Savannah River NUCLEAR SOLUTIONS℠

Early Action Statement of Basis/Proposed Plan for the Beneficial Reuse of Select Coal Ash and Coal Fines at the A-Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), F-Area Ash Landfill (288-F), H-Area Ash Basin (288-H), K-Area Ash Basin (188-K), and L-Area Ash Basin (188-L) Operable Units (U)

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Prepared for
U.S. Department of Energy
and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina

CERTIFICATION

Early Action Statement of Basis/Proposed Plan for the Beneficial Reuse of Select Coal Ash and Coal Fines at the A- Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), F-Area Ash Landfill (288-F), H- Area Ash Basin (288-H), K-Area Ash Basin (188-K), and L-Area Ash Basin (188-L) Operable Units (U)
SRNS-RP-2025-01221, Revision 0, October 2025

[REF: 40CFR270.11 (d)(1)]

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_____ _____

Duane F. McLane, Senior Vice President
Environment, Safety, Health and Quality (ESH&Q)
for Savannah River Nuclear Solutions, LLC
as the Co-Operator with the U. S. Department of Energy
Savannah River Operations Office

Date Signed

_____ _____

Karen D. Morrow, Acting Director
Office of Closure and Project Management
Savannah River Operations Office
Office of Environmental Management
U.S. Department of Energy
Owner and Co-Operator

Date Signed

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LIST OF ACRONYMS AND ABBREVIATIONS

AAP	A-Area Ash Pile (788-A)
ac	acres
ACPRB	A-Area Coal Pile Runoff Basin (788-3A)
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirement
ARF	Administrative Record File
Ba	barium
BRA	baseline risk assessment
bgs	below ground surface
CCR	coal combustion residuals
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CM	contaminant migration
CMIP	corrective measures implementation plan
CMS	corrective measures study
EA	early action
FAL	F-Area Ash Landfill (288-F)
FFA	Federal Facility Agreement
FS	feasibility study
ft	feet
ha	hectare
HAB	H-Area Ash Basin (288-H)
HH	human health
IOU	Integrator Operable Unit
IWT	Industrial Waste Treatment
K-40	potassium-40
KAB	K-Area Ash Basin (188-K)
km/km^2	kilometer/square kilometer
LAB	L-Area Ash Basin (188-L)
LLC	Limited Liability Company
LUCs	Land Use Controls
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
NCP	National Oil and Hazardous Substances Contingency Plan
m/m^3	meter/cubic meter
mi/mi^2	mile/square mile
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
PRG	Preliminary Remedial Goals, Preliminary Remediation Goals
PTSM	Principal Threat Source Material
Ra-226	radium-226
Ra-228	radium-228
RAIP	remedial action implementation plan
RAO	Remedial Action Objective
RCOC	Refined constituents of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments Reauthorization Act

LIST OF ACRONYMS AND ABBREVIATIONS *(continued)*

SB/PP	statement of basis/proposed plan
SCDES[1]	South Carolina Department of Environmental Services
SCHWMR	South Carolina Hazardous Waste Management Regulations
SDU	Saltstone Disposal Unit
SEMS	Superfund Enterprise Management System
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
TAL	target analyte list
Th-232	thorium-232
U-233/234	uranium-233/234
U-238	uranium-238
U-235	Uranium-235
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WSRC	Westinghouse Savannah River Company
yd^3	cubic yard

[1] SCDES was known as the South Carolina Department of Health and Environmental Control prior to July 1, 2024.

I. INTRODUCTION AND BACKGROUND

Introduction

This Early Action Statement of Basis/Proposed Plan (EA SB/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 Environmental Services (SCDES). The EA SB/PP is a document that the lead agency is required to issue to fulfill the requirements of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 117(a) and National Oil and Hazardous Substances Contingency Plan (NCP) section 300.430 (f)(2). The purpose of this EA SB/PP is to describe the preferred remedial alternative(s) for five coal ash and coal fines Operable Units (OUs) that include the A-Area Ash Pile (788-A) (AAP) and A-Area Coal Pile Runoff Basin (788-3A) (ACPRB) OU, F-Area Ash Landfill (288-F) (FAL) OU, H-Area Ash Basin (288-H) (HAB) OU, K-Area Ash Basin (188-K) (KAB) OU, and L-Area Ash Basin (188-L) (LAB) OU, and to provide for public involvement in the decision-making process. The five OUs addressed in this EA SB/PP are herein called the remaining coal ash and coal fines OUs at the SRS. The EA SB/PP provides basic background information, describes the other remedial options considered, and solicits public input on all remedial alternatives and the rationale for the preferred remedial alternative.

The EA SB/PP highlights key information from the Focused EA Corrective Measures Study/Feasability Study (CMS/FS) for the remaining coal ash and coal fines OUs (SRNS 2024). Refer to the EA CMS/FS report and the SRS Administrative Record File (ARF) for more information regarding the remedial action.

SRS occupies approximately 803 square kilometers (km^2) (310 square miles [mi^2]) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS is located approximately 40 kilometers (km) (25 miles [mi]) southeast of Augusta, Georgia, and 32 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 CERCLA, are currently present in the environment at SRS.

The AAP and ACPRB OU and FAL OU are located at the SRS in Aiken County, South Carolina (Figure 1). The HAB, KAB, and LAB OUs are at the SRS in Barnwell County, South Carolina (Figure 1).

A remedial action is needed at the remaining coal ash and coal fines OUs because contaminants are present that may pose a threat to human health and the environment. Arsenic and naturally-occurring radionuclides present in surface ash/soil may pose an unacceptable exposure risk to the future resident and industrial worker in all five of the remaining coal ash and coal fines OUs. Barium (Ba) and naturally-occurring radionuclides present in unit ash/soil at the HAB OU, and Ba present in unit ash/soil at the LAB OU have the potential to impact groundwater above groundwater protection standards.

The preferred remedial alternative for the remaining coal ash and coal fines OUs is Land Use Controls (LUCs) with Beneficial Reuse. LUCs with Beneficial Reuse provides adequate protection from human exposure to contaminated media and is readily implementable at a moderate cost point when compared to other alternatives. This alternative also allows for clean closure (unrestricted use) of the OUs by removing the contaminated ash material to beneficially reuse as a fill material or concrete additive rather than manage as waste material that requires disposal or containment by an engineered cover system. SRS will have a need for large quantities of fill material for the closures of waste storage facilities such as the Saltstone Disposal Units (SDUs) or F-Area and H-Area Tank Farms. Preliminary analysis indicates that the ash material can be used as lower fill material as part of the cover systems at these receiving facilities.

The LUCs with Beneficial Reuse remedial alternative will be implemented in a two-phase approach. LUCs will be needed in Phase 1 to prevent unrestricted use of the OUs until implementation of beneficial reuse in Phase 2. During Phase 1, land use will remain industrial. Following excavation and removal of the coal ash and coal fines in Phase 2, clean closure (i.e., unrestricted land use) will be evaluated for each OU.

SRS Compliance History

SRS manages certain waste materials that are regulated under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901–6992k, a comprehensive law requiring responsible management of hazardous waste. The remaining coal ash and coal fines OUs for SRS are solid waste management units under RCRA Section 3004(u). SRS received a RCRA hazardous waste permit from the SCDES, which was most recently renewed on February 11, 2014 (SC1 890 008 989). Module VIII of the Hazardous and Solid Waste Amendments portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List (NPL). 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(e)(2), USDOE has negotiated a Federal Facility Agreement (FFA) (FFA 1993) with the USEPA and SCDES to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. The FFA lists the remaining coal ash and coal fines OUs as RCRA/CERCLA units requiring further evaluation using an investigation/ assessment process that integrates and combines the RFI process with the CERCLA Remedial Investigation (RI) process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

Both RCRA and CERCLA require the public to be given an opportunity to review and comment on the draft RCRA permit modification and proposed remedial alternatives. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA 42 U.S.C. § 9613(k) and 9617(a). These requirements include establishment of an 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. SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require 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.

SCHWMR R.61-79.124 requires that a brief description and response to all significant comments be made available to the public as part of the RCRA Administrative Record. Community involvement in consideration of this evaluation of alternatives for the remaining coal ash and coal fines OUs is strongly encouraged. All submitted comments will be reviewed and considered. Following the public comment period, a Responsiveness Summary will be prepared to address issues raised during the public comment period. The Responsiveness Summary will be made available with the final RCRA permit modification and the Record of Decision (ROD).

The final remedial decision will be made only after the public comment period has ended and all the comments have been received and considered. The final remedial decision under RCRA will be in the form of a final permit modification, which is made by SCDES. Selection of the remedial alternative that will satisfy the FFA requirements will be made by USDOE, in consultation with USEPA and SCDES. 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 Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the following locations:

US Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
471 University Parkway
Aiken, South Carolina 29803
(803) 641-3465

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

The FFA Administrative Record File is available electronically at the following address: www.srs.gov/general/programs/soil/arf/arfirf.html.

Hard copies of the EA SB/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 RCRA ARF for SCDES is available for review by the public at the following locations:

The South Carolina Department of Environmental Services
Bureau of Land and Waste Management
2600 Bull Street
Columbia, South Carolina 29201
(803) 898-2000

The South Carolina Department of Environmental Services
Aiken Environmental Affairs Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 642-1637

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 meetings, 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:

Barbara Smoak
Savannah River Nuclear Solutions, LLC
Savannah River Site
Building 703-43A
Aiken, South Carolina 29808
(803) 952-8060
barbara.smoak@srs.gov

The South Carolina Department of Environmental Services
Attn: Mr. Kent Krieg, Director
Division of Waste Management
Bureau of Land and Waste Management
2600 Bull Street
Columbia, South Carolina 29201
(803) 898-0255

Following the public comment period, a ROD will be signed, and a final decision for the SRS RCRA permit will be issued. The ROD and RCRA permit will detail the remedial alternative chosen for the remaining coal ash and coal fines OUs operable unit and include responses to oral and written comments received during the public comment period in the Responsiveness Summary.

III. OPERABLE UNIT BACKGROUND

Early infrastructure development of the SRS between 1951 and 1955 included the use of coal-fired powerhouses to generate steam and electricity. These powerhouses were located in each industrial/ administrative area of the SRS. As a result of boiler operations, coal ash (coal combustion products) was produced as a waste product. The coal ash was either sluiced into a nearby ash basin or hauled to an ash pile. Associated coal pile runoff basins were constructed to receive surface water runoff from coal storage areas. The five remaining coal ash and coal fines OUs were constructed as a result of the generated waste products.

Prior to consideration of a beneficial reuse strategy for all remaining SRS coal ash and coal fines OUs, the AAP and ACPRB OU was investigated via the RI/FS process in 2008 and documented in the combined *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 (SRNS 2012a). A Revision 1.1 Redline Interim Action SB/PP (SRNS 2014) was submitted in March 2014 identifying the preferred remedial action for consolidation of AAP into the ACPRB with a soil cover, LUCs, and groundwater monitoring.

A preliminary design for excavation of the AAP was prepared as part of the Interim Action SB/PP development in 2014. However, finalization and regulatory approval of the Interim Action SB/PP and preparation of a ROD were placed on hold due to the uncertainty associated with the proposed USEPA coal combustion residuals (CCRs) regulations being applied to this OU as applicable or relevant and appropriate requirements (ARARs).

With the exception of the AAP and ACPRB OU, no previous RCRA/CERCLA regulatory actions have been implemented for the remaining coal ash and coal fines OUs considered for beneficial reuse.

In 2022, the USDOE proposed a wholistic remedial approach to address the remaining coal ash and coal fines OUs at the SRS, including the AAP and ACPRB OU, that includes future beneficial reuse of the ash material as fill material or a concrete additive rather than a waste material that requires excavation and disposal or containment by an engineered cover system. The proposed strategy for the remaining coal ash and coal fines OUs was to complete the remedial action in two phases with LUCs implemented in Phase 1 followed by excavation of the coal ash and coal fines material for beneficial reuse in Phase 2. The USEPA and SCDES approved the implementation and administrative strategy for the remaining coal ash and coal fines OUs on August 11, and September 22, 2022, respectively.

The characteristics for the five remaining coal ash and coal fines OUs including the nature and extent of contamination are described below.

A-Area Ash Pile and A- A-Area Coal Pile Runoff Basin

The AAP (788-A) is located in A Area in the northwest portion of SRS within the Upper Three Runs watershed (Figure 1). The AAP was formed from the stockpiling of ash (bottom ash and fly ash) received from the A-Area coal-fired boiler house (784-A) between 1952 and 1978. The boundary of the AAP encompasses 0.65 hectares (ha) (1.60 acres [ac]) and is located south of the ACPRB (788-3A) (Figures 2 and 3). The total area of ash, including ash outside the boundary, is approximately (~)1.03 ha (2.55 ac). The AAP ash and the additional ash outside the AAP boundary has an estimated total ash volume of 53,518 cubic meters [m^3] (70,000 cubic yards [yd^3]). Within the AAP, the topography ranges from ~99 to 101 m (325 to 330 feet [ft]) above mean sea level (amsl). During operation of the AAP, the pile was graded, the top leveled, and the north side (stream side) benched. The elevation at the top of the pile is ~105 m (345 ft) amsl (4.6 to 6.1 m [15 to 20 ft] above grade). The depth to groundwater is ~37 m (~120 ft) below ground surface (bgs). Surface water in the vicinity of the AAP drains to the north-northeast via overland flow toward the unnamed tributary of Tims Branch, to Tims Branch, and to Upper Three Runs Creek (SRNS 2012a). Over the years, the banks of the unnamed tributary to Tims Branch were significantly scoured, and erosion threatened the stability of the ash pile until sheet piling and other erosion control measures were installed in the early 2000s. Though the erosion

control measures appear to be sufficient, an annual slope stability assessment to monitor this area is performed to ensure that there is no immediate threat of collapse of the ash pile and/or migration into the adjacent tributary. Currently, the AAP is heavily vegetated with mature pines, hardwoods, and a dense undergrowth. The heavily vegetated side slopes help to prevent migration and slope failure.

