



# **Proposed Plan for the Stormwater Outfall A-013 (NBN) Operable Unit (U)**

**SEMS Number: 62**

**SRNS-RP-2020-00135**

**Revision ~~0~~1 Redline**

**~~June~~September 2020**

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Aiken, South Carolina

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## LIST OF ABBREVIATIONS AND ACRONYMS

~	approximate, approximately
AAP	A-Area Ash Pile
ARAR	Applicable or Relevant and Appropriate Requirement
ARF	Administrative Record File
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CM	contaminant migration
CPRB	Coal Pile Runoff Basin
ERA	ecological risk assessment
FFA	Federal Facility Agreement
ft	feet
HHRA	human health risk assessment
IOU	Integrator Operable Unit
km	kilometer
km <sup>2</sup>	square kilometer
LLC	Limited Liability Company
LUCs	Land Use Controls
mi	miles
mi <sup>2</sup>	square miles
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PP	Proposed Plan
PTSM	principal threat source material
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
RSL	regional screening level
SEMS	Superfund Enterprise Management System
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
TCL	target compound list
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WSRC	Washington Savannah River Company, LLC

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## I. INTRODUCTION AND BACKGROUND

### Introduction

This Proposed Plan (PP) is being issued by the United States Department of Energy (USDOE), which functions as the lead agency for Savannah River Site (SRS) remedial activities, with concurrence by the United States Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The purpose of this PP is to describe the preferred remedial alternative for the Stormwater Outfall A-013 Operable Unit (OU), and to provide for public involvement in the decision-making process.

SRS occupies approximately (~) 803 square kilometers (km<sup>2</sup> [310 square miles {mi<sup>2</sup>]]) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS is located ~40.2-kilometers (km [25-miles {mi}]) southeast of Augusta, Georgia, and 32.2-km (20-mi) south of Aiken, South Carolina.

SRS is owned by the USDOE. Management and operating services are provided by Savannah River Nuclear Solutions (SRNS). SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense. Chemical and radioactive wastes are byproducts of nuclear material production processes. Hazardous substances, as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), are currently present in the environment at SRS.

The Stormwater Outfall A-013 OU is located at the SRS in Aiken County, South Carolina (Figure 1). A remedial action is not needed at the Stormwater

Outfall A-013 OU because there are no problems that require remedial action and land use controls (LUCs) are not required. The preferred remedial alternative for the Stormwater Outfall A-013 OU is No Action. As part of the selected remedy, the future land use for the Stormwater Outfall A-013 OU will be unrestricted.

### SRS Compliance History

SRS manages certain waste materials that are regulated under the Resource Conservation and Recovery Act (RCRA), a comprehensive law requiring responsible management of hazardous waste. On December 21, 1989, SRS was included on the National Priorities List. The inclusion created a need to integrate the established RCRA Facility Investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 U.S.C. § 9620, USDOE has negotiated a Federal Facility Agreement (FFA) (FFA 1993) with the USEPA and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements.

Appendix C of the SRS FFA lists the Stormwater Outfall A-013 OU as a CERCLA unit. The Stormwater Outfall A-013 OU is not a solid waste management unit under RCRA 3004(u).

CERCLA requires the public to be given an opportunity to review and comment on the proposed remedial alternatives. Public participation requirements are listed in Sections 113 and 117 of CERCLA 42 U.S.C. § 9613 and 9617. These requirements include establishment of an Administrative Record File (ARF) that documents the investigation and selection of remedial alternatives and allows for review and comment by the public

regarding those alternatives (See Section II). The ARF must be established at or near the facility at issue. The SRS FFA Community Involvement Plan (WSRC 2011) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. Section 117(a) of CERCLA, as amended, requires the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. Because this Stormwater Outfall A-013 OU is not a RCRA 3004(u) solid waste management unit, a RCRA permit notification is not required.

The final remedial decision will be made only after the public comment period has ended and all the comments have been received and considered. Selection of the remedial alternative that will satisfy the FFA requirements will be made by USDOE, in consultation with USEPA and SCDHEC. It is important to note that the final action(s) may be different from the preferred alternative discussed in this plan depending on new information or public comments. The alternative chosen will be protective of human health and the environment and comply with all Federal and State laws.

## II. COMMUNITY PARTICIPATION

The FFA ARF, which contains the information pertaining to the selection of the response action, is available at the following locations:

U.S. Department of Energy  
Public Reading Room  
Gregg-Graniteville Library  
University of South Carolina – Aiken  
471 University Parkway  
Aiken, South Carolina 29803  
(803) 641-3504

Thomas Cooper Library  
Government Information and Maps Department  
University of South Carolina  
1322 Green Street  
Columbia, South Carolina 29208  
(803) 777-4841

Hard copies of the PP are available at the following locations:

Reese Library  
Government Information Department  
Augusta University  
2500 Walton Way  
Augusta, Georgia 30904  
(706) 737-1744

Asa H. Gordon Library  
Savannah State University  
2200 Tompkins Road  
Savannah, Georgia 31404  
(912) 358-4324

The public will be notified of the public comment period through mailings of the SRS Environmental Bulletin, a newsletter sent to citizens in South Carolina and Georgia, and through notices in the *Aiken Standard*, *The Augusta Chronicle*, *The People-Sentinel*, and *The State* newspapers. The public comment period will also be announced on local radio stations.

USDOE will provide an opportunity for a public meeting during the public comment period if significant interest is expressed. The public will be notified of the date, time, and location. At the meeting, the proposed action will be discussed, and questions about the action will be answered.

To request a public meeting during the public comment period, to obtain more information concerning this document, or to submit written comments, contact one of the following:

Angie Benfield  
Savannah River Nuclear Solutions, LLC  
Savannah River Site  
Building 730-1B  
Aiken, South Carolina 29808  
(803) 952-9830  
[Angela.Benfield@srs.gov](mailto:Angela.Benfield@srs.gov)

Following the public comment period, a Record of Decision (ROD) will be signed. The ROD will detail the remedial alternative chosen for this OU and include responses to oral and written comments received during the public.

### III. OPERABLE UNIT BACKGROUND

The Stormwater Outfall A-013 was formerly a subunit of the A-Area Ash Pile (788-A) (AAP), A-Area Coal Pile Runoff Basin (788-3A) (CPRB), and Stormwater Outfall A-013 OU. The USDOE decided to pursue a comprehensive evaluation for disposition of the remaining coal ash waste units at SRS, including the AAP/CPRB. In addition, the Stormwater Outfall A-013 did not receive any discharge or runoff from the AAP/CPRB, but was only included as a subunit due to geographic proximity. For this reason, the AAP (788-A) and CPRB (788-3A) subunits were decoupled from the Stormwater Outfall A-013 subunit, and the milestones associated with the AAP/CPRB OU delayed in order for the USDOE to evaluate and discuss ash disposal options with the regulatory agencies. The Stormwater Outfall A-013 subunit was officially placed on a separate administrative pathway as a single OU in the FFA (Appendix E) in January 2020.

