4-5	Ash	136	38.2 (J)	6,620 (U)
AMRP15TR-09	7-8	Ash	511	158	6,660 (U)
AMRP15TR-09	10-11	Ash	382	145	6,650 (U)
AMRP15TR-09	12-13	Soil	1.12 (U)	1.12 (U)	3,520 (U)
AMRP15TR-11	4-5	Ash	1 (U)	1 (U)	2,810 (U)
AMRP15TR-11	7-8	Ash	325	72.9 (J)	6,610 (U)
AMRP15TR-11	10-11	Soil	588	75.3 (J)	2,540 (J)
AMRP15TR-12	4-5	Ash	324	89.3 (J)	6,630 (U)
AMRP15TR-12	7-8	Ash	945	52.5 (J)	6,670 (U)
AMRP15TR-12	10-11	Ash	732	50 (J)	6,550 (U)
AMRP15TR-12	12-13	Soil	0.959 (U)	0.959 (U)	7,450 (U)

Table 4. Results of Trenches Subunit Sampling (Continued/End)

Sample	Depth	Media	PCE	TCE	Oil and Grease
	(ft)				
AMRP15TR-13	4-5	Ash	498	166	5,120 (J)
AMRP15TR-13	7-8	Ash	1,020	557	6,000 (J)
AMRP15TR-13	10-11	Ash	822	359	8,150 (J)
AMRP15TR-13	12-13	Soil	0.644 (J)	0.541 (J)	4,060 (U)
AMRP15TR-14	4-5	Ash	932	438	6,630 (U)
AMRP15TR-14	7-8	Ash	4,140	2,260	6,590 (U)
AMRP15TR-14	10-11	Soil	4,140	1,660	6,590 (U)
AMRP15TR-15	4-5	Ash	316	75.8 (J)	6,650 (U)
AMRP15TR-15	7-8	Ash	838	444	6,660 (U)
AMRP15TR-15	10-11	Soil	1.05 (U)	1.05 (U)	3,140 (U)
AMRP15TR-16	4-5	Ash	313	61.3 (J)	2,360 (J)
AMRP15TR-16	7-8	Soil	0.923 (U)	0.923 (U)	5,330 (U)

U = non-detect
 J = estimated value

Table 5. Project Cost Comparison

	Cost		
	ROD Construction	Incurred Construction	Delta
	(\$)	(\$)	(%)
TRENCHES AREA: PSVE			
PSVE System Direct Capital	0	121,000	N/A
PSVE System Indirect Capital Cost	0	190,000	N/A
PSVE System O&M Costs	0	TBD	N/A

PSVE was not included in the ROD; therefore, the Delta cannot be calculated
 Actual O&M costs are not available as the system has been operating for just over 1 year reported in five-year remedy reports.