The ACPRB (788-3A) is located in A Area, just north of the AAP, in the northwest portion of SRS within the Upper Three Runs watershed (Figure 1). The ACPRB was constructed in 1978 and operated until closure of the boiler house in 2008. Runoff from the coal storage pile was collected/transported in ditches and underground pipes that discharged to the ACPRB. The basin is an unlined earthen surface impoundment surrounded by earthen berms. The ACPRB covers ~1.06 ha (2.62 ac) (Figure 4). The approximate total volume of coal fines is 7,646 m^3 (10,000 yd^3). The average depth of coal fines within the ACPRB is ~0.7 m (2.4 ft). The ACPRB is inactive and receives water only via precipitation. The depth to groundwater in this area is ~37 m (~120 ft) bgs. Elevations across the basin range from 105 to 108 m (344 to 355 ft) amsl (Figure 4).

The AAP and ACPRB OU are inactive units listed as RCRA/CERCLA units on Appendix C within the FFA (FFA 1993).

The AAP and ACPRB was investigated via the RI/FS process in 2008. Ash/soil samples were collected at both units and analyzed for a comprehensive list of chemicals and radionuclides. The ash-related contaminants identified for remedial action (i.e., arsenic and naturally occurring radionuclides) are consistent with other ash waste units. The complete data evaluation and results are documented in the 2012 combined document (SRNS 2012a).

In 2020, sampling along transects was conducted to determine te extent of ash outside the boundary of the ash pile (Figures 3 and 4).

F-Area Ash Landfill Operable Unit

The FAL (288-F) OU is located in the Upper Three Runs watershed between F and H Areas (Figure 1). The FAL OU became operational in 1954 and received ash from the operation of the A-, F-, and H-Area powerhouses. The interior area of the FAL OU is ~2.84 ha (7.01 ac). There is an estimated 4.64 ha (11.47 ac) of ash observed outside of the FAL OU boundary (Figure 5). The total volume of ash inside and outside of the FAL OU is ~163,201 m^3 (213,459 yd^3). The FAL OU is surrounded by a relatively congested industrial area and has engineered storm water controls in place. Depth to groundwater is ~ 21 to 24 m (70 to 80 ft) bgs.

The FAL OU is listed as a RCRA/CERCLA unit in Appendix C of the FFA (FFA 1993), and is an active Class II Landfill (SCDES Solid Waste Landfill Permit #025800-1601). SCDES clarified in a May 2022 meeting with the Core Team that the 288-F Class II Ash Landfill will remain a permitted operating landfill until beneficial reuse is initiated (SRNS 2022).

For the FAL OU, 2012 sampling results for metals were documented in the *Waste Characterization Report for Savannah River Site Ash Outside 288-F Landfill* and submitted to SCDES (SRNS 2012b). Elevated arsenic levels were consistent with other ash containing units. Radionuclide results are not available but are expected to be consistent with naturally occurring radionuclides present at similar ash basins

(i.e., HAB, KAB, and LAB OUs). Based on the arsenic results and similarity with the other ash OUs, the Core Team agreed with the use of analogous site data from the HAB, KAB, and LAB OUs combined into one dataset for use at the FAL OU, and additional data collection to support a remedial decision for the FAL OU was not needed.

H-, K-, and L- Area Ash Basin Operable Units

The HAB (288-H) OU is located in the Fourmile Branch watershed, downgradient of H-Area (Figure 1). The HAB OU received ash via sluice of wet ash slurry from the H-Area powerhouse. The powerhouse operated from 1950 to 1990. All operating systems in the H-Area powerhouse have been shut down. The area of the HAB OU covers ~5.29 ha (13.06 ac). Additional ash outside of the basin boundary is estimated to have an area of ~7.45 ha (18.40 ac). The total estimated volume of ash inside and outside of the basin is 198,105 m^3 (259,112 yd^3). Elevations across the HAB OU range from 85 to 90 m (278 to 295 ft) amsl. The land surface slopes toward Fourmile Branch. A constructed ditch on the southern side of the basin channels water from the basin to the south-east toward a small permanently pooled water body that flows toward a small tributary of Fourmile Branch at the northwest corner of H Area. The depth to groundwater in this area is ~4.6 m (15 ft) bgs. The HAB OU is currently heavily vegetated with mature pines, hardwoods, and dense undergrowth. Wet ash/soils at the southeastern side of the basinare primarily located/associated with ash deposits outside the basin berm where ash deposits align with the location of a historical Carolina bay that a portion of the HAB OU was partially constructed on top of (Figure 6).

The HAB OU is an inactive unit listed as a RCRA/CERCLA unit in Appendix C of the FFA (FFA 1993). Although the HAB OU is considered inactive since it no longer receives sluiced ash, the HAB OU is permitted as an “as-built” industrial wastewater facility (Permit #7291). HAB OU is currently receiving rainwater runoff from an above ground pipeline that can be re-routed, as necessary, to support future remedial activities at the HAB OU.

The KAB OU is located southwest of the K-Reactor Complex and is in the Pen Branch watershed (Figure 1). The KAB OU received ash from the K-Area coal-fired powerhouse (184-K) via wet sluice. The powerhouse operated from 1951 to 1990. The area of the basin is ~4.52 ha (11.16 ac) (Figure 7). Additional ash was discovered beyond the basin, covering ~1.54 ha (3.81 ac). The total volume of ash inside and outside of the basin is ~208,362 m^3 (272,527 yd^3). Elevations across the KAB OU range from 75 to 80 m (246 to 262 ft) amsl with a gentle slope toward Indian Grave Branch. The KAB OU is not located near surface water conveyances that would facilitate surface water movement. The depth to groundwater in this area is ~16 m (53 ft) bgs. The KAB OU has undergone secondary succession since operations at the basin have ceased. The KAB OU is currently heavily vegetated with mature pines, hardwoods with dense undergrowth. No standing water has been observed during multiple field visits to the basin.

The KAB (188-0K) OU is listed as a RCRA/CERCLA unit in Appendix C of the FFA (FFA 1993). Although considered inactive since it no longer receives sluiced ash, the KAB OU is permitted as an “as-built” industrial wastewater facility (Permit #7293). KAB OU currently receives stormwater discharge that can

be re-routed, as necessary, to support future remedial activities at the KAB OU.

The LAB (188-L) OU is located northeast of the L-Reactor Complex and a small portion of the LAB OU is within the Steel Creek watershed, with the remainder in the Pen Branch watershed (Figure 1). The LAB OU received ash from the L-Area coal-fired powerhouse (184-L) via wet sluice. The powerhouse operated from 1951 to 1968. The area of the basin is ~7.13 ha (17.61 ac) (Figure 8). Additional ash outside of the basin boundary is estimated to have an area of 0.68 ha (1.67 ac). The volume of fly ash and bottom ash is estimated to be ~246,971 m^3 (323,026 yd^3) including ash deposits inside and outside the basin. Elevations across the LAB OU range from 75 to 80 m (246 to 262 ft) amsl. In general, the surface water from the LAB OU would flow toward Pen Branch. The depth to groundwater in this area is estimated to be about 4.9 to 6.1 m (16 to 20 ft) bgs. It is currently heavily vegetated with mature pines, hardwoods, and a dense undergrowth.

The LAB OU is an inactive ash basin listed as a RCRA/CERCLA unit in Appendix C of the FFA (FFA 1993).

As part of the ash consolidation strategy development, three ash/soil samples were collected from each of the HAB, KAB, and LAB OUs in 2020 to compare the results to other remediated ash OUs with similar ash-related contaminants (i.e., arsenic and naturally-occurring radionuclides). In addition, the extent of ash outside the basin berms was determined from multiple transects extending from the boundary of the unit (Figures 6 through 8). The results indicated that the all the basins had similar arsenic and radionuclide levels. The data are presented in the Focused EA CMS/FS document (SRNS 2024).

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Remedial decisions have been completed for other ash waste units at the SRS prior to the investigation of the remaining coal ash and coal fines OUs. Concentrations of ash-related constituents have been found to be consistent among similar characterized ash waste units, allowing for a streamlined remedial approach to addressing ash waste units at the SRS.

In 2022, the USDOE proposed a wholistic remedial approach to address several of the remaining coal ash and coal fines OUs at the SRS that includes future beneficial reuse of the ash material (Phase 2) following the implementation of LUCs (Phase 1).

The USEPA and SCDES approved the implementation and administrative strategy for the remaining coal ash and coal fines OUs on August 11, and September 22, 2022, respectively.

To manage a comprehensive cleanup strategy, the site is divided into watersheds because of the complexity and size of multiple waste units located in different areas of the SRS. 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 AAP and ACPRB OU and the FAL OU is located within the Upper Three Runs watershed. (Figure 1). The HAB OU is located in the Fourmile branch watershed. The KAB OU is located in the Pen Branch watershed. A small portion of the LAB OU is within the Steel Creek watershed, with the remainder in the Pen Branch watershed (Figure 1).

V. SUMMARY OF SITE RISKS

This section identifies the basis for taking action and identifies the contaminants that were retained following a weight-of-evidence evaluation (i.e., Refined Constituents of Concern [RCOCs]) and exposure pathways that the remedial actions need to address. Additional information pertaining to the risk assessment is in the Focused EA CMS/FS (SRNS 2024).

Summary of Human Health Risk Assessment

A HHRA was included in Appendix C of the Focused EA CMS/FS document (SRNS 2024). The HH risk assessment evaluates the potential for adverse effects associated with exposure to constituents present at the remaining coal ash and coal fines OUs. The assessment for each OU estimates the risk potential in the absence of any remedial action and provides a basis for determining whether a remedial action is necessary.

In general, the remaining coal ash and coal fines OUs are located near or within the perimeter of industrial areas. No current or future development of the remaining coal ash and coal fines OUs is planned. Nevertheless, to support the risk management decision-making, both the residential (unrestricted) and industrial land use scenarios are evaluated.

The hypothetical receptors evaluated include the future resident and the future industrial worker. A description of each is presented below.

The future resident receptor scenario evaluates long term risks to individuals assumed to have unrestricted use of the area. This scenario considers residents (adults and children) who hypothetically live on the OUs and are exposed chronically, both indoors and outdoors, to OU contaminants. The standard exposure assumptions are 26 years, 350 days per year, and 24 hours per day. Exposure routes associated with soil include inhalation of particulates and vapors, external exposure to radiation, dermal absorption, and incidental ingestion.

The future industrial worker scenario is a standard USEPA exposure scenario that addresses long-term risks to workers who are exposed to OU contaminants within an industrial setting. The standard exposure assumptions are 25 years, 250 days per year, and 8 hours per day. The USEPA refers to this receptor as “composite worker,” and it is analogous to the term “industrial worker” used herein. The future industrial worker scenario considers an adult who hypothetically works on-unit in an outdoor setting most of the time. Exposure routes include inhalation, external exposure to radiation, dermal absorption, and incidental ingestion of soil.

RCOCs are identified as those constituents that warrant a response action. Human health (HH) RCOCs were identified for the future resident and industrial worker scenarios at all of the remaining coal ash and coal fines OUs.

One metal (arsenic) and three radionuclides (potassium-40 [K-40], [Ra-226], and uranium-238 [U-238]) were identified as HH (future resident and industrial worker) RCOCs in the 0 to 0.3 m (0 to 1 ft) surface ash/soil interval at the AAP. Ra-226 is a daughter product of the U-238 decay series and will be managed under the cleanup level established for the entire decay series. One metal (arsenic) was identified as a HH (future resident and industrial worker) RCOC in the 0 to 0.3 m (0 to 1 ft) surface ash/coal fines interval at the ACPRB.

Results from the FAL, HAB, KAB, and LAB OUs HHRA identified one metal (arsenic) and three radionuclides (K-40, thorium-232 [Th-232], and U-238) as HH (future resident and industrial worker) RCOCs for the 0 to 0.3 m (0 to 1 ft) surface ash/soil interval.

Summary of Ecological Risk Assessment

An ecological risk assessment is presented in Appendix D of the Focused EA CMS/FS document (SRNS 2024). The ecological risk assessment consists of steps that provide a scientifically based and defensible evaluation of exposure and hazard to ecological resources that will support a risk management decision regarding site remediation.

Ecological risk is associated with the potential for harmful effects to ecological systems resulting from exposure to an environmental stressor. A stressor is any physical, chemical, or biological entity that induces an environmental response. Stressors may adversely affect specific natural resources or entire ecosystems, including plants and animals, as well as the environment with which they interact.

Site-specific ecological/biological studies have been conducted on various ash units at the SRS, primarily associated with ash depositional areas in sensitive environments such as Carolina bays (i.e., Wetland Area at Dunbarton Bay) or within floodplain habitat (i.e., D-Area Ash Basin Wetlands). Despite elevated concentrations of trace elements within soil and/or biota associated with these OUs, the studies concluded that the ecological risks were negligible.

The ash units subject to this decision are generally in less sensitive ecological habitats, and there were no ecological RCOCs identified for the remaining coal ash and coal fines OUs that require a remedial action.

Summary of Contaminant Fate and Transport Analysis

An evaluation of the potential for contaminated media to leach contaminants to groundwater is evaluated in Appendix B of the Focused EA CMS/FS document (SRNS 2024). The contaminant migration (CM) analysis identified CM RCOCs in the vadose zone for the HAB OU (Ba, uranium-233/234 [U-233/234], uranium-235 [U-235], and U-238) and the LAB OU (Ba) with the potential to migrate to groundwater and exceed groundwater protection standards within 1,000 years. There were no CM RCOCs identified for the AAP and ACPRB OU, KAB OU, or FAL OU.

Principal Threat Source Material (PTSM) Evaluations

An evaluation for source materials that are highly toxic was conducted as part of the Principal Threat Source Material (PTSM) assessment in Appendix E of the Focused EA CMS/FS document (SRNS 2024). The quantitative evaluation concluded that there are no contaminants that constitute PTSM at any of the remaining coal ash and coal fines OUs.

Problems Warranting Action

As determined in the Focused EA CMS/FS (SRNS 2024), problems warranting action are identified for the five remaining coal ash and coal fines OUs under the potential future resident and industrial worker scenarios, as discussed below. There are no ecological or PTSM RCOCs for the five OUs.

A-Area Ash Pile and A-Area Coal Pile Runoff Basin Operable Unit

- AAP: Arsenic and naturally occurring radionuclides (K-40, Ra-226, U-238) are present in 0 to 0.3 m (0 to 1 ft) surface ash/soil that pose an unacceptable risk to the future resident (Total cumulative risk [TCR] = 3.7E-04) and industrial worker (TCR = 1.9E-04).
- ACPRB: Arsenic is present in the 0 to 0.3 m (0 to 1 ft) surface ash/soil that presents an unacceptable risk to the future resident (TCR = 9.4E-05) and industrial worker (TCR = 2.3E-05).