The Stormwater Outfall A-013 OU is located in A Area, which is part of the larger A/M Area in the northwest portion of SRS. It is located in the southern portion of A Area (Figure 2); the AAP and CPRB are also shown on the figure for reference.

Outfall A-013 is a stormwater outfall that drains a small area along a section of abandoned railroad track on the southern end of A Area. A shallow open ditch, ~122-meters (m [400-feet {ft}]) long, follows the railroad track and feeds into a drain pipe and to the outfall. There is a drop in elevation of ~5 m (15 ft) from the inlet drain to the outfall. The outfall and drainage ditch are normally dry; the only flow through the drainage is stormwater during periodic rain events. A photograph of the outfall in 2010 is shown in Figure 3. Potential past releases to this outfall include runoff from the former 716-A Motor Shop and adjacent parking areas located north/northwest of the drainage ditch and outfall, and the Motor Shop Seepage Basin located north of the outfall pipe (Figure 2). The Motor Shop Seepage Basin was closed under a 1998 No Action ROD (WSRC 1998).

Characterization of the Stormwater Outfall A-013 consisted of two (2) phases of sampling. The initial phase of soil sampling was conducted in January 2010 along a conveyance leading to and including Stormwater Outfall A-013. This phase of sampling included four (4) sample locations (A013-01 through A013-04) as shown in Figure 4. Samples were collected from the 0- to 0.3-m (0- to 1-ft) and 0.3- to 1.2-m (1- to 4-ft) below ground surface (bgs) intervals at each location for a total of eight (8) soil samples. In addition, one (1) field duplicate sample was collected from the 0- to 0.3-m (0- to 1-ft) bgs interval. Samples for each interval were analyzed for target compound list (TCL) volatile organic compounds, TCL

semi-volatile organic compounds, TCL pesticides/polychlorinated biphenyls, target analyte list inorganics, mercury, cyanide, gross alpha, non-volatile beta, and gamma pulse height analysis. One (1) sample also was analyzed for alpha spectroscopy (uranium and thorium isotopes).

Following review of the initial sampling results, soil samples were collected in April and May 2011 from three additional soil sampling stations (A013-05 through A013-07) to confirm elevated polycyclic aromatic hydrocarbon (PAH) detections (primarily benzo(a)pyrene), that were apparent in samples that were collected near, and potentially impacted by, an access road (Figure 4). During this second phase of sampling, soil samples were collected from the 0- to 0.3-m (0- to 1-ft) bgs interval at the three (3) locations. In addition, one (1) field duplicate sample and one (1) split sample were collected from the 0- to 0.3-m (0- to 1-ft) bgs. During the second confirmatory stage of sampling, soil samples were analyzed for PAHs only. The Phase 2 data and all of the supporting information for Outfall A-013 are provided in the *RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan and RFI/RI Report with Baseline Risk Assessment and Corrective Measures Study/Feasibility Study for the A-Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), and Stormwater Outfall A-013 (NBN) Operable Unit (U)* (SRNS 2012).

#### IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Due to the complexity and size of multiple waste units located in different areas of the SRS, the site is divided into watersheds for the purpose of managing a comprehensive cleanup strategy. The SRS is

segregated into six watersheds: Upper Three Runs, Lower Three Runs, Fourmile Branch, Steel Creek, Pen Branch, and the Savannah River and Floodplain Swamp. In addition, the SRS also identifies six Integrator Operable Units (IOUs) which are the surface water bodies and associated wetlands that correspond to the six respective watersheds. Waste units within a watershed may be evaluated and remediated individually or grouped with other waste units and evaluated as part of a larger Area OU. Upon disposition of all the waste units within a watershed, a final comprehensive ROD for the corresponding IOU (i.e., surface water and associated wetlands) will be pursued with additional public involvement. The Stormwater Outfall A-013 OU is located within the Upper Three Runs watershed (Figure 1).

#### V. SUMMARY OF SITE RISKS

This section summarizes the nature and extent of contamination at the site and the risks posed to human health and the environment using information developed during the RFI/RI. The following summary of site risks includes key findings made in the baseline risk assessment as part of the RFI/RI document (SRNS 2012).

##### Summary of Human Health Risk Assessment

The human health risk assessment (HHRA) evaluates the potential for adverse effects associated with exposure to constituents present at the Stormwater Outfall A-013 OU. The assessment estimates the risk potential in the absence of any remedial action and provides a basis for determining whether or not remedial action is necessary.

The Stormwater Outfall A-013 OU is located in an area currently designated for industrial land use.

However, in order to support risk management decision making, both unrestricted (i.e., residential) and industrial land use scenarios were evaluated in the HHRA.

The primary pathways for evaluation relative to human receptors include exposure to surface media (0 to 0.3 m [0 to 1 ft]) via incidental ingestion, dermal contact, inhalation of windblown dust, inhalation of volatile constituents, and external exposure from radionuclides. At Stormwater Outfall A-013, the medium of concern is surface soil. Human health refined constituents of concern (RCOCs) are defined as those constituents that are considered for remedial action.

The initial HHRA (SRNS 2012) identified five (5) PAHs as RCOCs for the residential scenario with a total cumulative risk of 1.9E-04. The primary risk driver was benzo(a)pyrene (risk = 1.3E-04). There were no human health RCOCs identified for the industrial worker scenario. However, the initial HHRA considered sample locations that were near an access road, a potential source of elevated PAH concentrations (due to asphalt road materials, vehicle exhaust, motor oil, tar, etc.). At the June 27, 2012, scoping meeting for the AAP/CPRB OU Statement of Basis/Proposed Plan, the USEPA, SCDHEC, and USDOE concluded that the data from sample locations near the access road (i.e., locations A013-04, -05, -06, and -07) were not related to the Stormwater Outfall A-013 and the initial HHRA was biased high. For this reason, the HHRA was revised to include only data from the sample locations determined to be directly related to the outfall (i.e., locations A013-01 through A013-03). Appendix A of this document, *Stormwater Outfall A-013 Operable Unit Risk Evaluation*, provides the revised human health risk estimates. In

June 2017 the USEPA regional screening levels (RSLs) for the PAHs were updated based on a new toxicological profile. The RSLs increased by an order of magnitude for both the residential and industrial worker scenarios. As shown in Tables A1 and A2 of Appendix A, no constituents had a risk greater than 1E-06 for ~~the~~ either the residential or industrial worker scenario. The November 2019 RSLs were used to calculate risk. Based on the revised risk assessment, there are no human health RCOCs and there are no problems warranting action at Stormwater Outfall A-013 OU that would require remedial action.

There is no current or projected future use of groundwater as a drinking water source. Groundwater is not part of the Stormwater Outfall A-013 OU and is addressed separately under the M-Area Hazardous Waste Management Facility RCRA Permit. Therefore, a formal HHRA on groundwater was not performed.

#### Summary of Ecological Risk Assessment

The ecological risk assessment (ERA) consists of steps designed to provide a scientifically based and defensible evaluation of exposure and hazard to ecological resources that will support a risk management decision regarding site remediation. This OU is located in an industrially developed area and does not provide prime wildlife habitat but may be frequented by terrestrial receptors.

