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Early Action Statement of Basis/Proposed Plan for the D-Area Operable Unit (U)

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DISCLAIMER

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and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina

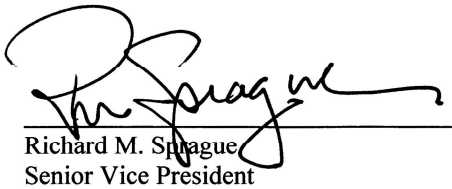
CERTIFICATION

Early Action Statement of Basis/Proposed Plan
for the
D-Area Operable Unit (U)

SRNS-RP-2017-00723, Revision 1, December 2019

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

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."



01/29/20

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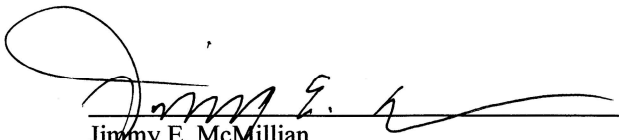
Savannah River Operations Office

Date Signed



02/12/20

Jimmy E. McMillian
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Date Signed

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LIST OF ABBREVIATIONS AND ACRONYMS

~	approximately
>	less than
ac	acre
AM	Action Memorandum
ARAR	Applicable or Relevant and Appropriate Requirement
ARF	Administrative Record File
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cm	centimeters
COC	Constituent of Concern
CPRB	Coal Pile Runoff Basin
DAG	D-Area Groundwater
DAOU	D-Area Operable Unit
EAROD	Early Action Record of Decision
EASB/PP	Early Action Statement of Basis/Proposed Plan
ECs	Engineering Controls
EE/CA	Engineering Evaluation/Cost Analysis
FFA	Federal Facility Agreement
FSP	Field Sampling Plan
ft	feet
ha	hectare
HQ	Hazard Quotient
ICs	Institutional Controls
in.	inches
IOU	Integrator Operable Unit
IWT	Industrial Wastewater Treatment
km	kilometer
km^2	square kilometer
LLC	Limited Liability Company
LUCs	Land Use Controls
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
m	meter
m^3	cubic meter
mi	mile
mg/kg	milligram per kilogram
mi^2	square mile
NCP	National Contingency Plan
NPDES	National Pollution Discharge and Elimination System
O&M	Operations and Maintenance
OU	Operable Unit
PTSM	Principal Threat Source Material
RADP	Removal Action Design Plan
RAO	Remedial Action Objective
RAR	Removal Action Report
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGO	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
RSER	Removal Site Evaluation Report
SAP	Sampling and Analysis Plan

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

SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SEMS	Superfund Enterprise Management System
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SWL	Solid Waste Landfill
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WOF	Waste Oil Facility
WSRC	Washington Savannah River Company, LLC
yd^3	cubic yards

I. INTRODUCTION AND BACKGROUND

Introduction

This Early Action Statement of Basis/Proposed Plan (EASB/PP) is being issued by the United States Department of Energy (USDOE), which functions as the lead agency for Savannah River Site (SRS) remedial activities, with concurrence by the United States Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The purpose of this EASB/PP is to describe the preferred remedial alternative(s) for a portion of the D-Area Operable Unit (DAOU), and to provide for public involvement in the decision-making process.

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 ~40 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 by-products of nuclear material production processes. Hazardous substances, as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), are currently present in the environment at SRS.

The DAOU is comprised of multiple subunits and includes both deactivation and decommissioning facilities and facilities associated with the former operation of the 484-D Powerhouse. Following a series of removal actions, an Early Action Record of Decision (EAROD) (SRNS 2011) was issued in 2011 that selected land use controls (LUCs) as the final remedial action to prevent unrestricted use for the Bubble Tower Subunit, Moderator Processing Subunit, 489-D Coal Pile Runoff Basin (CPRB) (Northern 25%), D-Area Asbestos Pit (including restrictions against land disturbance), and D-Area Process Sewer Lines as Abandoned inside the area fence.

This EASB/PP supports a Second EAROD for the following four DAOU subunits: 488-1D Ash Basin (including Inlet Basins), 488-2D Ash Basin, 488-4D Ash Landfill, and the 489-D CPRB (Southern 75%). A range of alternatives were evaluated for each of these subunits through a series of removal action documents that support an accelerated cleanup strategy for the DAOU. These documents include a Removal Site Evaluation Report (RSER) for the time-critical removal action at the 488-2D Ash Basin and a RSER/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for each of the non-time critical removal actions at the 488-1D Ash Basin, 488-4D Ash Landfill and the 489-D CPRB (Southern 75%). The removal actions selected include ash removal and installation of a geosynthetic cover system at the 488-1D Ash Basin (non-time critical); ash removal at the 488-2D Ash Basin (time critical); installation of a geosynthetic cover system at the 488-4D Ash Landfill (non-time critical); and excavation and disposal of coal residue at the 489-D CPRB (Southern 75%) (non-time critical). The selected removal actions for each

subunit were made available for public notice and comment, and Action Memoranda (AM) were issued after the comment periods ended.