F-Area Landfill Operable Unit

- Arsenic and naturally occurring radionuclides (K-40, Th-232, and U-238) are present in the 0 to 0.3 m (0 to 1 ft) surface ash/soil that pose an unacceptable risk to the future resident (TCR=9.8E-04; Hazard Index [HI] = 2.0) and industrial worker (TCR=5.7E-04).

H-, K-, and L-Area Ash Basin Operable Units

- Arsenic and naturally occurring radionuclides (K-40, Th-232, and U-238), are present in the 0 to 0.3 m (0 to 1 ft) ash/soil interval that pose an unacceptable risk to the future resident (TCR=9.8E-04; Hazard Index [HI] = 2.0) and industrial worker TCR=5.7E-04) for the HAB, KAB, and LAB OUs.
- Ba is present in the vadose zone with the potential to migrate to groundwater and exceed groundwater action levels within 1,000 years for the HAB OU and LAB OU.
- U-233/234, U-235, and U-238 are present in the vadose zone with the potential to migrate to groundwater and exceed groundwater action levels within 1,000 years for the HAB OU.

Conclusion

It is the lead agency's current judgement that the preferred alternative identified in this EA SB/PP, or one of the other active measures considered in the EA SB/PP, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

VI. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media- or OU-specific objectives for protecting human health and the environment. RAOs usually specify potential receptors and exposure pathways and are identified during project scoping once the conceptual site model is understood. RAOs describe what the remediation must accomplish and are used as a framework for developing remedial alternatives. The RAOs are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure.

The future land use of the remaining coal ash and coal fines OUs is assumed to be industrial land use with

DOE maintaining control of the land. The following RAOs have been identified for the remaining coal ash and coal fines OUs to support the industrial land use.

For all remaining coal ash and coal fines OUs, the RAO is to prevent human exposure to contaminants present in the surface ash/soil that present a risk to the future resident and industrial worker greater than 1E-06 risk threshold or background levels.

For the HAB OU and LAB OU, the RAO is to protect groundwater resources from migration of contaminants in unit ash/soil that would impact the groundwater above groundwater protection standards.

Preliminary Remedial Goals

Preliminary Remedial Goals (PRGs) serve to provide a range of cleanup goals for each RCOC and are typically identified along with the RAOs. These cleanup goals are either concentration levels that correspond to a specific risk or hazard or are based on ARARs. Following public comment and approval of the EA SB/PP, the PRGs for the selected remedy are documented as final cleanup goals in the ROD.

The Focused EA CMS/FS presents a range of HH PRGs (SRNS 2024) corresponding to target cancer risks of 1 x 10^{-6} and levels protective of groundwater. PRGs were calculated for the future resident and future industrial worker and are presented in Table 1.

Applicable or Relevant and Appropriate Requirements

ARARs are Federal and more stringent, promulgated State environmental or facility siting requirements in a law or regulation that a selected remedy must attain, which vary from site to site. They specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws.

Three categories of ARARs are identified to clarify how to identify and comply with environmental requirements. They include action-specific, location-specific, and chemical-specific requirements.

- Action-specific ARARs control or restrict the design, performance, and other aspects of implementation of specific remedial activities.
- Location-specific ARARs reflect the physiographic and environmental characteristics of the unit or the immediate area, and may restrict or preclude remedial actions depending on the location or the characteristics of the unit.
- Chemical-specific ARARs are media-specific concentration limits promulgated under federal or state law.

A summary of the ARARs for the preferred alternative are presented in Table 2.

VII. SUMMARY OF REMEDIAL ALTERNATIVES

The range of alternatives includes options that restrict exposure to contaminated media, reduce exposure to contaminated media, and eliminate exposure to contaminated media. A detailed description of each alternative is provided in the Focused EA CMS/FS (SRNS 2024). A detailed cost analysis for the proposed alternatives is provided in Appendix A of this document.

Alternative A-1: No Action

The No Action alternative is required by the NCP to serve as a baseline for comparison with other remedial alternatives. Under this alternative, no effort would be made to control access, limit exposure, or reduce toxicity, mobility, or volume of RCOCs at the remaining coal ash and coal fines OUs. This alternative would leave the remaining coal ash and coal fines OUs in their current condition with no additional controls. This alternative does not include five-year remedy reviews. The No Action alternative is not effective and does not achieve RAOs.

Summary of Costs

Capital Cost $0
O&M $0
Total Present-Worth Cost $0

Alternative A-2: LUCs with Beneficial Reuse

Alternative A-2 consists of implementing LUCs in Phase 1 and excavation with beneficial reuse in Phase 2 of the remedy implementation. LUCs involve the use of administrative and engineering controls to limit access to the individual OUs. LUCs have been implemented successfully within SRS and are fully employed in all areas of the site to limit access at the site boundary and on-site facilities. LUCs would be implemented at the remaining coal ash and coal fines OUs through the use of warning and no trespassing signs; excavation permit restrictions; and a Land Use Control Implementation Plan (LUCIP), and would remain until removal for beneficial reuse. This alternative would require five-year remedy reviews unless unrestricted use is achieved during excavation of the contaminated media for beneficial reuse (Phase 2).

Due to the CM concerns at the HAB and LAB OUs, groundwater monitoring wells would be installed/ identified at these two OUs and would be monitored every five years to coincide with the five-year remedy reviews. Groundwater beneath the FAL OU would continue to be monitored semi-annually in accordance with its Industrial Wastewater Treatment (IWT) permit. Additionally, the AAP is currently monitored (i.e., inclinometers, LIDAR surveys) annually for slope stability due to its proximity to the unnamed tributary of Tims Branch. This monitoring will continue until the ash is removed. LUCs with groundwater monitoring for HAB, LAB, and FAL OUs will remain in-place until the ash is excavated and transported to its beneficial reuse location. Phase 2 (excavation and beneficial reuse) of this alternative would involve excavation of ash material in an attempt to achieve unrestricted use levels while providing beneficial reuse of the material. Following completion of the excavation activities, the ash units will be restored (i.e., contoured for proper drainage and revegetated as necessary). Proven unencapsulated beneficial reuse alternatives for coal ash/fines include use as fill material. SRS will have a need for large quantities of fill material for the closures of waste storage facilities such as the SDUs or F-Area and H-Area Tank Farms. Coal ash/fines can be used as lower fill material as part of the cover systems at these receiving facilities. Another beneficial reuse alternative includes using the coal ash/fines as an additive or replacement for cement in concrete mixes, improving the durability and strength of concrete products. The LUCs with Beneficial Reuse alternative would achieve RAOs.

Summary of Costs

Capital Cost *$23,089,898*

O&M *$16,518,056*
Total Present-Worth Cost *$39,607,954*

Alternative A-3: Class III Cover with LUCs

Alternative A-3 consists of placing a SCDES Class III cover system over the ash basins to break the direct exposure pathway, applying LUCs to maintain the integrity of the cover system, and installing groundwater monitoring wells at all remaining coal ash and coal fines OUs, except FAL OU, to monitor for migration of contaminants. A Class III cover system includes a geosynthetic materials including a liner and drainage layer to limit infiltration of rainwater through the covered waste. Monitoring at the FAL OU will be monitored semi-annually in accordance with its IWT permit. This alternative would also require LUCs through the use of warning and no trespassing signs, excavation permit restrictions, a LUCIP, and deed restrictions would be put into place to preclude activities that could cause exposure to contaminated media exceeding acceptable risk levels in the even the property were to be transferred out of federal ownership. Maintenance of the soil cover and five-year remedy reviews are required. The Class III Cover System with LUCs alternative would achieve RAOs.

Summary of Costs

Capital Cost *$48,165,265*
O&M *$11,499,505*
Total Present-Worth Cost *$59,664,770*

VIII. EVALUATION OF ALTERNATIVES

This section summarizes the results of the evaluation of the remedial alternatives in the *Focused Early Action Corrective Measures Study/Feasibility Study Support of Beneficial Reuse of Select Coal Ash and Coal Fines at the A- Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), F-Area Ash Landfill (288-F), H- Area Ash Basin (288-H), K-Area Ash Basin (188-K), and L-Area Ash Basin (188-L) Operable Units* (SRNS 2024).

The NCP [40 CFR 300.430(e)(9)] requires that potential remedial alternatives undergo detailed analysis using relevant evaluation criteria that will be used to select a final remedy. USEPA has established nine evaluation criteria to address the statutory requirements under CERCLA. The criteria fall into categories of threshold criteria, primary balancing criteria, and modifying criteria. The nine evaluation criteria are detailed in Table 3.

Comparative Analysis of Alternatives

The potential remedial alternatives have been evaluated against the threshold and primary balancing criteria. Modifying criteria (i.e. state or support agency acceptance and community acceptance) will be evaluated after the public comment period on the EA SB/PP. Provided below is a summary of the comparison of the alternatives against the CERCLA evaluation criteria. Key advantages and disadvantages for each alternative relative to one another and in relation to the two threshold criteria and five primary balancing criteria are discussed below and summarized in Table 4.

Overall Protection of Human Health and the Environment

Alternative A-1 would not be protective of human health or the environment. Alternatives A-2 and A-3 are protective of human health and the environment. Alternative A-2 limits human exposure to contaminated ash/soil through the implementation of LUCs in Phase 1. After the ash is excavated for beneficial reuse (Phase 2), the remaining coal ash and

coal fines OUs are expected to be clean closed. The potential for clean closure will be evaluated following excavation activities in Phase 2. Alternative A-3 breaks the exposure pathway to contaminated media and limits contaminant migration to groundwater through the use of an engineered cover system in addition to the use of LUCs. Alternatives A-2 and A-3 would not result in any natural resource injury.

Compliance with ARARs

There are no chemical-specific ARARs for any of the alternatives. Location-specific ARARs associated with the excavation or consolidation of the ash/soil media in any wetland area are considered for Alternatives A-2 and A-3. These alternatives achieve the location-specific ARARs by avoiding, minimizing, or mitigating the destruction, loss, or degradation of wetlands. Excavation within any wetland area may require restoration upon completion of the excavation to comply with the applicable ARARs in 10 CFR 1023 (see Table 2). Action-specific ARARs associated with Alternatives A-2 and A-3 are achieved by employing best management practices to minimize erosion of ash/soil and management of storm water runoff, and developing a storm water management plan. In addition, the characterization, disposal, and transportation of ash generated from Alternative A-2 would be handled in accordance with Federal and State regulations 40 CFR 262.11(b) and SCDES 61-107.5(D)(3). Coal ash and coal pile runoff are excluded as hazardous, solid waste per 40 CFR 261.4(b)(4)(i) and (ii). Installation of monitoring wells will be in accordance with R.61-71B(2)).

Short-Term Effectiveness

Alternative A-1 is not effective in the short-term since exposure is not prevented and therefore, ranked lowest of all the alternatives. Both Alternatives A-2 and A-3 pose minimal risk to the industrial worker during implementation. However, Alternative A-3 was ranked higher due to a shorter time frame to implement.

Long-Term Effectiveness and Permanence

Alternative A-1 is not effective in the long-term since exposure is not prevented and therefore, ranked the lowest. Alternative A-2 is ranked slightly higher than A-3. Alternative A-2 relies on LUCs to prevent exposure in the near term, but excavation and beneficial reuse will eliminate exposure in the long term. Alternative A-3 can be implemented sooner but relies on long term cover maintenance and LUCs to prevent exposure, as the ash material will remain in place.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives employ any treatment to reduce the toxicity, mobility, or volume of the contaminated media. As such, all alternatives are given an equally low ranking.

Implementability

No implementation is required of Alternative A-1; therefore, this alternative was ranked highest. Alternative A-2 was ranked slightly lower than Alternative A-1 because this alternative requires administrative and engineering controls. Alternative A-3 was ranked the same as Alternative A-2 because similar alternatives have been successfully implemented at SRS.

Cost

Alternative A-1 No Action:..... *$0*

Alternative A-2 LUCs with Beneficial Reuse: ..*$39,607,954*

Alternative A-3 Class III Cover with LUCs: *$59,664,770*

IX. PREFERRED ALTERNATIVE

A comparative alternative analysis, provided in Table 5, for the remaining coal ash and coal fines OU was developed to quantitatively evaluate the alternatives as they relate to the CERCLA criteria. This analysis does not necessarily select the preferred alternative, although it does attempt to rank the remedies in order of superiority when compared to the CERCLA criteria. The preferred alternative for the remaining coal ash and coal fines OU is Alternative A-2, LUCs with Beneficial Reuse. Alternative A-2 will prevent worker exposure to the ash related contaminants that are present in the surface ash/soil that present an unacceptable risk to the future industrial worker.

Phase 1 of Alternative A-2 is readily implementable due to the previously successful implementation of LUCs at other locations on the SRS. Phase 2 (excavation and beneficial reuse) is also considered to be implementable, e.g., the likely use of the ash material as fill for a large cover system.

LUCs for the remaining coal ash and coal fines OUs include the following:

- Warning signs posted at each OU around the waste unit boundaries/areas. Operations and maintenance of the signage.
- Administrative/Worker Access Controls: Includes SRS administrative controls and land use restrictions for onsite workers as implemented under the Site Use/Site Clearance Program and other controls that are in place to ensure worker safety, including work controls/work packages that include worker training, and health and safety requirements and pre-work briefings.
- Engineering controls: SRS access controls that limit and inform SRS workers and inadvertent trespassers as described in the 2023 RCRA Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.
- Installation/identification of groundwater monitoring wells for the HAB and LAB OUs, monitored every five years. Groundwater beneath the FAL OU will be monitored semi-annually.

The preferred remedy for the remaining coal ash and coal fines OUs at SRS temporarily leaves hazardous substances in place that pose a potential future risk and will require land use restrictions until Phase 2 of the remedy is implemented. As negotiated with USEPA, and in accordance with USEPA - Region 4 Policy (*Assuring Land Use Controls at Federal Facilities*, April 21, 1998), SRS has developed a Land Use Control Assurance Plan (LUCAP) (WSRC 1999) to ensure that land use restrictions are maintained and periodically verified. The unit-specific LUCIP that will be referenced in the ROD for the remaining coal ash and coal fines OUs will provide details and specific measures required for the LUCs selected as part of this preferred remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs described in this EA SB/PP. The LUCIP, developed as part of this action, will be submitted concurrently with

the Corrective Measures Implementation/ Remedial Action Implementation Plan (CMIP/RAIP), as required in the FFA for review and approval by USEPA and SCDES. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the remaining coal ash and coal fines OUs ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect until modified as needed to be protective of human health and the environment. LUCIP modification will only occur through another CERCLA document. Approval by USEPA and SCDES is required for any modification or termination of the LUCs.