The ERA concluded that contaminants are not present in the soil media that would pose a hazard to ecological receptors (SRNS 2012). Therefore, no ecological RCOCs are identified for the Stormwater Outfall A-013 OU.

### Summary of Contaminant Fate and Transport Analysis

To determine the potential for groundwater contamination, a contaminant migration (CM) analysis was performed to assess the migration potential of residual vadose zone contaminants. It was concluded that contaminants are not present in any OU soils that would leach to groundwater at concentrations greater than drinking water standards within 1,000 years (SRNS 2012). Therefore, no CM RCOCs are identified for the Stormwater Outfall A-013 OU.

No principal threat source material (PTSM) was identified at the Stormwater Outfall A-013 OU.

### Conclusion

No PTSM, human health, ecological, or CM RCOCs are identified at the Stormwater Outfall A-013 OU. There is no current or potential threat to human health, welfare, or the environment. Therefore, No Action is the appropriate remedial response for the Stormwater Outfall A-013 OU.

### VI. REMEDIAL ACTION OBJECTIVES

There is no current or potential threat to public health, welfare, or the environment from the Stormwater Outfall A-013 OU. There are no potential applicable or relevant and appropriate requirements (ARARs) for this OU. Therefore, no remedial action objectives are required, and no remedial goal options are established.

### VII. SUMMARY OF REMEDIAL ALTERNATIVES

#### No Action

Under this alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume at the Stormwater Outfall A-013 OU. This alternative would leave the OU in its current condition with no additional controls. This alternative would not require five-year remedy reviews.

The Stormwater Outfall A-013 OU poses no unacceptable risk based on an unlimited exposure and unrestricted land use scenario. For this reason, a No Action alternative has been identified as the preferred remedial alternative. The OU poses no risk to human health and the environment based on unrestricted land use; therefore, no LUCs are required.

### VIII. EVALUATION OF ALTERNATIVES

According to USEPA guidance, if there is no current or potential threat to human health and the environment and no action is warranted, the CERCLA 121 requirements are not triggered. If the requirements are not triggered, there is no need to evaluate other cleanup alternatives or to evaluate the No Action alternative against the nine remedy selection criteria under CERCLA. These nine criteria are used as a basis for selecting cleanup remedies that are protective of human health and the environment, implementable, cost-effective, and acceptable to the regulatory agencies. The proposed No Action alternative will be the final action for the Stormwater Outfall A-013 OU. This alternative will provide protection to human health and the environment at the Stormwater Outfall A-013 OU.

## IX. PREFERRED ALTERNATIVE

The No Action alternative is the preferred alternative for the Stormwater Outfall A-013 OU. There is no waste to treat, no institutional or engineering controls are required, and there are no ARARs. Because there are no problems warranting action at the Stormwater Outfall A-013 OU, no action will be taken. The Stormwater Outfall A-013 OU poses no unacceptable risk to human health or the environment and warrants unrestricted land use.

The preferred alternative can change in response to public comment or new information.

## X. POST-ROD SCHEDULE

No remedial action is proposed for the Stormwater Outfall A-013 OU; therefore, no schedule for post-ROD activities is provided. It is anticipated that the ROD (including a Responsiveness Summary for comments received during the public comment period on this PP) will be issued in November 2021. Milestone dates for the PP and ROD are provided below:

PP submittal (Revision 0)	June 22, 2020
No Action ROD Submittal (Revision 0)	March 9, 2021
No Action ROD Issuance	November 29, 2021

## XI. REFERENCES

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

SRNS, 2012. *RCRA Facility Investigation/ Remedial Investigation (RFI/RI) Work Plan and RFI/RI Report with Baseline Risk Assessment and Corrective Measures Study/Feasibility Study for the A-Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), and Stormwater Outfall A-013 (NBN) Operable Unit (U)*, Revision 1, SRNS-RP-2010-01457, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC (July).

WSRC, 1998. *Record of Decision Remedial Alternative Selection for the Motor Shops Seepage Basin (716-A) (U)*, Revision 0, WSRC-RP-97-840, Westinghouse Savannah River Company, LLC, Savannah River Site, Aiken SC (April).

WSRC, 2011. *Savannah River Site Federal Facility Agreement Community Involvement Plan (U)*, Revision 7, WSRC-RP-96-120, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC (February).

## XII. GLOSSARY

**Administrative Record File:** A file that is maintained and contains all information used to make a decision on the selection of a response action under the Comprehensive Environmental Response, Compensation and Liability Act. This file is to be available for public review, and a copy is to be established at or near the Site, usually at one of the information repositories. Also a duplicate file is held in a central location, such as a regional or state office.

**ARARs:** Applicable, or Relevant and Appropriate Requirements. Refers to the federal and state requirements that a selected remedy will attain. These requirements may vary from site to site.

**Baseline Risk Assessment:** Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

**Characterization:** The compilation of all available data about the waste units to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980:** A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act.

**Corrective Action:** A USEPA requirement to conduct remedial procedures under RCRA 3004(u) at a facility when there has been a release of hazardous waste or constituents into the environment. Corrective action may be required beyond the facility boundary

and can be required regardless of when the waste was placed at the facility.

**Exposure:** Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

**Federal Facility Agreement (FFA):** The legally binding agreement between regulatory agencies (USEPA and SCDHEC) and regulated entities (USDOE) that sets the standards and schedules for the comprehensive remediation of the SRS.

**Land Use Controls:** Legal and/or administrative mechanisms as well as physical installations that modify or guide human behavior at operable units where residual contamination remains in place. Institutional controls and engineering controls are types of land use controls.

**Media:** Pathways through which contaminants are transferred. Five media to which a release of contaminants may occur are groundwater, soil, surface water, sediments, and air.

**National Priorities List :** USEPA's formal list of the nation's most serious uncontrolled or abandoned waste sites, identified for possible long-term remedial response, as established by CERCLA.

**Operable Unit (OU):** A discrete action taken as one part of an overall site cleanup. The term is also used in USEPA guidance documents to refer to distinct geographic areas or media-specific units within a site. A number of operable units can be used in the course of a cleanup.

**Operation and Maintenance (O&M):** Activities conducted at a site after a response action occurs to ensure that the cleanup and/or systems are functioning properly.

**Overall Protection of Human Health and the Environment:** The assessment against this criterion describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.

**Proposed Plan:** A legal document that provides a brief analysis of remedial alternatives under consideration for the site/operable unit and proposes the preferred alternative. It actively solicits public review and comment on all alternatives under consideration.

**Reasonable Maximum Exposure (RME):** This is the value that the average concentration will fall below 95 percent of the time.

**Record of Decision (ROD):** A legal document that explains to the public which alternative will be used at a site/operable unit. The record of decision is based on information and technical analysis generated during the remedial investigation/ feasibility study and consideration of public comments and community concerns.