The DAOU is located at the SRS in Barnwell County, South Carolina (Figure 1). A remedial action is needed at the 488-1D Ash Basin, 488-2D Ash Basin and 488-4D Ash Landfill because coal-related contaminants are present that may pose a threat to human health and the environment. The preferred remedial alternative for these subunits of the DAOU is LUCs to prevent unrestricted land use. Future land use for these DAOU subunits will be industrial. At the 489-D CPRB (Southern 75%) subunit and the Inlet Basins portion of the 488-1D Ash Basin, there are no human health, ecological or contaminant migration constituents of concern (COCs) following the removal action. The preferred remedial alternative for the 489-D CPRB (Southern 75%) and the Inlet Basins is No Action. In their current state, these subunits pose no risk to human health and the environment and support unrestricted land use.

SRS Compliance History

SRS manages certain waste materials that are regulated under the Resource Conservation and Recovery Act (RCRA), a comprehensive law requiring responsible management of hazardous waste. The DAOU is a solid waste management unit under RCRA Section 3004(u). SRS received a RCRA hazardous waste permit from the SCDHEC, 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. The inclusion created a need to integrate the established RCRA Facility Investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 U.S.C. § 9620, USDOE has negotiated a Federal Facility Agreement (FFA) (FFA 1993) with the USEPA and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. The FFA lists the DAOU as a RCRA/CERCLA unit 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 and 9617. These requirements include establishment of an Administrative Record File (ARF) that documents the investigation and selection of remedial alternatives and allows for review and comment by the public regarding those alternatives (see Section II). The ARF must be established at or near the facility at issue. The SRS

FFA Community Involvement Plan (WSRC 2011) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. 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 DAOU 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 Second EAROD for the DAOU.

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

II. COMMUNITY PARTICIPATION

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

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

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

Hard copies of the EASB/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 SCDHEC is available for review by the public at the following locations:

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

The South Carolina Department of Health and Environmental Control
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:

Angie Benfield
Savannah River Nuclear Solutions, LLC
Public Involvement
Savannah River Site
Building 730-1B
Aiken, South Carolina 29808
(803) 952-9830
angela.benfield@srs.gov

The South Carolina Department of Health and Environmental Control
Attn: Stacey French, P.E., Director
Division of Waste Management
Bureau of Land and Waste Management
2600 Bull Street
Columbia, South Carolina 29201
(803) 898-2000

Following the public comment period, a Second EAROD for the DAOU will be signed, and a final decision for the SRS RCRA permit will be issued. The Second EAROD and RCRA permit will detail the remedial alternatives chosen for this operable unit (OU) and include responses to oral and written comments received during the public comment period in the Responsiveness Summary.

III. OPERABLE UNIT BACKGROUND

SRS produced special nuclear materials for the United States Department of Defense between 1952 and 1988. The reactors that were used to produce the nuclear materials required heavy water as a moderator to control the speed of neutrons in the reactor. The heavy water was produced at D Area on the SRS. D Area also contained the heavy water rework facility to purify the SRS inventory of used reactor moderator.

D Area is located in the southwest quadrant of the SRS, ~915-meters (m) (3,000-feet [ft]) east of the nearest site boundary, the Savannah River (Figure 2). The DAOU is ~85 hectares (ha) (210 acres [ac]) and contains surface units and source areas in D Area that are potentially responsible for contaminating groundwater. Previous groundwater investigations at D Area have identified relatively large, commingled, depleting plumes of tritium, volatile organic compounds (primarily trichloroethylene [TCE]), and metals. The tritium and TCE are a result of historical releases associated with operations at D Area, and the metals are attributed to the leaching of coal used at the 484-D Powerhouse. Groundwater is not part of the DAOU. Groundwater is currently being addressed separately under the D-Area Groundwater (DAG) OU.