The Preferred Alternative can change in response to public comment or new information obtained before the remedial action is implemented at the individual OUs.

The preferred remedy for the five remaining coal ash and coal fines OUs was selected based on the following:

- Alternative A-2, LUCs and Beneficial Reuse, was selected over Alternative A-1, No Action, and Alternative A-3, Class III Cover and LUCS. Alternative A-1, No Action, does not achieve the RAOs identified at the OUs. While both Alternatives A-2 and A-3 are considered protective of human health and the environment, Alternative A-2 is more effective in the long term as waste is excavated and used for beneficial reuse, rather than remaining in place indefinitely. Both alternatives are implementable. In addition, the estimated cost to implement is significantly higher for Alternative A-3 than Alternative A-2.
- Alternative A-2 achieves the RAOs established for these OUs. Potential exposure to human receptors is prevented by limiting access to the OUs in Phase 1 through LUCs. In Phase 2 of Alternative A-2, excavation of ash material for beneficial reuse removes the source of exposure and future potential migration of contaminants to groundwater. A stormwater management plan will be developed to meet SCDES regulations on storm water management during Phase 2 excavation activities.

Based on information currently available, the lead agency believes that Alternative A-2 provides the best balance of tradeoffs among the other alternatives with respect to the evaluation criteria. The USDOE expects the Preferred Alternative to satisfy the statutory requirements in CERCLA Section 121(b) to: (1) be protective of human health and the environment, (2) comply with ARARs, and be (3) be cost-effective, and (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Based on previous meetings with USEPA and SCDES to discuss remedial alternatives for these OUs, the regulatory agencies concur with the preferred remedy.

X. POST-ROD SCHEDULE

Deliverable	Due Date
Submit Rev. 0, EA Record of Decision	06/11/2026
Submit Rev. 0, EA Land Use Control Implementation Plan	11/24/2026
Issuance of the EA Record of Decision	02/20/2027
Remedial Action Start	02/23/2028

XI. REFERENCES

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

SCDES, 2022. *Savannah River Site's Responses to the Regulatory Comments on the Preferred Remedial Action and Regulatory Strategy for Remaining Savannah River Site's Coal Ash and Coal Fines Operable Units (U)* (IACD-22-166, dated July 21, 2022) dated September 15, 2022 and received September 21, 2022 (SRNS-OS-2022-00299), September 2022, South Carolina Department of Environmental Services, Columbia, SC

SRNS, 2012a. *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-RP-2010-01457, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

SRNS, 2012b. *Waste Characterization Report for Savannah River Site Ash Outside 288-F Landfill*, SRNS-J2000-2012-00214, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

SRNS, 2014. *Interim Action Statement of Basis/ Proposed Plan 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-RP-2012-00307, Revision 1.1 Redline, March 2014, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

SRNS, 2022. *Preferred Remedial Action and Regulatory Strategy for Remaining Savannah River Site's Coal Ash and Coal Fines Operable Units (U)* IACD-22-166, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

SRNS, 2024. *Focused Early Action Corrective Measures Study/Feasibility Study in Support of Beneficial Reuse of Select Coal Ash and Coal Fines at the A- Area Ash Pile (788-A), A-Area Coal Pile Runoff Basin (788-3A), F-Area Ash Landfill (288-F), H- Area Ash Basin (288-H), K-Area Ash Basin (188-K), and L-Area Ash Basin (188-L) Operable Units,* SRNS-RP-2024-00222, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

USDOE, 2022. *Preferred Remedial Action and Regulatory Strategy for Remaining Savannah River Site's Coal Ash and Coal Fines Operable Units (U)*, IACD-22-166, Department of Energy, Savannah River Operations Office, Aiken, SC

USEPA, 2022. *EPA Approval of the Preferred Remedial Action and Regulatory Strategy for Remaining Coal Ash and Coal Fines Operable Units, Savannah River Site,* SRNS-OS-2022-00247, U.S. Environmental Protection Agency, Atlanta, GA

WSRC, 1999. *Land Use Control Assurance Plan for the Savannah River Site*, WSRC-RP-98-4125, Revision 1.1, August 1999, latest update, Savannah

River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC.

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

XII. GLOSSARY

Administrative Record File (ARF): 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.

Applicable, or Relevant and Appropriate Requirements (ARARs): Federal and more stringent, promulgated State environmental or facility siting requirements in a law or regulation that a selected remedy must attain, which vary from site to site.

Baseline Risk Assessment (BRA): 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 SCDES) and regulated entities (USDOE) that sets the standards and schedules for the comprehensive remediation of the SRS.

Land Use Controls (LUCs): 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. Media to which a release of contaminants may occur are groundwater, soil, surface water, sediments, and air.

National Priorities List (NPL): 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.

Statement of Basis: A report describing the corrective measures/remedial actions being conducted pursuant to South Carolina Hazardous Waste Management Regulations, as amended.

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 ($1.0x10^{-4}$) and one excess cancer in an exposed population of one million ($1.0x10^{-6}$). 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 ($1.0x10^{-6}$). Risks greater than $1.0x10^{-4}$ indicate that remedial action is generally warranted

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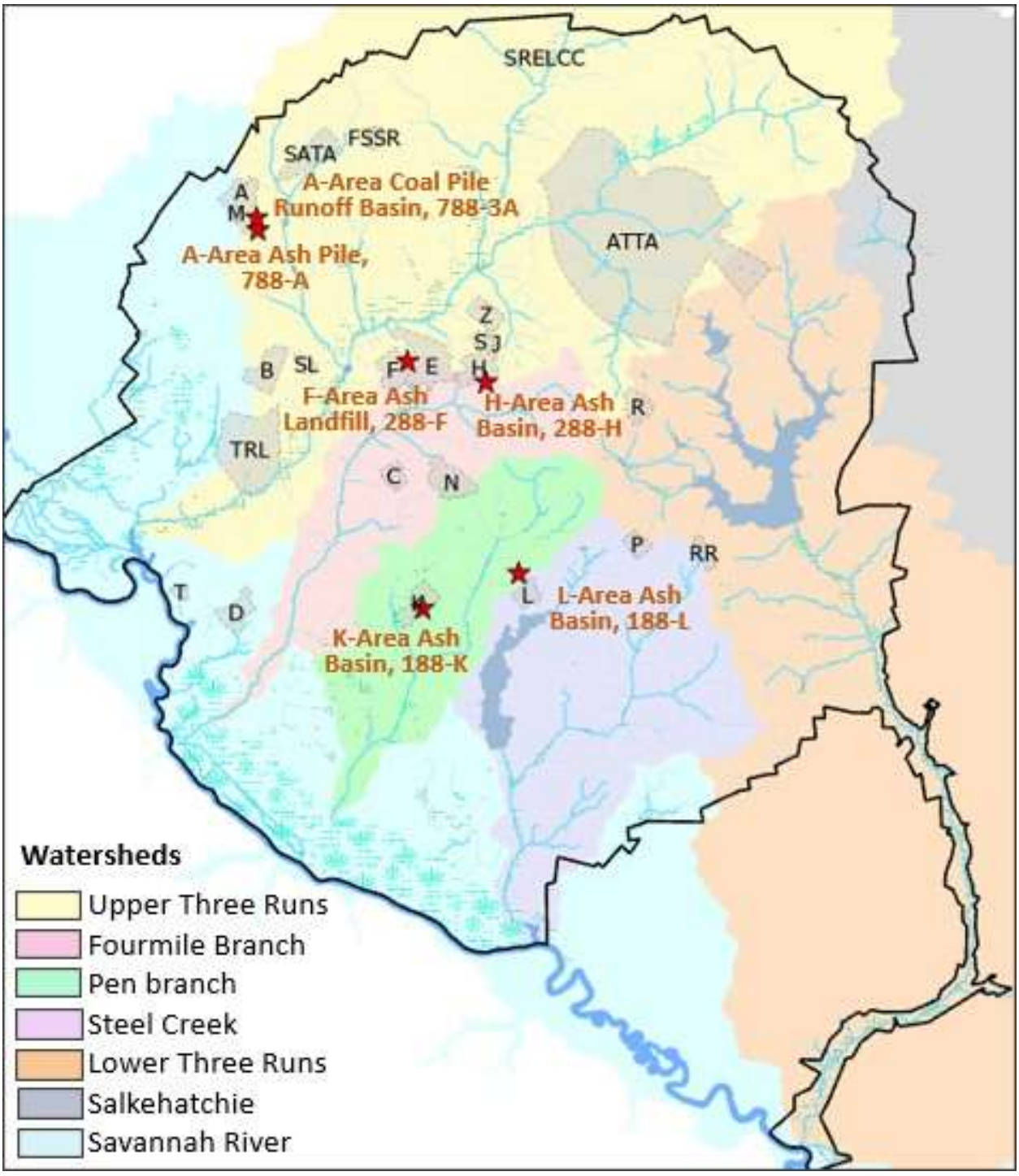

Figure 1. Location of the Remaining Coal Ash and Coal Fines OUs within the Savannah River Site