**Resource Conservation and Recovery Act (RCRA), 1976:** A Federal law that established a regulatory system to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

**Responsiveness Summary:** A summary of oral and/or written comments received during the proposed plan comment period and includes responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns.

**Superfund:** The common name used for CERCLA; also referred to as the Trust Fund. The Superfund program was established to help fund cleanup of hazardous waste sites. It also allows for legal action to force those responsible for the sites to clean them up.

**Target Risk Range:** USEPA guidance for carcinogenic risk due to exposure to a known or suspected carcinogen between one excess cancer in an exposed population of ten thousand ( $1.0 \times 10^{-4}$ ) and one excess cancer in an exposed population of one million ( $1.0 \times 10^{-6}$ ). Risks within this range require risk management evaluation of remedial action alternatives to determine if risks can be reduced below one excess cancer in one million ( $1.0 \times 10^{-6}$ ). Risks greater than  $1.0 \times 10^{-4}$  indicate that remedial action is generally warranted.

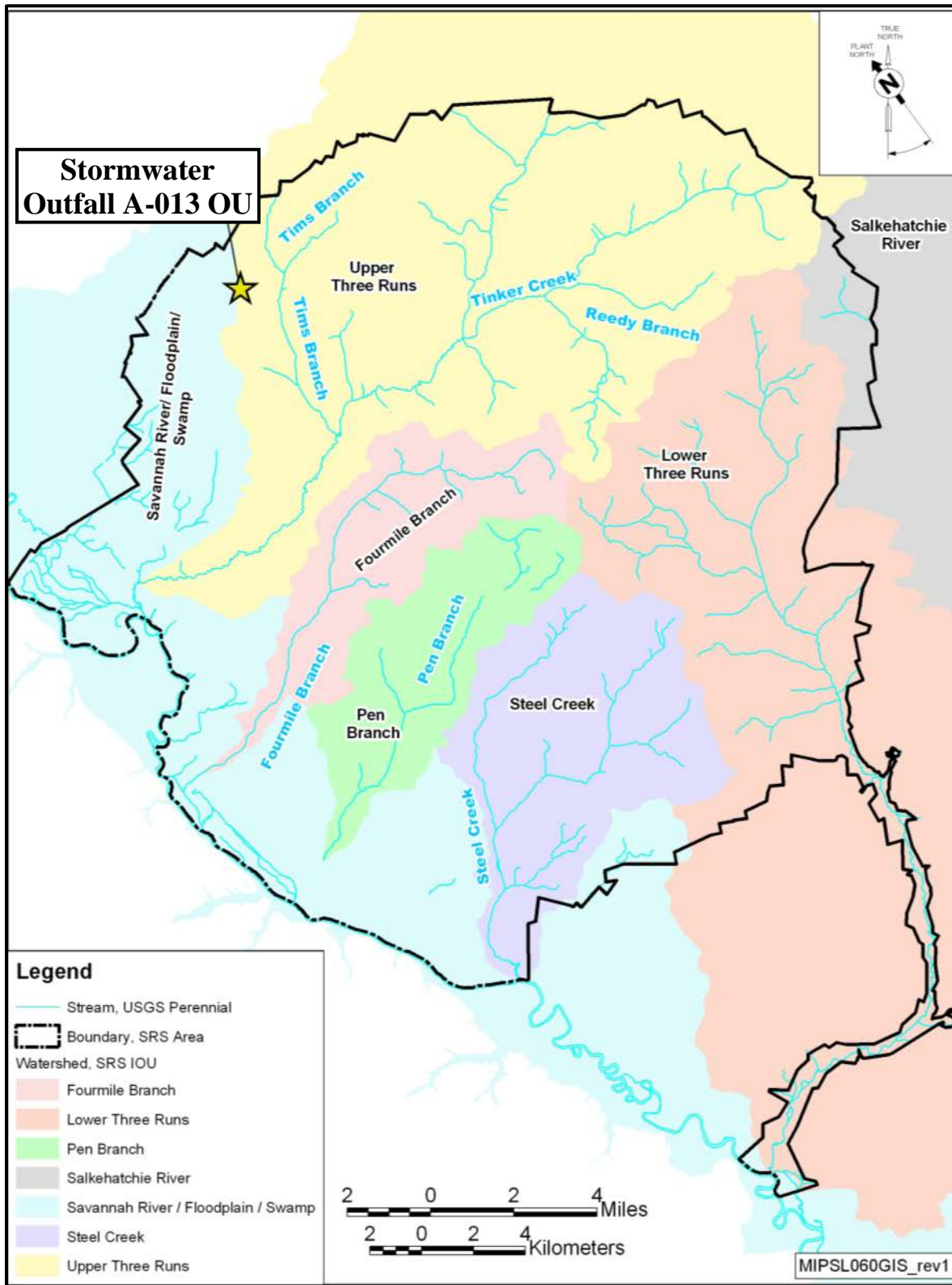


Figure 1. Location of the Stormwater Outfall A-013 OU within the Savannah River Site and Upper Three Runs Watershed