D Area consists of three main facility areas: the 484-D Powerhouse, the D-Area Heavy Water Facility (i.e., bubble towers), and the Moderator Processing Facility (Figure 3). The facilities began operation in the early 1950s. The bubble towers were shut down in January 1982, the moderator processing facility remained operational until the late 1990s, and the 484-D Powerhouse (and associated support facilities) was shut down in April 2012.

An *Early Action Record of Decision Remedial Alternative Selection for the D-Area Operable Unit (DAOU)* (SRNS 2011) integrated the outcomes of the completed removal actions and selected the final action (LUCs) to prevent unrestricted use for the Bubble Tower Subunit, Moderator Processing Subunit, 489-D CPRB (Northern 25%), D-Area Asbestos Pit (including restrictions against land disturbance), and D-Area Process Sewer Lines as Abandoned inside the area fence. The 2011 EAROD documented that there were no problems warranting action for the 904-50G Outfall, electrical transformers, and miscellaneous buildings.

In 2013, the USDOE, USEPA, and SCDHEC agreed to add the 488-1D Ash Basin, 488-2D Ash Basin, and the 488-4D Ash Landfill as subunits of the DAOU. The ash basins are currently permitted under the SCDHEC Industrial Wastewater Treatment (IWT) regulations (Permit #7295), and the ash landfill is currently permitted under a Class Two Solid Waste Landfill (SWL) (Permit #025800-1602). The USDOE, USEPA, and SCDHEC agreed to the submittal of three separate RSER/EE/CA documents and AMs to perform the cleanup. The FFA documentation will satisfy the substantive technical objectives of the closure plan requirements for these units. The applicable IWT operating permits have been closed upon the completion of the removal actions. The SWL permit has been terminated and is to be managed in accordance with the post-closure Applicable or Relevant and Appropriate Requirements (ARARs) specified in the Second EAROD.

In 2015, the USEPA, SCDHEC and USDOE agreed that only a Revised AM was necessary to proceed with the removal action for the remaining portion of the 489-D CPRB (Southern 75%). The USEPA and SCDHEC approved deletion of the submittal of the Revision 1 RSER/EE/CA from the FFA and agreed that only the submittal of the Revised AM and a Removal Action Start milestone were necessary. The 489-D CPRB was permitted under IWT Permit #7295 and has been closed.

Because of the extensive scope, cost and duration, these removal actions were divided into two major phases. Phase 1 included the 488-2D Ash Basin and the 488-4D Ash Landfill; Phase 2 included the 488-1D Ash Basin and the 489-D CPRB (Southern 75%) (Figure 4).

A *Corrected Revision 1 Focused Corrective Measures Study/Feasibility Study Letter in Support of the D-Area Operable Unit* was submitted in October2019 (USDOE 2019). The letter provides information regarding the evaluation of remedial alternatives for the subunits of the DAOU that are within the scope of this EASB/PP. The alternative evaluation supports the USDOE, USEPA and SCDHEC agreement on the preferred remedy for the 488-1D Ash Basin, 488-2D Ash Basin, 488-4D Ash Landfill, and 489-D CPRB (Southern 75%).

488-1D Ash Basin (including Inlet Basins)

The 488-1D Ash Basin was an unlined, earthen containment structure that was built generally on existing grade (ground elevation). Powerhouse ash slurry flowed via an ash sluice line from the 484-D Powerhouse into one of two Inlet Basins identified as Inlet Basin #1 (northern) and Inlet Basin #2 (southern), each ~1.2 ha (3 ac) in size. The bulk of ash settled out of the slurry in the Inlet Basins and the remaining waste water flowed into the eastern end of the 488-1D Basin (~14 ha [35 ac]). As the waste water level increased in the 488-1D Ash Basin, the waste water flowed through a pipe located at the western end of the basin into the 488-2D Ash Basin for polish settling of any remaining solids. Figure 5 shows the relationship of the wastewater flow between the basins.

When the Inlet Basin(s) were filled to capacity, the dry ash was excavated, trucked and placed into the 488-4D Ash Landfill for final disposal. This operation ended when the 484-D Powerhouse was removed from service in 2012. Following cessation of the 484-D Powerhouse operations, only wash water was received in the Inlet Basins for ~6 months during the 484-D Powerhouse deactivation activities. The area impacted by the presence of ash (including the 2.4 ha [6-ac] Inlet Basins) is ~16 ha (40 ac). Ash historically contains unacceptable levels of contaminants that require remediation to meet cleanup requirements.