Figure 2. A-Area Ash Pile and A-Area Coal Pile Runoff Basin Operable Unit

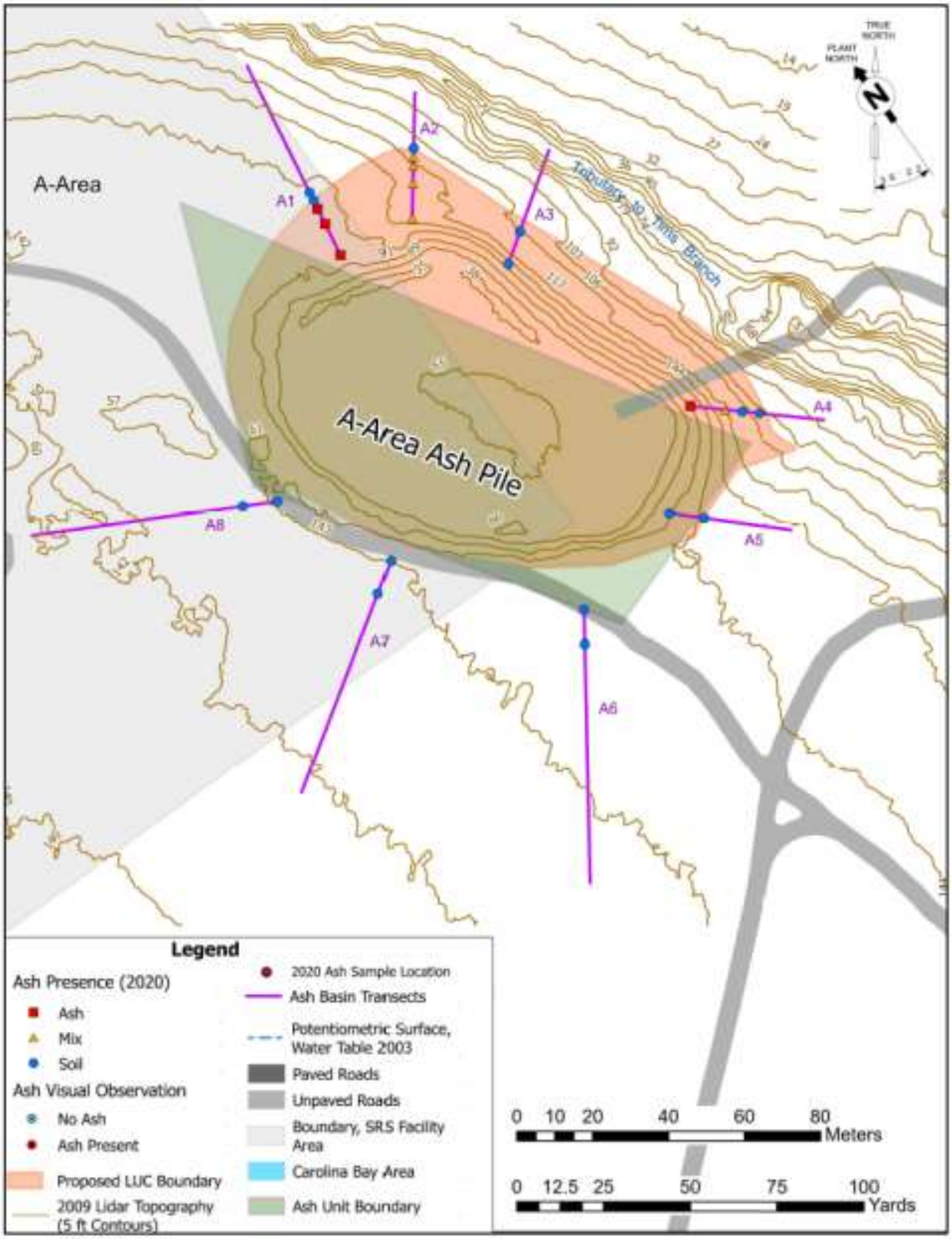

Figure 3. A-Area Ash Pile Topography and Ash Observation Transects

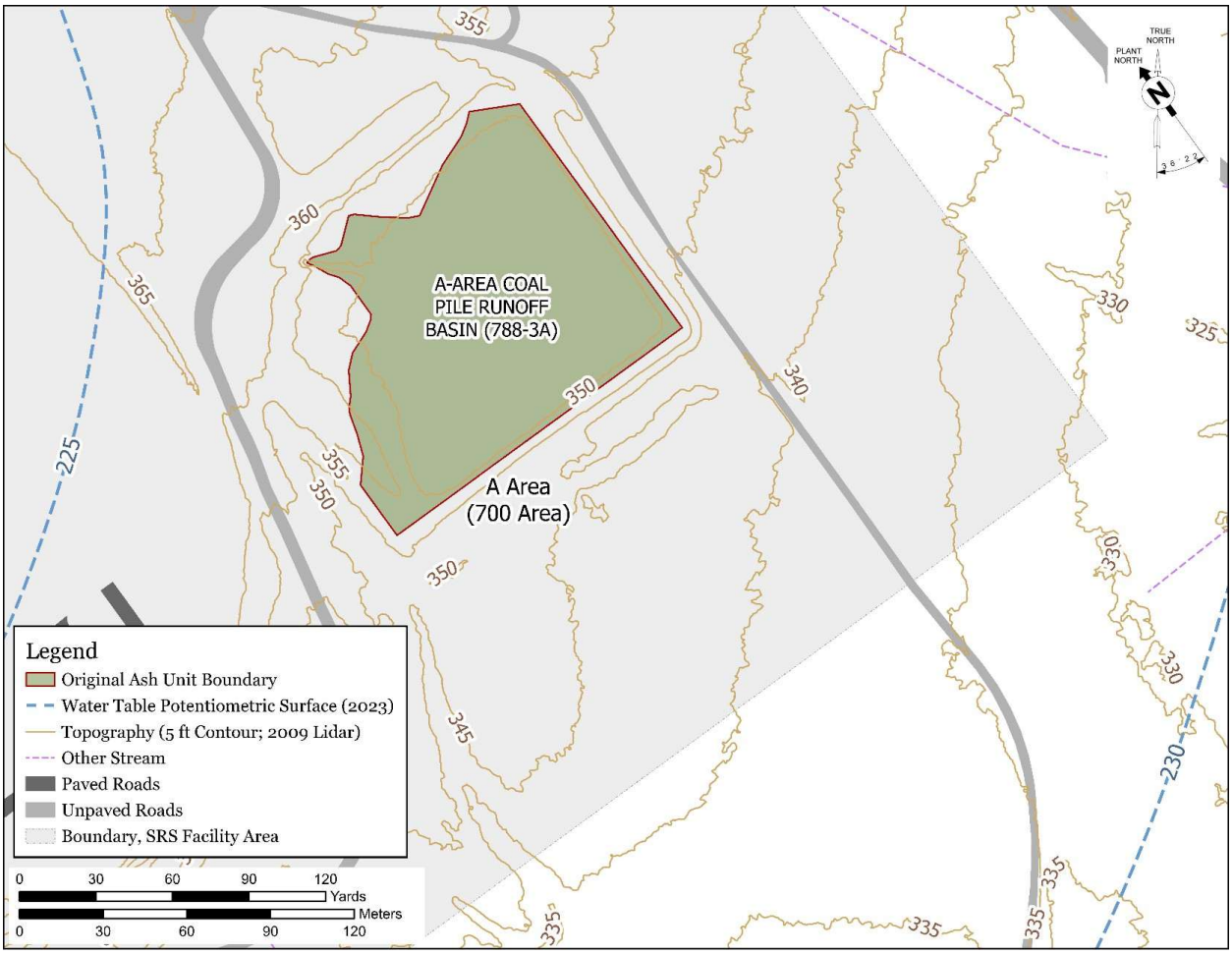

Figure 4. A-Area Coal Pile Runoff Basin Topography

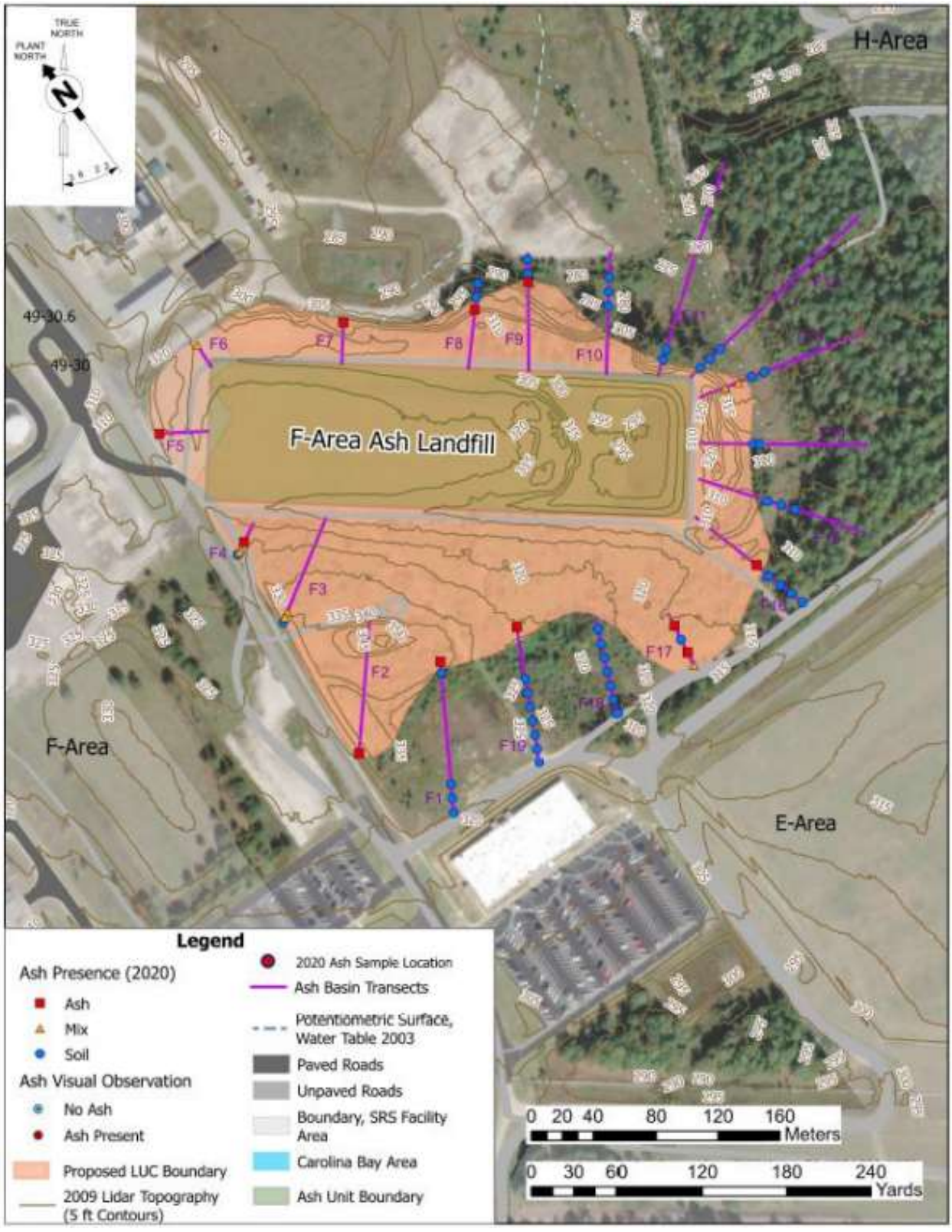

Figure 5. F-Area Ash Landfill OU Topography and Ash Observation Transects

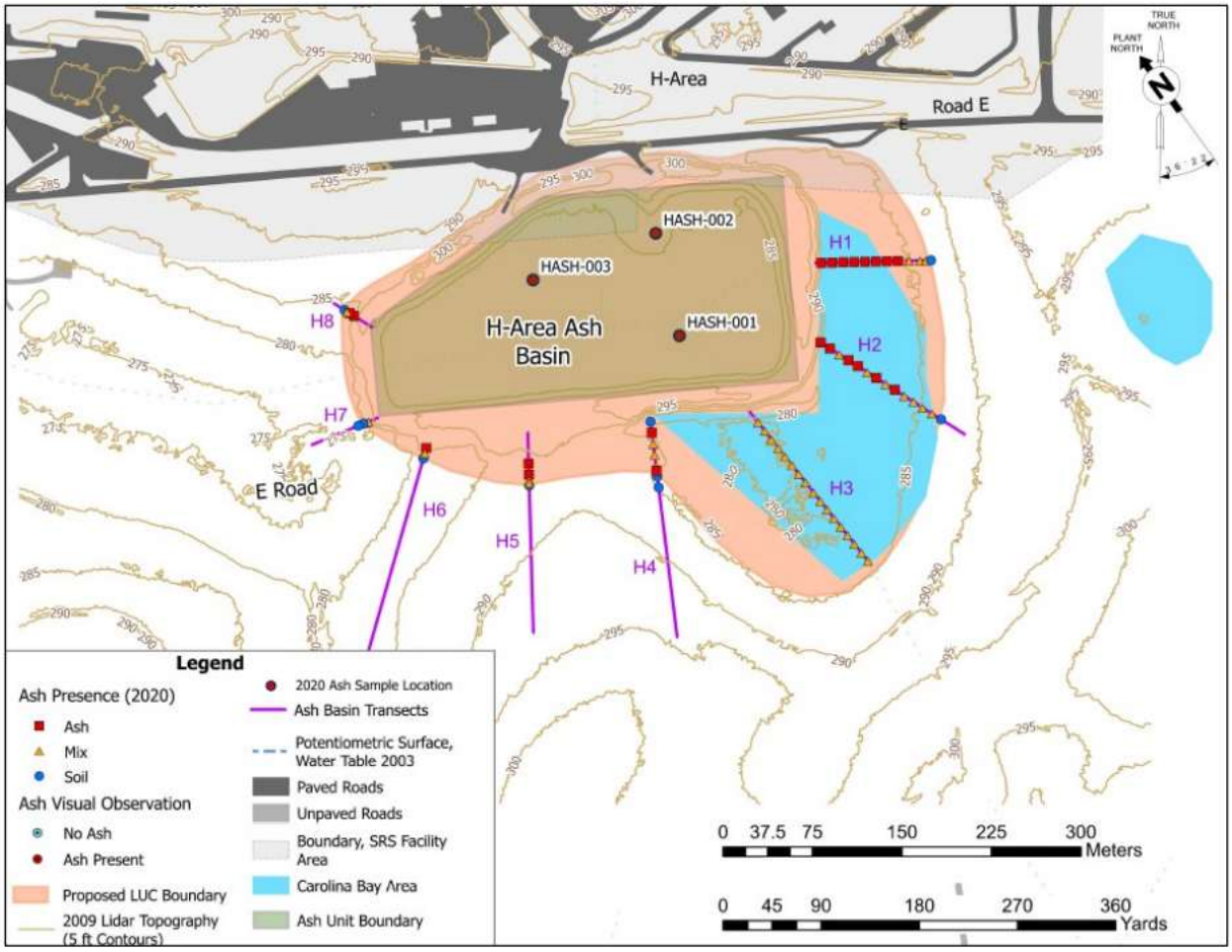

Figure 6. H-Area Ash Basin OU Topography and Ash Observation Transects

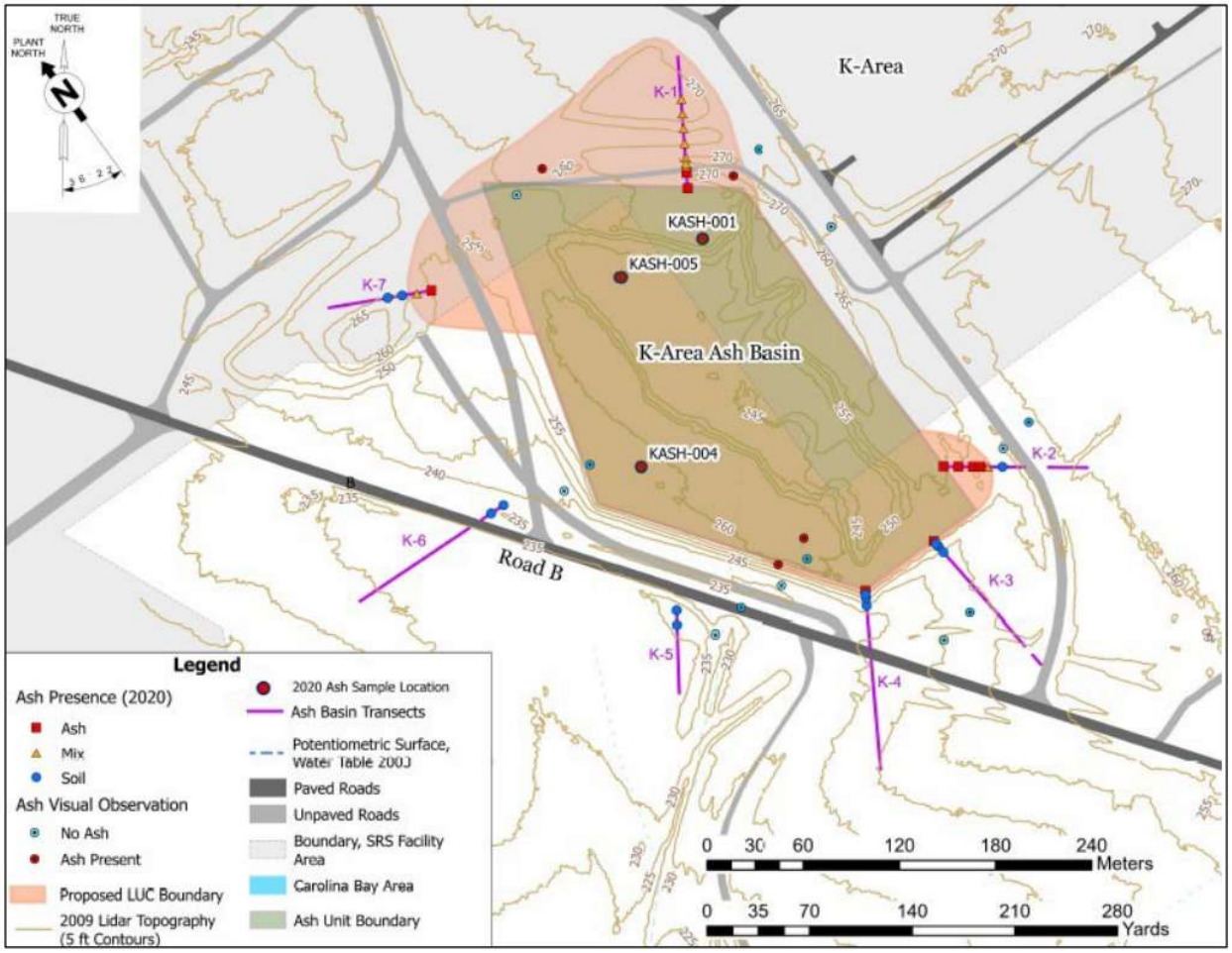

Figure 7. K-Area Ash Basin OU Topography and Ash Observation Transects

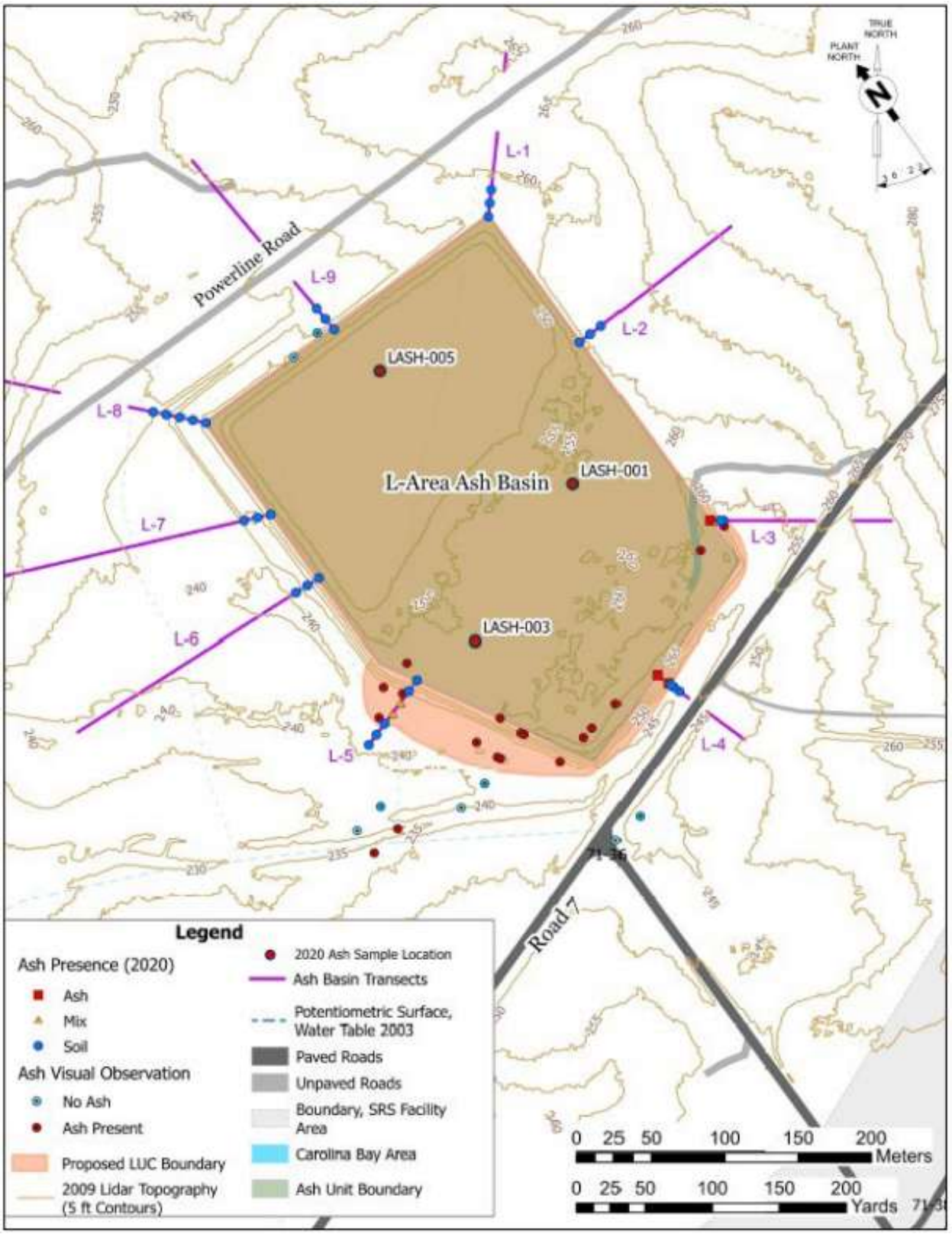

Figure 8. L-Area Ash Basin OU Topography and Ash Observation Transects

Table 1. Summary of the Remaining Coal Ash and Coal Fines Operable Units Cleanup

Media	RCOC[1, 14]	Units	ARAR[2]	HHRA Future Resident[3] (1E-06)	HHRA Industrial Worker[4] (1E-06)	HHRA Onsite Worker[5] (1E-06)	HHRA Adolescent Trespasser[6] (1E-06)	PTSM[7]	ERA[8]	CM[9]	Most Restrictive PRG[10]	SRS Background 95th%[11]	Most Likely PRG[12]
AAP (ash)	Arsenic	mg/kg	-	0.68	3.0	6.24	7.1	-	-	-	0.68	*8.2*	8.2
	Potassium-40	pCi/g	-	0.144	0.219	0.446	0.819	-	-	-	0.144	*3.3*	3.3
	Uranium-238	pCi/g	-	0.0125	0.020	0.0416	NA[13]	-	-	-	0.0125	*1.22*	1.22
ACPRB (sediment/coal fines)	Arsenic	mg/kg	-	0.68	3.0	6.24	7.1	-	-	-	0.68	*8.3*	8.3
ACPRB (surface water)	None	-	-	-	-	-	-	-	-	-	-	-	-
FAL, HAB, KAB, LAB (ash)	Arsenic	mg/kg	-	0.68	3.00	6.24	7.1	-	-	-	0.68	*8.2*	8.2
	Potassium-40	pCi/g	-	0.144	0.219	0.446	0.819	-	-	-	0.144	*3.3*	3.3
	Thorium-232	pCi/g	-	0.00985	0.0153	0.0318	0.0688	-	-	-	0.001	*1.94*	1.94
	Uranium-238	pCi/g	-	0.0125	0.020	0.0416	NA[13]	-	-	-	0.125	*1.22*	1.22
HAB	Barium	mg/ kg	-	-	-	-	-	-	-	*64.1*	64.1	75.3	64.1
	Uranium-233/234	pCi/g	-	-	-	-	-	-	-	0.67	0.67	*1.20*	1.20
	Uranium-235	pCi/g		-	-	-	-	-	-	0.03	0.03	*0.11*	0.11
	Uranium-238	pCi/g	-	-	-	-	-	-	-	0.67	0.67	*1.22*	1.22
LAB	Barium	mg/kg	-	-	-	-	-	-	-	*75.3*	75.3	49.9	75.3
FAL, HAB, KAB, LAB (surface water)	None	-	-					-	-	-	-	-	-
FAL, HAB, KAB, LAB (groundwater)	None	-	-					-	-	-	-	-	-

1 - RCOC = refined constituent of concern
2 - ARAR = applicable or relevant and appropriate requirement.
3 - HHRA = human health risk assessment. PRGs calculated for the future resident at a target risk of 1E-06.
4 - HHRA = human health risk assessment. PRGs calculated for the future industrial worker at a target risk of 1E-06.
5 - HHRA = human health risk assessment. PRGs calculated for the onsite worker at a target risk of 1E-06.
6 - HHRA = human health risk assessment. PRGs calculated for the adolescent trespasser at a target risk of 1E-06.
7 - PTSM = principal threat source material evaluation. No RCOCs identified (Appendix E).
8 - ERA = ecological risk assessment. No RCOCs identified (Appendix D).
9 - CM = contaminant migration analysis. No RCOCs identified (Appendix B).
10 - Most Restrictive PRG = the lesser of the ARAR, HHRA, PTSM, ERA and CM PRGs.
11 - SRS 95th %tile = ninety-fifth percentile from the SRS Background Soils Statistical Summary Report, Appendix B-2 (all depths), dated October 2006
12 - Most Likely Cleanup Level = the most restrictive risk-based PRG if it is greater than background concentrations. If the most restrictive risk-based PRG is less than SRS background concentrations, then the PRG defaults to the background value. Sources of the PRGs in this column are highlighted in italics.
13 - NA = not applicable. U-238(+D) not identified as a HH RCOC for the adolescent trespasser receptor scenario.
14 - Radium-226 risk will be managed under the cleanup level established for the entire decay series. Radium-226 is a daughter product of the uranium-238 decay series.

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Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs

Action	Requirements	Prerequisites	Citation
Action-Specific ARARs			
General Construction Standards — All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)			
Managing storm water run-off from land-disturbing activities	Must comply with the substantive requirements for stormwater management and sediment control of *NPDES General Permit No. SCR100000.*	Large and small construction activities (as defined in R.61-9) of more than 1 acre of land – **applicable**	SC R.61-9.122.26(c) NPDES General Permit No. SCR100000
	The requirements of R.72-305 and R.72-307 will apply.	For land disturbing activities disturbing more than five (5) acres – **applicable**	SC R.72-305.B.(3)
	The stormwater management and sediment control plan shall contain at a minimum the information provided in the following subsections:	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 – **applicable**	SC R.72-307 I. – *South Carolina Storm Water Management and Sediment Reduction Regulations*
	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.		SC R.72-307 I.(3)(d)
	Provisions for stormwater runoff control during the land disturbing activity and during the life of the facility meeting the following requirements: • Post-development peak discharge rates shall not exceed pre-development discharge rates for the 2- and 10-year frequency 24-hour duration storm event. Implementing agencies may utilize a less frequent storm event (e.g. 25-year, 24-hour) to address existing or future stormwater quantity or quality problems. • Discharge velocities shall be reduced to provide a non- erosive velocity flow from a structure, channel, or other control measure or the velocity of the 10-year, 24-hour storm runoff in the receiving waterway prior to the land disturbing activity, whichever is greater.		SC R.72-307 I.(3)(e)