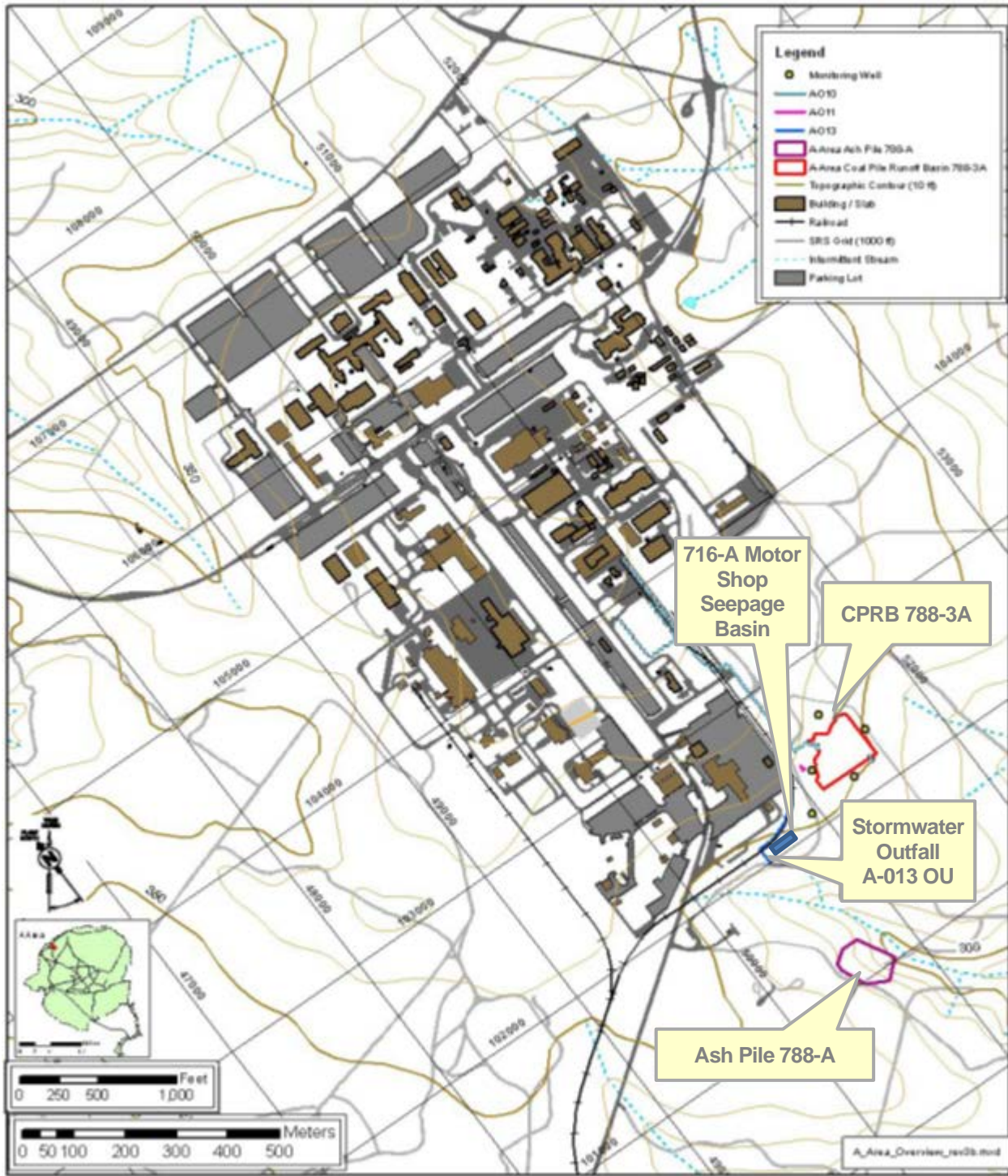


Figure 2. Location of the Stormwater Outfall A-013 OU in Relation to the AAP (788-A) and the CPRB (788-3A) within A-Area



**Figure 3.** Photo of Stormwater Outfall A-013 (2010)

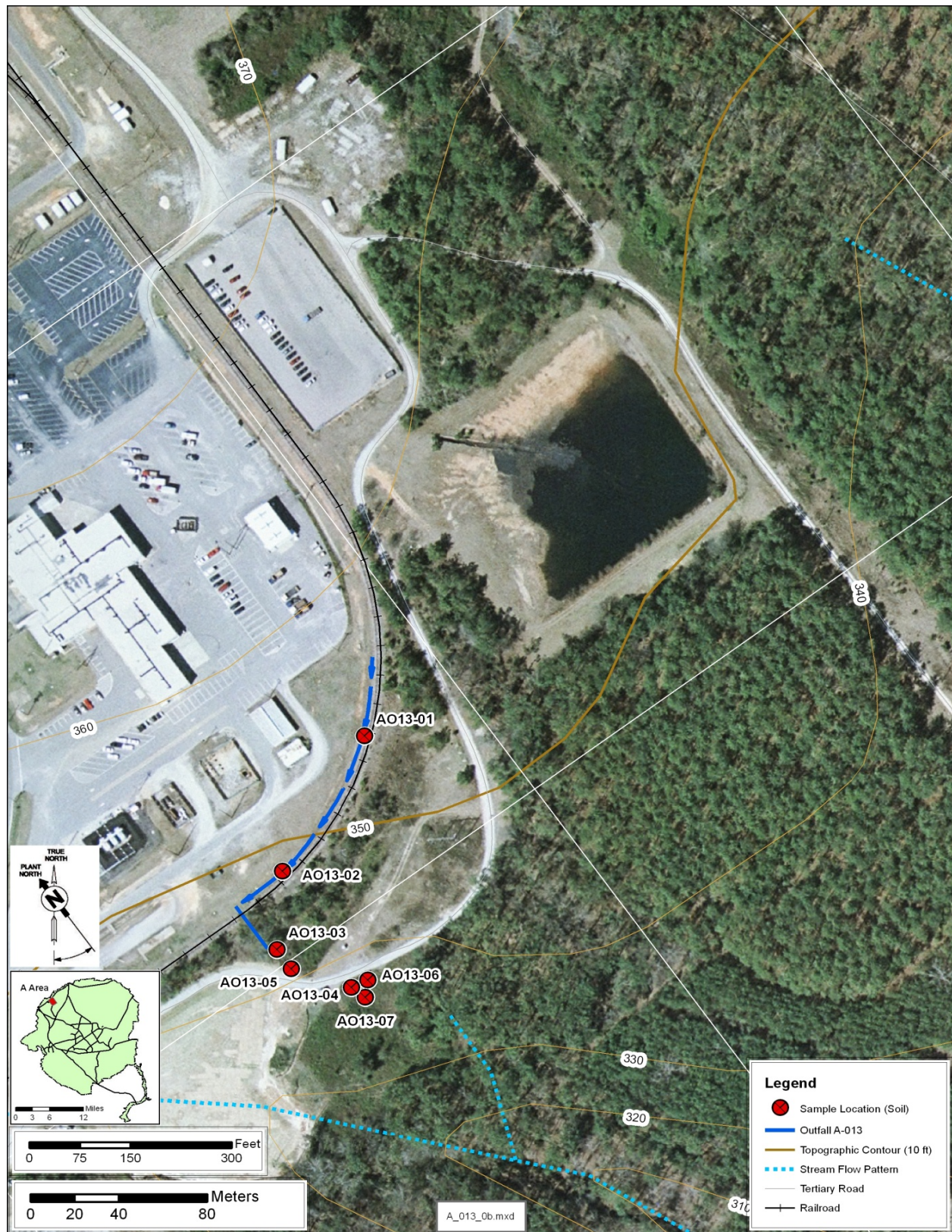


Figure 4. Phase 1 and Phase 2 Sample Locations at Stormwater Outfall A-013

**APPENDIX A**

**Stormwater Outfall A-013 Operable Unit  
Risk Evaluation**

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## Introduction/Purpose

The RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan and RFI/Report with Baseline Risk Assessment and Corrective Measure Study/Feasibility Study for the A-Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), and Stormwater Outfall A-013 (NBN) Operable Unit (SRNS 2012) identified polycyclic aromatic hydrocarbons (PAHs) as a problem warranting action for the residential scenario at the Stormwater Outfall A-013 subunit pending further discussion with the U.S. Department of Energy (USDOE), U.S. Environmental Protection Agency (USEPA), and South Carolina Department of Health and Environmental Control (SCDHEC). (For the purposes of this discussion, this report will be referred to as the “Combined Document.”) The USDOE, USEPA, and SCDHEC subsequently met on June 27, 2012, to scope the A-Area Ash Pile (788-A) (AAP) / A-Area Coal Pile Runoff Basin (788-3A) (CPRB) Operable Unit (OU) Statement of Basis/Proposed Plan and more thoroughly consider the nature and extent of contamination of the PAH constituents based on a second phase of soil sampling from three additional locations. The three additional Phase 2 sampling locations and one location from the Phase 1 sampling event were collected near an access road. The Core Team recognized that asphalt is a known source of PAH contamination and agreed that the elevated PAH concentrations in samples obtained near the access road are not likely related to Stormwater Outfall A-013. Based on this information, the USDOE, USEPA, and SCDHEC concluded that there are no problems warranting action at the Stormwater Outfall A-013 subunit.