The *Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for the D-Area Ash Basin (488-1D)* (SRNS 2016a) identified the objectives of the removal action for the 488-1D Ash Basin, described alternatives that address the potential threats from release of contaminants to the environment, and provided a vehicle for public comment. The AM was submitted on 08/17/16 (USDOE 2016a) with a Removal Action Start Date of 08/24/16 (USDOE 2016b).

The removal action for the 488-1D Ash Basin was conducted in accordance with the *Removal Action Design Plan (RADP) for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin* (SRNS 2016b). After dewatering and vegetation removal, the ash in the 488-1D Ash Basin was consolidated into the eastern portion of the basin and a new berm installed along the western side interface. A geosynthetic cover was installed over the ash consolidation area ~7.9 ha (19.4 ac). A vegetative layer (sod) was placed over the geosynthetic cover. The cover system is compliant with the SCDHEC Class Three Solid Waste Landfill cover requirements. The western portion of the basin ~6.5 ha (16 ac) is covered with soil and graded to direct storm water away from the basin into an existing ditch at the southwest corner of the 488-1D Ash Basin.

The 488-1D Ash Basin subunit includes the ash sluicing lines. These above ground lines ran from the 484-D Powerhouse to the Inlet Basins at the 488-1D Ash Basin. Removal of these lines included 25.4-centimeters (cm) (10-inch [in.]) cast iron and fiberglass pipe, 20.3 cm (8-in.) carbon steel pipe, and a temporary 15.2-cm (6-in.) polyvinyl chloride pipe. These materials were dispositioned at an approved disposal facility (Three Rivers Landfill). The sluicing lines were removed during Phase 1 construction activities. Documentation is provided in the *Removal Action Report for the 488-2D Ash Basin and 488-4D Ash Landfill* (SRNS 2017a).

Ash was removed from the two Inlet Basins and placed in the 488-1D Ash Basin. The Inlet Basin area was

graded to provide sheet flow drainage to an existing ditch located along the east side of the Inlet Basins.

The *Field Sampling Plan for the 488-1D Inlet Basins* (SRNS 2014a) identified a total of eight sample locations (four per Inlet Basin) for confirmation sampling. The confirmation sampling results located in the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins* (SRNS 2019a) report concluded that the residual concentrations of all analytes met the pre-established cleanup levels for unrestricted land use at the Inlet Basins. The *Field Sampling Plan for the 488-1D Ash Basin* (SRNS 2015a) identified a total of 19 confirmation sampling locations in the western end (16 within the basin and 3 basin berm) of the 488-1D Ash Basin. Also, two confirmation samples on the east side of the 488-4D Ash Landfill were collected and are included in the 488-1D Ash Basin confirmation sample dataset. Therefore, a total of 21 samples were evaluated to demonstrate that the ash has been successfully removed from the areas of excavation. The confirmation sampling results located in the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins* (SRNS 2019a) report concluded that the residual concentrations of all analytes, except hexavalent chromium, met the pre-established cleanup levels for unrestricted land use. The maximum concentration of hexavalent chromium (1.94 mg.kg) did not exceed the threshold level for an industrial use scenario (6.3 mg/kg). The residential threshold for hexavalent chromium is 0.29 mg/kg. The report recommended that LUCs to prevent unrestricted use (i.e., residential) be implemented at the 488-1D Ash Basin and Area East of the 488-4D Ash Landfill. Toxicity characteristic leaching procedure (TCLP) sample results from the same area confirm that the material is non-hazardous.

Figure 6 is an aerial photograph showing the 488-1D Ash Basin in October 2013 before initiation of the removal action, and Figure 7 is a photograph of the same area in October 2018 after removal action completion. Completion of the removal action addressed the problems warranting action to human and ecological receptors in surface ash as well as the potential for migration of contaminants to groundwater identified prior to any construction activities. The *Removal Action Report (RAR) for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin*, documents the construction activities and as-built condition of the 488-1D Ash Basin (including Inlet Basins) (SRNS 2019b).

488-2D Ash Basin

The 488-2D Ash Basin served as the final settling stage for the treatment of the 484-D Powerhouse operation ash contaminated wastewater. This basin received the overflow waste water from the 488-1D Ash Basin and provided final settling of the solids as the water flowed from the western end of the 488-2D Ash Basin to the discharge pipe located at the eastern end of the 488-2D Ash Basin. As the water flowed from west to east, the flow distance, along with the settling velocity of solids, provided sufficient removal of any remaining solids to ensure compliance with the National Pollution Discharge and Elimination System (NPDES) discharge permit at Outfall D-01C. The 488-2D Ash Basin discharged the treated water into the D-Area Discharge Canal at the D-01C Outfall which eventually flowed into Beaver Dam Creek.