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**	SC R.61-62.6 Section III(a)-*Control of Fugitive Particulate Matter Statewide* SC R.61-62.6 Section III(d)

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued)*

Action	Requirements	Prerequisites	Citation
Action-Specific ARARs *(continued)*			
Waste Characterization and Storage — (e.g., wastewaters, excavated ash, coal fines, contaminated soils/sediments, vegetation, debris)			
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) SC 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) SC R.61-79 262.11*(b)*
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR Part 261 by either: • 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 • 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) SC R.61-79 262.11*(c)*
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 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) SC 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) SC 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) SC 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) SC R.61-79 268.7*(a)* (1)

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued)*

Action	Requirements	Prerequisites	Citation
Action-Specific ARARs *(continued)*			
Waste Characterization and Storage — (e.g., wastewaters, excavated ash, coal fines, contaminated soils/sediments, vegetation, debris) **(continued)**			
Temporary Storage of Solid Waste	Shall be conducted in a manner to: • Inhibit the harborage of flies, rodents, and other vectors; • Prevent conditions for transmission of diseases to man or animals; • Prevent blowing debris and particulates so as not to be injurious to human health and the environment; • Prevent water pollution and prevent the escape of solid waste or leachate to waters of the State; and • Minimize objectionable odors, dust, unsightliness, and aesthetically objectionable conditions, and prevent the accumulation of materials in an untidy and unsafe manner so as to become a fire and safety hazard.	Generation of solid waste for temporary storage prior to processing, disposal of that waste – **relevant and appropriate**	SC R.61-107.5(C)(1)
Dewatering of Ash Basin (If Necessary – no basins currently hold water)			
Discharge to Surface Water	Any discharge into waters of the State must be permitted by the Department and receive a degree of treatment and/or control which shall produce an effluent which is consistent with the Act, the Clean Water Act (P.L. 92-500, 95-217, 97-117, 100-4), this regulation, and related regulations. *Note: Under CERCLA Section 121(e) permits are not required for on-site response actions. Instead, SRS must meet any applicable effluent limits in its existing NPDES discharge permit or other substantive requirements, including the numeric water quality criteria for the protection and maintenance of the appropriate class of surface waters as adopted in SC R.61-68 and listed in Sections E, G, and the appendix therein.*	Discharge of pollutants (including toxic substances) into waters of the State of South Carolina – **applicable**	SC R.61-68E.4.a SC R.61-68 E.14
	Site-specific permit effluent limitations and alternate criteria less stringent than those derived in accordance with the requirements in SC R.61-68 E.14.c. may be derived where it is demonstrated that such limits and criteria shall maintain the existing and classified uses.		SC R.61-68 E.14.c.(7)
	Discharge of garbage, cinders, ashes, oils, sludges, or other refuse is not allowed.	Quality Standards for Waters of the State of South Carolina (classified as FW as provided in SC R.61-68G.10) – **applicable**	SC R.61-68G.10.a

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued)*

Action	Requirements	Prerequisites	Citation
Action-Specific ARARs *(continued)*			
***Dewatering of Ash Basin (If Necessary – no basins currently hold water)* (continued)**			
	Treated wastes, toxic wastes, deleterious substances in sufficient amounts to make the waters unsafe or unsuitable for primary contact recreation or to impair the waters for any other best usage are not allowed.		SC R.61-68G.10.b
	Discharge of toxic pollutants is not allowed except as prescribed in Section E of SC R.61-68.		SC R.61-68G.10.c
	Stormwater, and other nonpoint source runoff is allowed if water quality necessary for existing and classified uses shall be maintained and protected consistent with anti-degradation rules.		SC R.61-68G.10.d
	Dissolved oxygen – daily average not less than 5.0 mg/L with a low of 4.0 mg/L		SC R.61-68G.10.e
	pH between 6.0 and 8.5		SC R.61-68G.10.g
Monitoring Well Installation, Operation, and Abandonment			
Installation or Abandonment 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 (including non-standard installation, as defined in R.61-71B(2)) – **relevant and appropriate** *(NOTE: "Applicable" for 288-F only since it is a SCDES permitted landfill.)*	SC R.61-71H.1(b) SC R.61-71H.2(e)
On-Site Closure/Capping of Ash Basins			
Closure of CCR Unit	Closure of a CCR landfill, CCR surface impoundment, or any lateral expansion of a CCR unit must be completed either by leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit,	Closure of CCR Unit– **relevant and appropriate** *(NOTE: "Applicable" for 288-F only since it is a SCDES permitted landfill.)*	40 CFR 257.102 (a) SC R.61-107.19 Part V