The purpose of this appendix is to revise the human health risk estimates presented in the Combined Document using only the samples that are directly associated with the Stormwater A-013 Outfall as agreed to at the June 27, 2012, Scoping Meeting to demonstrate that there are no problems warranting action at the Stormwater A-013 Outfall. The November 2019 regional screening levels (RSLs) were used in the risk estimates.

## Characterization Background

The following is a summary of the characterization efforts at the Stormwater Outfall A-013 subunit. Additional details are provided in the Combined Document (SRNS 2012).

Sampling of Stormwater Outfall A-013 was conducted in two phases. Phase 1 soil samples were collected from four stations along Outfall A-013 (A013-01 through A013-04). Phase 2 soil samples were collected from three additional soil sampling stations (A013-05 through A013-07) (Figure A1).

Phase 1 consisted of sampling at four locations (A013-01 through A013-04) along Stormwater Outfall A-013 during January 2010. The following is a summary of the data collected during the Phase 1 sampling.

- Two soil sample stations along the drainage ditch upstream of Outfall A-013: A013-01 and A013-02
- One soil sample station at Outfall A-013: A013-03
- One soil sample station downstream of the Outfall A-013 pipe and south of the access road: A013-04
- Depth intervals: 0- to 0.3-meters (m [0- to 1-foot {ft}]) and 0.3- to 1.2-m (1- to 4-ft) below ground surface (bgs)
- Laboratory analyses: target compound list (TCL) volatile organic compounds, TCL semivolatile organic compounds, TCL pesticides/polychlorinated biphenyls, target analyte list inorganics, mercury, cyanide, gross alpha, non-volatile beta, and gamma pulse height analysis

Following review of the Phase 1 sampling results, soil samples were collected from three additional sample locations (A013-05 through A013-07) in April and May 2011 to confirm elevated PAH detections in sample station A013-04 (Figure A1). The following is a summary of the data collected during the Phase 2 sampling.

- One soil sample station below the Outfall A-013 pipe near the access road: A013-05
- One soil sample station adjacent to Phase 1 sample location A013-04 (i.e., south of the gravel access road): A013-06
- One soil sample station downgradient of Phase 1 sample location A013-04 (i.e., south of the gravel access road): A013-07

- Depth interval: 0- to 0.3-m (0- to 1-ft) bgs
- Laboratory analyses: PAHs

In general, the soil from the Phase 1 sample locations (A013-01 through A013-04) is a fine- to medium-grained sand in the upper 0.15 m (0.5 ft) that overlies clay or silty clay. There were no coal fines, ash, or asphalt observed in these samples. During the Phase 2 sampling, weathered asphalt was observed to be mixed in with the soil at locations south of the gravel access road.

The human health risk assessment (HHRA) identified five refined constituents of concern (RCOCs) in surface soil (0- to 0.3-m [0- to 1-ft] bgs) (SRNS 2012) using the Phase 1 sampling results (locations A013-01 through A013-04). The five RCOCs were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. A summary of the detections in surface soil for the Phase 1 samples is provided below. During the Phase 1 sampling, the location of the maximum detection for the five RCOCs was A013-04 in the surface soil (0- to 0.3-m [0- to 1-ft] bgs) interval.

Constituent	Frequency of Detects	Range of Concentrations (mg/kg)
Benzo(a)anthracene	2/4	non-detect to 1.7
Benzo(a)pyrene	3/4	non-detect to 1.87
Benzo(b)fluoranthene	3/4	non-detect to 2.96
Dibenz(a,h)anthracene	1/4	non-detect to 0.303
Indeno(1,2,3-cd)pyrene	3/4	non-detect to 0.908

mg/kg = milligram per kilogram

The Phase 2 samples were collected to verify the results of the Phase 1 sampling. A summary of the detections in surface soil for the Phase 2 samples is provided below.

Constituent	Frequency of Detects	Range of Concentrations (mg/kg)
Benzo(a)anthracene	3/3	0.236 to 0.823
Benzo(a)pyrene	3/3	0.234 to 0.876
Benzo(b)fluoranthene	3/3	0.354 to 1.4
Dibenz(a,h)anthracene	3/3	0.0375 to 0.146
Indeno(1,2,3-cd)pyrene	3/3	0.132 to 0.467

mg/kg = milligram per kilogram

The Phase 2 sampling results confirmed that the majority of the elevated detections are located south of the access road at locations A013-04, A013-06, and A013-07.

During the Phase 2 sampling, weathered asphalt fragments were observed in the soil south of the access road. Asphalt is a known potential source of PAH contamination. Because no asphalt was observed in samples from Outfall A-013 (A013-01 through A013-03), and because the asphalt and elevated PAH concentrations are located near the access road, it is believed that the elevated PAHs detected at locations A013-04, A013-05, A013-06, and A013-07 are not related to Stormwater Outfall A-013.

### **Evaluation of the HHRA and Problems Warranting Action**

The HHRA presented in the Combined Document was based on the four samples from the Phase 1 sampling event (A013-01 through A013-04). Because only four samples were taken initially, a calculation of the 95% upper confidence limit (UCL) was not possible. Therefore, the maximum detected concentrations (from sample A013-04)

were used for the risk estimate. The following conclusions were presented in the Combined Document HHRA (SRNS 2012). The initial risk estimates were calculated using November 2010 RSLs.

For the residential scenario, 0- to 0.3 m (0- to 1-ft) soil interval, human health RCOCs included benzo(a)anthracene (risk = 1.1E-05), benzo(a)pyrene (risk = 1.3E-04), benzo(b)fluoranthene (risk = 2.0E-05), dibenzo(a,h)anthracene (risk = 2.0E-05), and indeno(1,2,3-cd)pyrene (risk = 6.1E-06). The total cumulative risk was 1.9E-04 (based on sample A013-04).

For the industrial worker scenario, 0- to 0.3 m (0- to 1-ft) soil interval, there were no human health RCOCs identified.

The data from the Phase 2 sampling event were evaluated for nature and extent but were not used to recalculate the risk for the Combined Document. At the June 27, 2012, scoping meeting for the AAP/CPRB OU Statement of Basis/Proposed Plan, the Core Team agreed that the samples on the south side of the road (A013-04 through A013-07) that have elevated PAH concentrations are not related to the Stormwater Outfall A013 subunit. In general, PAHs are ubiquitous environmental pollutants that can be found in substances such as vehicle exhaust, asphalt road materials, motor oil, and coal tar pitch.