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued)*

Action	Requirements	Prerequisites	Citation
Action-Specific ARARs *(continued)*			
Transportation of Wastes			
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) SC 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)(i) 40 CFR 261.4(d)(2)(i)(A) and (B) SC R.61-79 261.4*(d)* (2)(i)(A) and (B)
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	SCDES R. 61-62.6 Section III(a)- Control of Fugitive Particulate Matter Statewide SCDES R. 61-62.6 Section III(d)
Location-Specific ARARs			
Presence of wetlands as defined in 10 *CFR* 1022.4	Avoid, to the extent possible, the long- and short-term adverse effects associated with destruction, occupancy, and modification of wetlands and floodplains.	DOE actions that involve potential impacts to, or take place within, wetlands – **applicable.**	10 *CFR* 1022.3(a)
	Take action, to extent practicable, to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.		10 *CFR* 1022.3(a)(7) and (8)
	Undertake a careful evaluation of the potential effects of any new construction in wetlands. Identify, evaluate, and as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on wetlands.		10 *CFR* 1022.3(b) and (d)
	If no practicable alternative to locating or conducting the action in the wetland is available, then before taking action, design or modify the action in order to minimize potential harm to or within the wetland, consistent with the policies set forth in E.O. 11990.		10 CFR 1022.14(a)

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued)*

Action	Requirements	Prerequisites	Citation
Location-Specific ARARs *(continued)*			
Location encompassing *aquatic ecosystem* as defined in 40 CFR 230.3(c)	No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 *et seq.* have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable.**	40 *CFR* 230.10(a) 40 *CFR* 230.10(d)
	No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 *et seq.* have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable.**	40 *CFR* 230.10(a) 40 *CFR* 230.10(d)
	Must comply with the substantive requirements of the NWP 38, General Conditions, as appropriate, any regional or case-specific conditions recommended by the Corps District Engineer, after consultation. *Note: Despite that consultation may be considered an administrative requirement, it should be performed to ensure activities are in compliance with substantive provisions of the permit.*	On-site CERCLA action conducted by Federal agency that involves discharge of dredged or fill material into *waters of the United States*, including jurisdictional wetlands – **relevant and appropriate**.	Nationwide Permit (38) – Cleanup of Hazardous and Toxic Waste 33 *CFR* 323.3(b)
Presence of wetlands	Requires Federal agencies to evaluate action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Actions that involve potential impacts to, or take place within, wetlands –**TBC**	Executive Order 11990 – *Protection of Wetlands* - Section 1.(a)
Presence of migratory birds and their habitats	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 may be permitted under the terms of a valid permit.	If action is likely to impact migratory birds – **applicable**.	16 *USC* 703-704 – Migratory Bird Treaty Act

Table 2. Potential ARARs for the Preferred Remedial Alternative for the Remaining Coal Ash and Coal Fines OUs *(continued/end)*

Action	Requirements	Prerequisites	Citation
Location-Specific ARARs *(continued)*			
Presence of archeological or cultural artifacts	No person may excavate, remove, damage, or otherwise alter or deface, or attempt to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands unless such activity is pursuant to a permit issued under §7.8 or exempted by § 7.5(b) of this part. *Note: Prior to removal activities existing Site Use process requires approval by the Savannah River Archaeological Research Program. The SRARP is a division of the South Carolina Institute of Archaeology and Anthropology (SCIAA) at the University of South Carolina. The SRARP manages the archaeological and other historic resources for the U.S. Department of Energy.*	Excavation and/or removal of archaeological resources from public lands – **applicable**.	43 *CFR* Part 7 – implementing the Archaeological Resources Protection Act of 1979.

1 - The requirements from 40 CFR Part 268 contained in this table will be triggered if any generated wastes, including coal ash, coal fines, soil, sediments, and/or groundwater are characterized as RCRA hazardous wastes.

Alt – Alternative
ARAR – applicable or relevant and appropriate requirement
CFR – Code of Federal Regulations
CMBST – Combustion
CCR – Coal Combustion Residuals
CWA – Clean Water Act of 1972
DEACT – deactivation
DOT – U.S. Department of Transportation
EPA – U.S. Environmental Protection Agency
LDR – Land Disposal Restrictions
NPDES – National Pollutant Discharge Elimination System
POLYM – polymerization
RCRA – Resource Conservation and Recovery Act of 1976
RORGS – recovery of organics
SCDES – South Carolina Department of Environmental Services
TCLP – Toxicity Characteristics Leaching Procedure
UHC – underlying hazardous constituents
UTS – Universal Treatment Standard
WWTU – Waste Water Treatment Unit

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Table 3. Description of CERCLA Evaluation Criteria

Threshold Criteria:
• *Overall Protectiveness of Human Health and the Environment* determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment. • *Compliance with ARARs* evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site. ARARs may be waived under certain circumstances. ARARs are divided into chemical-specific, location-specific, and action-specific criteria.
Primary Balancing Criteria:
• *Long-Term Effectiveness and Permanence* considers the ability of an alternative to maintain protection of human health and the environment over time. It evaluates magnitude of residual risk and adequacy of reliability of controls. • *Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment* evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. • *Short-Term Effectiveness* considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation. • *Implementability* considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. • *Cost* includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
Modifying Criteria:
• *State Support/Agency Acceptance* considers whether USEPA and SCDES agree with the analyses and recommendations by the USDOE. Approval of the Record of Decision constitutes approval of the selected alternative by the regulatory agencies. • *Community Acceptance* considers whether the local community agrees with the Preferred Alternative. Comments received on the Statement of Basis/Proposed Plan during the public comment period are an important indicator of community acceptance. Comments from the public are considered in the final remedy selection in the Record of Decision.

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Table 4. Comparison of Alternatives to CERCLA Criteria for the Remaining Coal Ash and Coal Fines Operable Units

Criterion	A-1 No Action	A-2 LUCs with Beneficial Reuse	A-3 Class III Cover with LUCs
Overall Protection			
Human Health	Not protective of the future resident or onsite worker because there are no controls or remediation.	Meets the requirement by limiting exposure to the contaminated media through the use of administrative and engineering controls.	Meets the requirement by placement of a soil cover to eliminate the direct exposure pathways.
Environment	Not protective because contaminants remain in place	Optimally protective of environment because the ash sites are restored to pre-ash conditions.	Protective of environment because the ash sites are isolated from ash.
Compliance with ARARs			
Chemical-Specific	No ARARs exist	No ARARs exist	No ARARs exist
Location-Specific	No ARARs exist	Meets the requirement by limiting exposure to the contaminated media through the use of administrative and engineering controls.	Meets the requirement by placement of a soil cover to eliminate the direct exposure pathways.
Action-Specific	No ARARs exist	Meets the requirement by limiting exposure to the contaminated media through the use of administrative and engineering controls.	Meets the requirement by placement of a soil cover to eliminate the direct exposure pathways.
Long-Term Effectiveness and Performance			
Magnitude of Residual Human Health Risk	Residual human health risk remains above $1x10^{-6}$ or SRS background concentrations	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations; 5-year remedy reviews and LUCs required until beneficial reuse.	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations; 5-year remedy reviews and LUCs required until risks decrease to allow for unlimited use and unrestricted exposure.
Adequacy of Controls	None.	Controls are adequate as long as they are maintained.	Controls are adequate as long as they are maintained.
Permanence	No	LUCs are permanent until beneficial reuse as long as controls are maintained.	Cover system and LUCs are permanent as long as it is maintained
Reduction of Mobility, Toxicity, or Volume Through Treatment			
Type of Reduction	No reduction	No reduction	No reduction
Degree of Expected Reduction in Toxicity, Mobility, or Volume	No reduction	No reduction	No reduction

Table 4. Comparison of Alternatives to CERCLA Criteria for the Remaining Coal Ash and Coal Fines Operable Units (*continued/end*)

Criterion	A-1 No Action	A-2 LUCs with Beneficial Reuse	A-3 Class III Cover with LUCs
Short-Term Effectiveness and Performance			
Amount of Hazardous Material Destroyed or Treated	No reduction	No reduction	No reduction
Risk to Remedial Worker	No risk	Minimal; Health and Safety Plan will be implemented to protect remedial workers	Minimal; Health and Safety Plan will be implemented to protect remedial workers
Risk to Community	None	None	None
Risk to Environment	None	None	None
Time to Implement and achieve RAO	Never	12+ years	5-10 years
Implementability			
Availability of Materials, Equipment, Contractors	Not Applicable	Readily Available	Readily Available
Ability to Construct and Operate the Technology	Not Applicable	Proven technology at SRS	Proven technology at SRS
Ability to Obtain Permits/Approvals from Other Agencies	Not Applicable	Prior history with similar permits/approvals at SRS	Prior history with similar permits/approvals at SRS
Estimated Cost*			
Total Capital Cost	$0	$23,089,898	$48,165,265
Present Worth O&M Cost	$0	$16,518,056	$11,499,505
Total Cost	**$0**	**$39,607,954**	**$59,664,770**

* For itemized costs per Ash OU, see Appendix A.

Table 5. Quantitative Summary of the Comparative Alternative Analysis

Alternatives	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-term Effectiveness	Implementability	Cost	Overall Ranking
Alternative A-1	No	NA	1	1	1	5	$0	8
Alternative A-2								
AAP	Yes	Yes	5	1	3	4	$2,477,495	13
ACPRB							$1,005,629	
FAL							$13,831,805	
HAB							$9,033,599	
KAB							$7,327,969	
LAB							$5,931,458	
Total							***$39,607,954***	
Alternative A-3								
AAP	Yes	Yes	4	1	4	4	N/A*	13
ACPRB							$8,155,203*	
FAL							$10,741,846	
HAB							$13,195,168	
KAB							$11,185,501	
LAB							$16,387,052	
Total							***$59,664,770***	

Note: Numeric range 1 through 5, where 1= worst and 5 = best
* cost of AAP and ACPRB are combined

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APPENDIX A

DETAILED COST ESTIMATES FOR THE PREFERRED ALTERNATIVES

APPENDIX A - LIST OF TABLES

Table A-1. Alternative A-2: Land Use Controls and Beneficial Reuse

Institutional Controls Estimate
Alternatives A-2
Land Use Controls w/Beneficial Reuse*

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
A-ASH				
Monitoring Wells				
Install monitoring wells to 120ft , core from surface to TD	0	ea	$20,324	$0
Technical Oversight	0	ls	$37,932	$0
Institutional Controls				
Install inclinometers	1	ea	$12,000	$12,000
Posting of Warning Signs	4	ea	$500	$2,000
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	70,000	yd^3	$3.59	$251,300
Confirmation Sampling / Analysis	15	ea	$1,000	$15,000
Stormwater Management	1,333	lf	$25	$33,325
Site Restoration				
Contour Basin After Sediment / Coal Removal	2.55	ac	$1,700	$4,335
Common Backfill (4 Inches)	1,645	yd^3	$13	$21,385
Topsoil (4 Inches)	1,645	yd^3	$35	$57,575
Fertilizer, Lime, Seed & Mulch	14,810	yd^2	$0.75	$11,108
Backfill Sampling / Analysis	4	ea	$1,200	$4,800
Subtotal - Direct Capital Cost				$422,828
Mobilization/Demobilization	9%	of subtotal direct capital		$38,054
Site Preparation/Site Restoration	9%	of subtotal direct capital		$38,054
Total Direct Capital Cost				**$498,936**
Indirect Capital Costs				
Engineering & Design	14%	of direct capital		$69,851
Project/Construction Management	25%	of direct capital		$124,734
Health & Safety	6%	of direct capital		$29,936
Overhead	30%	of direct capital + indirect capital		$217,037
Contingency	26%	of direct capital + indirect capital		$188,099
Total Indirect Capital Cost				**$629,658**
Total Estimated Capital Cost				**$1,128,594**
Direct O&M Costs	2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2027-2028*
Access Controls	1	ea	$500	$500
Maintenance	1	ea	$3,442	$3,442
Subtotal - Annual Costs				$3,942
Present Value Cost				**$7,631**
	2.5%	30 Year Discount Rate[1]		
Annual Costs	30	years O&M		*Years 2029-2058*
Access Controls	1	ea	$500	$500
Annual Inspection/Maintenance	1	ea	$3,442	$3,442
Slope Stability Monitoring	1	ea	$12,000	$12,000
Subtotal - 30 Year Annual Costs				$15,942

Table A-1. Alternative A-2: Land Use Controls and Beneficial Reuse *(continued/end)*

	Present Value Cost		**$333,670**
Five Year Costs	6		
Remedy Review	1 ea	$15,000	$15,000
Groundwater Monitoring - 4 wells	0 ea	$7,000	$0
Subtotal - Five Year O&M Costs			$15,000
	Present Value Cost		**$87,602**
	Total Present Value Direct O&M Cost		**$428,903**
Indirect O&M Costs			
Project/Admin Management	146% of direct O&M		$626,199
Health & Safety	19% of direct O&M		$81,492
Overhead	30% of direct O&M + indirect O&M		$128,671
Contingency	20% of direct O&M + indirect O&M		$83,636
	Total Present Worth Indirect O&M Cost		$919,997
	Total Estimated Present Worth O&M Cost		**$1,348,900**
	TOTAL ESTIMATED COST		**$2,477,495**

[1] *Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.*

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Table A-2. Alternative AC-2: Land Use Controls and Beneficial Reuse

Institutional Controls Estimate
Alternatives AC-2
Land Use Controls w/Beneficial Reuse*

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
A-CPRB				
Monitoring Wells				
Drill/core rotosonic soil borings to 120 ft	0	ea	$20,324	$0
Technical Oversight	0	ls	$37,932	$0
Institutional Controls				
Posting of Warning Signs	4	ea	$500	$2,000
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	10,000	yd^3	$3.59	$35,900
Confirmation Sampling / Analysis	15	ea	$1,000	$15,000
Stormwater Management	1,351	lf	$25	$33,775
Site Restoration				
Contour Basin After Sediment / Coal Removal	2.62	ac	$1,700	$4,454
Common Backfill (4 Inches)	1,690	yd^3	$13	$21,970
Topsoil (4 Inches)	1,690	yd^3	$35	$59,150
Fertilizer, Lime, Seed & Mulch	15,216	yd^2	$0.75	$11,412
Backfill Sampling / Analysis	4	ea	$1,200	$4,800
Subtotal - Direct Capital Cost				$198,461
Mobilization/Demobilization	9%	of subtotal direct capital		$17,861
Site Preparation/Site Restoration	9%	of subtotal direct capital		$17,861
Total Direct Capital Cost				**$234,184**
Indirect Capital Costs				
Engineering & Design	14%	of direct capital		$32,786
Project/Construction Management	25%	of direct capital		$58,546
Health & Safety	6%	of direct capital		$14,051
Overhead	30%	of direct capital + indirect capital		$101,870
Contingency	26%	of direct capital + indirect capital		$88,287
Total Indirect Capital Cost				**$295,540**
Total Estimated Capital Cost				**$529,724**

Table A-2. Alternative AC-2: Land Use Controls and Beneficial Reuse *(continued/end)*

Direct O&M Costs		2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)		2	years O&M		*Years 2027-2028*
Access Controls		1	ea	$500	$500
Maintenance		1	ea	$3,506	$3,506
	Subtotal - Annual Costs				$4,006
	Present Value Cost				**$7,754**
		2.5%	30 Year Discount Rate[1]		
Annual Costs		30	years O&M		*Years 2029-2058*
Access Controls		1	ea	$500	$500
Annual Inspection/Maintenance		1	ea	$3,506	$3,506
	Subtotal - 30 Year Annual Costs				$4,006
	Present Value Cost				**$83,838**
Five Year Costs		6			
Remedy Review		1	ea	$15,000	$15,000
Groundwater Monitoring - 4 wells		0	ea	$7,000	$0
Subtotal - Five Year O&M Costs					$15,000
	Present Value Cost				**$59,729**
	Total Present Value Direct O&M Cost				**$151,321**
Indirect O&M Costs					
Project/Admin Management		146%	of direct O&M		$220,929
Health & Safety		19%	of direct O&M		$28,751
Overhead		30%	of direct O&M + indirect O&M		$45,396
Contingency		20%	of direct O&M + indirect O&M		$29,508
	Total Present Worth Indirect O&M Cost				$324,584
	Total Estimated Present Worth O&M Cost				**$475,905**
	TOTAL ESTIMATED COST				**$1,005,629**

[1] *Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.*

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Table A-3. Alternative F-2: Land Use Controls and Beneficial Reuse

Institutional Controls Estimate
Alternatives F-2
Land Use Controls w/Beneficial Reuse*

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
F-ASH				
Institutional Controls				
Posting of Warning Signs	11	ea	$500	$5,500
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	205,703	yd^3	$3.59	$766,318
Confirmation Sampling / Analysis	110	ea	$1,000	$110,000
Stormwater Management	3,588	lf	$25	$89,700
Site Restoration				
Contour After Sediment / Coal Removal	18.48	ac	$1,700	$31,416
Common Backfill (4 Inches)	11,925	yd^3	$13	$155,025
Topsoil (4 Inches)	11,925	yd^3	$35	$417,375
Fertilizer, Lime, Seed & Mulch	107,331	yd^2	$0.75	$80,498
Backfill Sampling / Analysis	24	ea	$1,200	$28,800
Subtotal - Direct Capital Cost				$1,694,632
Mobilization/Demobilization	9% of subtotal direct capital			$152,517
Site Preparation/Site Restoration	9% of subtotal direct capital			$152,517
Total Direct Capital Cost				**$1,999,666**
Indirect Capital Costs				
Engineering & Design	14% of direct capital			$279,953
Project/Construction Management	25% of direct capital			$499,916
Health & Safety	6% of direct capital			$119,980
Overhead	30% of direct capital + indirect capital			$869,855
Contingency	26% of direct capital + indirect capital			$753,874
Total Indirect Capital Cost				**$2,523,578**
Total Estimated Capital Cost				**$4,523,244**

Table A-3. Alternative F-2: Land Use Controls and Beneficial Reuse (*continued/end*)

Direct O&M Costs		2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)		2	years O&M		*Years 2027-2028*
Access Controls		1	ea	$500	$500
Maintenance		12	ea	$9,361	$112,328
Groundwater Monitoring - 4 wells		2	ea	$7,000	$14,000
	Subtotal - Annual Costs				$126,828
	Present Value Cost				**$245,524**
		2.5%	30 Year Discount Rate[1]		
Annual Costs		30	years O&M		*Years 2029-2058*
Access Controls		1	ea	$500	$500
Monthly Inspections/Maintenance		12	ea	$9,361	$112,328
Groundwater Monitoring - 4 wells		2	ea	$7,000	$14,000
	Subtotal - 30 Year Annual Costs				$126,828
	Present Value Cost				**$2,654,544**
Five Year Costs		6			
Remedy Review		1	ea	$15,000	$15,000
Subtotal - Five Year O&M Costs					$15,000
	Present Value Cost				**$59,729**
	Total Present Value Direct O&M Cost				**$2,959,797**
Indirect O&M Costs					
Project/Admin Management		146%	of direct O&M		$4,321,303
Health & Safety		19%	of direct O&M		$562,361
Overhead		30%	of direct O&M + indirect O&M		$887,939
Contingency		20%	of direct O&M + indirect O&M		$577,160
	Total Present Worth Indirect O&M Cost				$6,348,764
	Total Estimated Present Worth O&M Cost				**$9,308,560**
	TOTAL ESTIMATED COST				**$13,831,805**

[1] *Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.*
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Table A-4. Alternative H-2: Land Use Controls and Beneficial Reuse

Institutional Controls Estimate
Alternatives H-2
Land Use Controls w/Beneficial Reuse*

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
H-ASH				
Monitoring Wells				
Drill/core rotosonic soil borings to 50 ft	4	ea	$17,277	$69,110
Technical Oversight	1	ea	$33,532	$33,532
Institutional Controls				
Posting of Warning Signs	15	ea	$500	$7,500
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	259,112	yd^3	$3.59	$930,212
Confirmation Sampling / Analysis	188	ea	$1,000	$188,000
Stormwater Management	4,682	lf	$25	$117,050
Site Restoration				
Contour Basin After Sediment / Coal Removal	31.46	ac	$1,700	$53,482
Common Backfill (4 Inches)	20,302	yd^3	$13	$263,926
Topsoil (4 Inches)	20,302	yd^3	$35	$710,570
Fertilizer, Lime, Seed & Mulch	182,719	yd^2	$0.75	$137,039
Backfill Sampling / Analysis	41	ea	$1,200	$49,200
Subtotal - Direct Capital Cost				$2,466,979
Mobilization/Demobilization	9% of subtotal direct capital			$222,028
Site Preparation/Site Restoration	9% of subtotal direct capital			$222,028
Total Direct Capital Cost				**$2,911,036**
Indirect Capital Costs				
Engineering & Design	14% of direct capital			$407,545
Project/Construction Management	25% of direct capital			$727,759
Health & Safety	6% of direct capital			$174,662
Overhead	30% of direct capital + indirect capital			$1,266,300
Contingency	26% of direct capital + indirect capital			$1,097,460
Total Indirect Capital Cost				**$3,673,727**
Total Estimated Capital Cost				**$6,584,763**

Table A-4. Alternative H-2: Land Use Controls and Beneficial Reuse *(continued/end)*

Direct O&M Costs	2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2027-2028*
Access Controls	1	ea	$500	$500
Maintenance	1	ea	$12,941	$29,721
Subtotal - Annual Costs				$30,221
Present Value Cost				**$58,505**
	2.5%	30 Year Discount Rate[1]		
Annual Costs	30	years O&M		*Years 2029-2058*
Access Controls	1	ea	$500	$500
Annual Inspection/Maintenance	1	ea	$12,941	$29,721
Subtotal - 30 Year Annual Costs				$30,221
Present Value Cost				**$632,537**
Five Year Costs	6			
Remedy Review	1	ea	$15,000	$15,000
Groundwater Monitoring - 4 wells	1	ea	$7,000	$7,000
Subtotal - Five Year O&M Costs				$15,000
Present Value Cost				**$87,602**
Total Present Value Direct O&M Cost				**$778,644**
Indirect O&M Costs				
Project/Admin Management	146%	of direct O&M		$1,136,821
Health & Safety	19%	of direct O&M		$147,942
Overhead	30%	of direct O&M + indirect O&M		$233,593
Contingency	20%	of direct O&M + indirect O&M		$151,836
Total Present Worth Indirect O&M Cost				$1,670,192
Total Estimated Present Worth O&M Cost				**$2,448,836**
TOTAL ESTIMATED COST				**$9,033,599**

[1] Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.
Real Interest Rates for OMB Circular No. A-94 (12/28/23)
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Table A-5. Alternative K-2: Land Use Controls and Beneficial Reuse

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
K-ASH				
Monitoring Wells				
Drill/core rotosonic soil borings to 50 ft	0	ea	$17,277	$0
Technical Oversight	0	ea	$33,532	$0
Institutional Controls				
Posting of Warning Signs	10	ea	$500	$5,000
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	272,527	yd^3	$3.59	$978,372
Confirmation Sampling / Analysis	89	ea	$1,000	$89,000
Stormwater Management	3,230	lf	$25	$80,750
Site Restoration				
Contour Basin After Sediment / Coal Removal	14.97	ac	$1,700	$25,449
Common Backfill (4 Inches)	9,660	yd^3	$13	$125,580
Topsoil (4 Inches)	9,660	yd^3	$35	$338,100
Fertilizer, Lime, Seed & Mulch	86,945	yd^2	$0.75	$65,209
Backfill Sampling / Analysis	20	ea	$1,200	$24,000
Subtotal - Direct Capital Cost				$1,741,460
Mobilization/Demobilization	9%	of subtotal direct capital		$156,731
Site Preparation/Site Restoration	9%	of subtotal direct capital		$1156,731
Total Direct Capital Cost				**$2,054,922**
Indirect Capital Costs				
Engineering & Design	14%	of direct capital		$287,689
Project/Construction Management	25%	of direct capital		$513,731
Health & Safety	6%	of direct capital		$123,295
Overhead	30%	of direct capital + indirect capital		$893,891
Contingency	26%	of direct capital + indirect capital		$774,706
Total Indirect Capital Cost				**$2,593,312**
Total Estimated Capital Cost				**$4,648,235**

Table A-5. Alternative K-2: Land Use Controls and Beneficial Reuse *(continued/end)*

Direct O&M Costs		2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)		2	years O&M		*Years 2027-2028*
Access Controls		1	ea	$500	$500
Maintenance		1	ea	$14,732	$14,732
	Subtotal - Annual Costs				$15,232
	Present Value Cost				**$22,782**
		2.5%	30 Year Discount Rate[1]		
Annual Costs		30	years O&M		*Years 2029-2058*
Access Controls		1	ea	$500	$500
Annual Inspection/Maintenance		1	ea	$14,732	$14,732
	Subtotal - 30 Year Annual Costs				$15,232
	Present Value Cost				**$318,805**
Five Year Costs		6			
Remedy Review		1	ea	$15,000	$15,000
Groundwater Monitoring - 4 wells		0	ea	$7,000	$0
Subtotal - Five Year O&M Costs					$15,000
	Present Value Cost				**$59,729**
	Total Present Value Direct O&M Cost				**$408,020**
Indirect O&M Costs					
Project/Admin Management		146%	of direct O&M		$595,710
Health & Safety		19%	of direct O&M		$77,524
Overhead		30%	of direct O&M + indirect O&M		$122,406
Contingency		20%	of direct O&M + indirect O&M		$79,564
	Total Present Worth Indirect O&M Cost				$875,203
	Total Estimated Present Worth O&M Cost				**$1,283,224**
	TOTAL ESTIMATED COST				**$5,931,458**

[1] *Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.*
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Table A-6. Alternative L-2: Land Use Controls and Beneficial Reuse

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
L-ASH				
Monitoring Wells				
Drill/core rotosonic soil borings to 50 ft	4	ea	$17,277	$69,110
Technical Oversight	1	ea	$33,532	$33,532
Institutional Controls				
Posting of Warning Signs	12	ea	$500	$6,000
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Off-Unit Disposal				
Excavate & Load Sediment / Coal Ash for Hauling	323,026	yd^3	$3.59	$1,159,663
Confirmation Sampling / Analysis	115	ea	$1,000	$115,000
Stormwater Management	3,665	lf	$25	$91,625
Site Restoration				
Contour Basin After Sediment / Coal Removal	19.28	ac	$1,700	$32,776
Common Backfill (4 Inches)	12,442	yd^3	$13	$161,746
Topsoil (4 Inches)	12,442	yd^3	$35	$435,470
Fertilizer, Lime, Seed & Mulch	111,978	yd^2	$0.75	$83,984
Backfill Sampling / Analysis	25	ea	$1,200	$30,000
Subtotal - Direct Capital Cost				$2,126,264
Mobilization/Demobilization	9%	of subtotal direct capital		$191,364
Site Preparation/Site Restoration	9%	of subtotal direct capital		$191,364
Total Direct Capital Cost				**$2,508,991**
Indirect Capital Costs				
Engineering & Design	14%	of direct capital		$351,259
Project/Construction Management	25%	of direct capital		$627,248
Health & Safety	6%	of direct capital		$150,539
Overhead	30%	of direct capital + indirect capital		$1,091,411
Contingency	26%	of direct capital + indirect capital		$945,890
Total Indirect Capital Cost				**$3,166,347**
Total Estimated Capital Cost				**$5,675,338**

Table A-6. Alternative L-2: Land Use Controls and Beneficial Reuse (*continued/end*)

Direct O&M Costs		2.2%	3 Year Discount Rate[1]		
Annual Costs (Existing System during Post-ROD Design & Const)		2	years O&M		*Years 2027-2028*
Access Controls		1	ea	$500	$500
Maintenance		1	ea	$18,650	$18,650
	Subtotal - Annual Costs				$19,150
	Present Value Cost				**$37,071**
		2.5%	30 Year Discount Rate[1]		
Annual Costs		30	years O&M		*Years 2029-2058*
Access Controls		1	ea	$500	$500
Annual Inspection/Maintenance		1	ea	$18,650	$18,650
	Subtotal - 30 Year Annual Costs				$19,150
	Present Value Cost				**$400,805**
Five Year Costs		6			
Remedy Review		1	ea	$15,000	$15,000
Groundwater Monitoring - 4 wells		1	ea	$7,000	$7,000
Subtotal - Five Year O&M Costs					$15,000
	Present Value Cost				**$87,602**
	Total Present Value Direct O&M Cost				**$525,479**
Indirect O&M Costs					
Project/Admin Management		146%	of direct O&M		$767,199
Health & Safety		19%	of direct O&M		$99,841
Overhead		30%	of direct O&M + indirect O&M		$157,644
Contingency		20%	of direct O&M + indirect O&M		$102,468
	Total Present Worth Indirect O&M Cost				$1,127,152
	Total Estimated Present Worth O&M Cost				**$1,652,630**
	TOTAL ESTIMATED COST				**$7,327,969**

[1] *Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.*
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