In January 2020, the Stormwater Outfall A-013 subunit was officially placed on a separate administrative pathway as a single OU in the FFA (Appendix E), the risk estimate was revised in this exercise to use only Phase 1 samples directly related to Stormwater Outfall A-013 (A013-01, -02, -03). Samples A013-04 through A013-07 were not included in this re-evaluation due to their proximity to the road. The maximum detected concentrations from samples A013-01 through A013-03 were used in the revised risk estimate. Table A1 shows the revised risk calculations for the residential scenario, and Table A2 shows the revised risk calculations for the industrial worker scenario. The November 2019 RSLs were used to calculate risk. The data used in the risk evaluation is provided in Table A3 and the data from the locations near the access road that were not used in the evaluation are provided in Table A4.

There are no constituents with a risk greater than 1E-06 for either the residential or the industrial worker scenarios.

**Conclusion:** Based on this revised risk estimate that used only the samples that are directly related to the Stormwater Outfall A-013 as well as the most current RSL thresholds (November 2019), there are no problems warranting action from a human health risk perspective at the Stormwater Outfall A013 OU. Accordingly, there are no remedial action objectives or remedial goal objectives associated with the Stormwater Outfall A013 OU.

No constituents were recommended for further remedial evaluation as ecological RCOCs in surface (0- to 0.3-m [0- to 1-ft]) or subsurface soils (0.3- to 1.2-m [1- to 4-ft]) in the Combined Document (SRNS 2012). For comparison purposes, the lowest observed adverse effects level (LOAEL)-based ecological thresholds that were used in the ecological risk assessment (ERA) were compared to the most current Los Alamos National Laboratory (LANL) LOAEL-based screening limits for soil media for a subset of the PAH constituents (LANL 2017). The table below shows that the current ecological screening values are approximately 1-4 orders of magnitude greater than the values used in the Combined Document. Note that the Combined Document identified considerable uncertainty in the PAH toxicity reference values used in the risk calculations. This additional information supports the original conclusions of the ERA that there are no problems warranting action from an ecological risk perspective.

PAH	LOAEL-Based Threshold (2012)	LOAEL-Based Screening Value (2017)
Benzo(a)anthracene	0.929 mg/kg	7.3 mg/kg
Benzo(a)pyrene	0.118 mg/kg	190 mg/kg
Benzo(b)fluoranthene	0.0165 mg/kg	180 mg/kg
Dibenz(a,h)anthracene	0.458 mg/kg	140 mg/kg
Indeno(1,2,3-cd)pyrene	0.118 mg/kg	710 mg/kg

mg/kg = milligram per kilogram

**References**

LANL, 2017. EcoRisk Database, Release 4.1, Los Alamos National Laboratory, Los Alamos, NM, accessed 02/19/2020

SRNS, 2012. *RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan and RFI/RI Report with Baseline Risk Assessment and Corrective Measures Study/Feasibility Study for the A-Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), and Stormwater Outfall A-013 (NBN) Operable Unit (U)*, Rev.1, SRNS-RP-2010-01457, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken SC

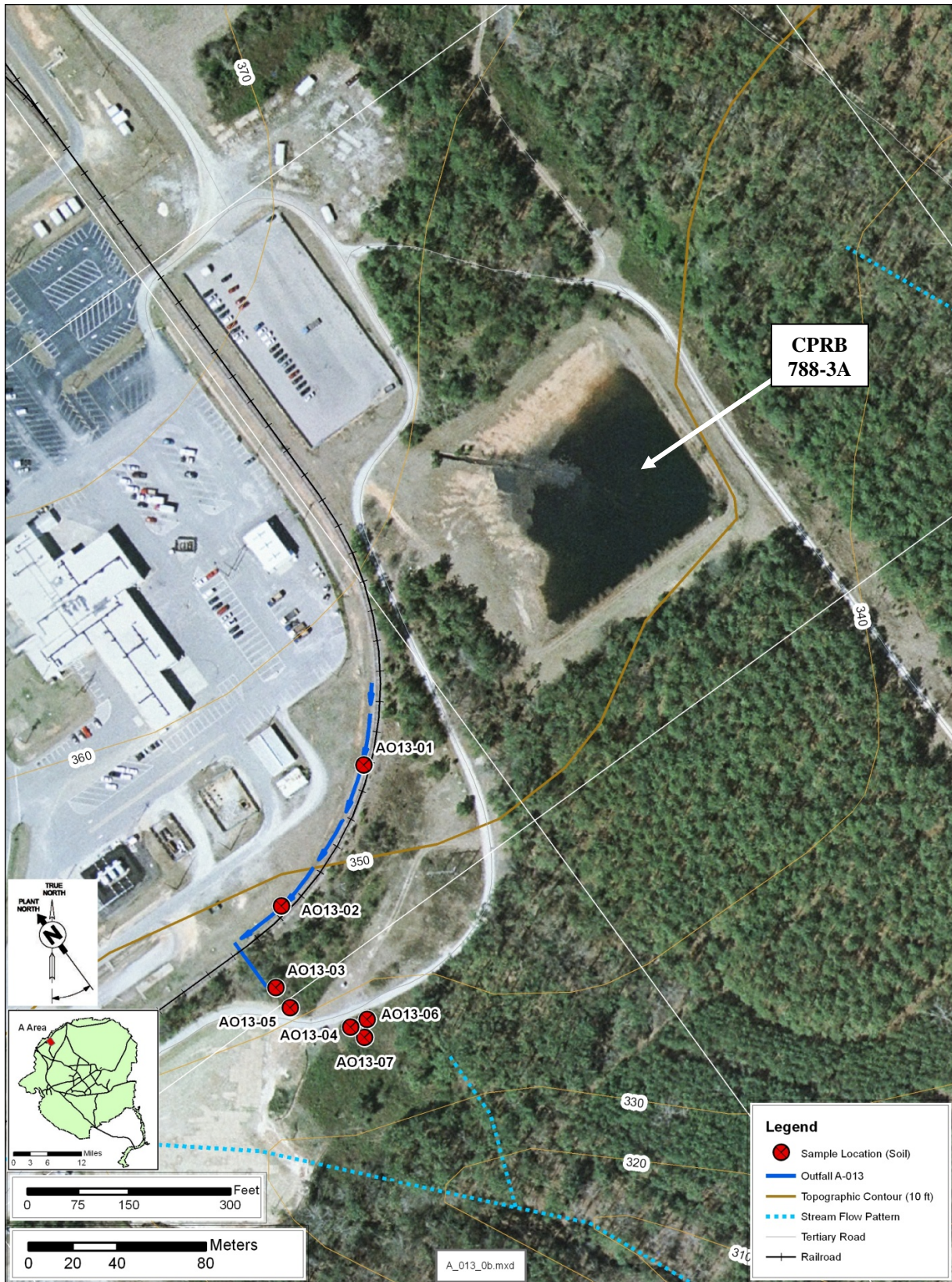


Figure A1. Phase 1 and Phase 2 Sample Locations at Stormwater Outfall A-013

**Table A1. Human Health Risk Calculation for the Stormwater Outfall A-013 Residential Scenario**

Analyte <sup>1</sup>	Exposure Point Concentration <sup>2</sup>	Residential RSL <sup>3</sup>	Residential Hazard Estimate <sup>4</sup>	Residential Risk Estimate <sup>5</sup>	COC? <sup>6</sup>
<b>Organics (mg/kg)</b>					
Benzo(a)anthracene	4.69E-02	1.1E+00	----	4.26E-08	no
Benzo(a)pyrene	4.93E-02	1.1E-01	----	4.48E-07	no
Benzo(b)fluoranthene	1.56E-01	1.1E+00	----	1.42E-07	no
Dibenz(a,h)anthracene	ND	1.1E-01	----	NA	no
Indeno(1,2,3-cd)pyrene	4.77E-02	1.1E+00	----	4.34E-08	no
<b>Carcinogenic PAH Risk =</b>				<b>6.96E-07</b>	

1 - Analytes from Combined Document (SRNS 2012) that were identified as RCOCs for the residential scenario.  
 2 - EPC = Reasonable maximum exposure (RME) exposure point concentration (EPC) is the lesser of the maximum detected concentration and the 95% upper confidence limit (UCL) on the mean. For this waste unit, a 95% UCL calculation could not be made on 3 samples. Therefore, the EPC is the maximum detected concentration.

3 - Nonradiological RSLs are residential soil values from the generic USEPA Regional Screening Levels (RSLs) Table, dated November 2019.  
 4 - Residential Hazard Estimate = EPC / RSL  
 5 - Residential Risk Estimate = (EPC / RSL) x 1E-06  
 6 - Constituent identified as COC if the individual cancer risk  $\geq 1E-06$ .  
 ND = non-detect; NA not applicable

**Table A2. Human Health Risk Calculation for the Stormwater Outfall A-013 Industrial Worker Scenario**

Analyte <sup>1</sup>	Exposure Point Concentration <sup>2</sup>	Industrial RSL <sup>3</sup>	Industrial Hazard Estimate <sup>4</sup>	Industrial Risk Estimate <sup>5</sup>	COC? <sup>6</sup>
<b>Organics (mg/kg)</b>					
Benzo(a)anthracene	4.69E-02	2.1E+01	----	2.23E-09	no
Benzo(a)pyrene	4.93E-02	2.1E+00	----	2.35E-08	no
Benzo(b)fluoranthene	1.56E-01	2.1E+01	----	7.43E-09	no
Dibenz(a,h)anthracene	ND	2.1E+00	----	NA	no
Indeno(1,2,3-cd)pyrene	4.77E-02	2.1E+01	----	2.27E-09	no
<b>Carcinogenic PAH Risk =</b>				<b>3.54E-08</b>	

1 - Analytes from Combined Document (SRNS 2012) that were identified as RCOCs for the residential scenario.  
 2 - EPC = Reasonable maximum exposure (RME) exposure point concentration (EPC) is the lesser of the maximum detected concentration and the 95% upper confidence limit (UCL) on the mean. For this waste unit, a 95% UCL calculation could not be made on 3 samples. Therefore, the EPC is the maximum detected concentration.

3 - Nonradiological RSLs are industrial worker soil values from the generic USEPA Regional Screening Levels (RSLs) Table, dated November 2019.  
 4 - Residential Hazard Estimate = EPC / RSL  
 5 - Residential Risk Estimate = (EPC / RSL) x 1E-06  
 6 - Constituent identified as COC if the individual cancer risk  $\geq 1E-06$ .  
 ND = non-detect; NA not applicable

Table A3. PAH Data Used in Revised Risk Calculation

Station	Analyte	MDL	PQL	Qual	Result	Units
A013-01	Benzo(a)anthracene	11.5	38.5	U	41.4	µg/kg
A013-02	Benzo(a)anthracene	11.9	39.6		<b>46.9</b>	µg/kg
A013-03	Benzo(a)anthracene	11.4	38.2	U	38.2	µg/kg
A013-01	Benzo(a)pyrene	11.5	38.5		47.9	µg/kg
A013-02	Benzo(a)pyrene	11.9	39.6		<b>49.3</b>	µg/kg
A013-03	Benzo(a)pyrene	11.4	38.2	U	38.2	µg/kg
A013-01	Benzo(b)fluoranthene	11.5	38.5		<b>156</b>	µg/kg
A013-02	Benzo(b)fluoranthene	11.9	39.6		150	µg/kg
A013-03	Benzo(b)fluoranthene	11.4	38.2	U	38.2	µg/kg
A013-01	Dibenz(a,h)anthracene	11.5	38.5	U	38.5	µg/kg
A013-02	Dibenz(a,h)anthracene	11.9	39.6	U	<b>39.6</b>	µg/kg
A013-03	Dibenz(a,h)anthracene	11.4	38.2	U	38.2	µg/kg
A013-01	Indeno(1,2,3-cd)pyrene	11.5	38.5		<b>47.7</b>	µg/kg
A013-02	Indeno(1,2,3-cd)pyrene	11.9	39.6		42.4	µg/kg
A013-03	Indeno(1,2,3-cd)pyrene	11.4	38.2	U	38.2	µg/kg

Table A4. PAH Data from Locations Near Access Road

Station <sup>1</sup>	Analyte	MDL	PQL	Qual	Result	Units
A013-04	Benzo(a)anthracene	12	39.9		1,700	µg/kg
A013-05	Benzo(a)anthracene	11	36.8		236	µg/kg
A013-06	Benzo(a)anthracene	11.2	37.2		823	µg/kg
A013-07	Benzo(a)anthracene	10.8	36.2		778	µg/kg
A013-04	Benzo(a)pyrene	12	39.9		1,870	µg/kg
A013-05	Benzo(a)pyrene	11	36.8		234	µg/kg
A013-06	Benzo(a)pyrene	11.2	37.2		876	µg/kg
A013-07	Benzo(a)pyrene	10.8	36.2		798	µg/kg
A013-04	Benzo(b)fluoranthene	12	39.9		2,960	µg/kg
A013-05	Benzo(b)fluoranthene	11	36.8		354	µg/kg
A013-06	Benzo(b)fluoranthene	11.2	37.2		1,400	µg/kg
A013-07	Benzo(b)fluoranthene	10.8	36.2		1,210	µg/kg
A013-04	Dibenz(a,h)anthracene	12	39.9		303	µg/kg
A013-05	Dibenz(a,h)anthracene	11	36.8		37.5	µg/kg
A013-06	Dibenz(a,h)anthracene	11.2	37.2		146	µg/kg
A013-07	Dibenz(a,h)anthracene	10.8	36.2		127	µg/kg
A013-04	Indeno(1,2,3-cd)pyrene	12	39.9		908	µg/kg
A013-05	Indeno(1,2,3-cd)pyrene	11	36.8		132	µg/kg
A013-06	Indeno(1,2,3-cd)pyrene	11.2	37.2		467	µg/kg
A013-07	Indeno(1,2,3-cd)pyrene	10.8	36.2		465	µg/kg

1 – Locations A-013-04 through A-013-07 were not used in the revised risk evaluation due to their proximity to the access road.