Figure 5 shows the relationship of the wastewater flow between the basins.

A time critical *Removal Site Evaluation Report for the 488-2D Ash Basin* (SRNS 2014b) was submitted to the USEPA and SCDHEC to dewater and remove the bulk ash from the basin that was essential to reduce the risk to human health and the environment and to maintain the DAOU construction and closure schedule. The *Action Memorandum for the Time-Critical Removal Action for the D-Area Ash Basin (488-2D)* (USDOE 2014a) was submitted on 10/28/14, with a Removal Action Start Date of 10/14/14 (USDOE 2014b).

The removal action for the 488-2D Ash Basin was conducted in accordance with the *Removal Action Design Plan (RADP) for the 488-4D Ash Landfill and the 488-2D Ash Basin* (SRNS 2015b). After dewatering, the ash and contaminated sediment/soils from the basin bottom and embankment along the entire length of the northern berm were excavated and consolidated in the 488-4D Ash Landfill. Approximately 0.3-m (1-ft) average depth of ash fines and 0.3-m (1-ft) average depth of contaminated sediment/soils were removed from across the 488-2D Ash Basin bottom. Approximately 69,420 cubic meters (m^3) (90,800 cubic yards [yd^3]) of ash from the 488-2D Ash Basin was placed into the 488-4D Ash Landfill; this volume includes an area of ash excavated from the west (outer edge) of the 488-4D Ash Landfill.

The 488-2D Ash Basin ~6 ha (15 ac) was re-graded, sloped appropriately and is used as a storm water detention structure. (A detention structure is a permanent storm water management structure whose primary purpose is to temporarily store storm water runoff and release the stored runoff at controlled rates). This detention structure is designed and constructed to serve as a storm water conveyance system as part of the post-closure ARARs specific to the 488-4D Ash Landfill.

Confirmation sample results were evaluated to demonstrate that the ash had been successfully removed in accordance with the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River Site* (SRNS 2014c) and the *Field Sampling Plan for the 488-2D Ash Basin* (SRNS 2015c). A total of 24 metals and six radionuclides were analyzed. Completion of the removal action addressed the problems warranting action to human and ecological receptors from exposure to contaminants in surface ash prior to any construction activities. The confirmation sampling results located in the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-2D Ash Basin* (SRNS 2016c) report concluded that the basin soil results were indeterminate with regard to meeting acceptance criteria for unrestricted (residential) land use because the residential threshold level for hexavalent chromium (0.29 mg/kg) is at (or very near) the method detection limit and there is a potential for analytical interferences resulting in false positives at these trace levels. Consequently, statistical hypothesis testing results and residual risks varied, depending on the analytical method used. Therefore, the report recommended that LUCs to prevent unrestricted land use would need to be implemented.

The *Removal Action Report for the 488-2D Ash Basin and 488-4D Ash Landfill (U),* (SRNS 2017a) documents the construction activities and as-built condition of the 488-2D Ash Basin. Figure 6 is an

aerial photograph showing the 488-2D Ash Basin in October 2013 before initiation of the removal action, and Figure 7 is a photograph of the same area in October 2018 after removal action completion.

488-4D Ash Landfill

The 488-4D Ash Landfill was a 8.9-ha (22-ac) basin that was initially part of the SRS As-Built Construction Permit #7295 and the associated 1991 SRS permit-to-operate for existing SRS wastewater facilities. Per agreement with SCDHEC, the basin was re-permitted in November 2007 as a Class Two Solid Waste Landfill under Solid Waste Landfill Permit #025800-1602 to accept ash waste for disposal. All storm water drainage was directed into the infiltration basin located within the western end of the landfill which had an overflow channel that directed any contaminated water to the 488-2D Ash Basin for treatment (settling). The water was combined with the 488-1D Ash Basin waste water, treated per the 488-2D Ash Basin IWT permit, and released through NPDES Outfall D-01C.

An ash waste characterization report was approved by SCDHEC in 2004 requiring ash characterization to be completed every six years. In 2009, a one-time approval was granted by SCDHEC to dispose of dredge spoils from the 681-3G (Downstream Water Pump House for 100 Area) and 681-5G (Water Pump House for 400 Area) into the 488-4D Landfill. In 2010, characterization of the coal ash from the 484-D Powerhouse indicated that arsenic levels would exceed the regulatory threshold for a Class Two Solid Waste Landfill. In 2013, the USDOE, USEPA, and SCDHEC agreed to add the 488-4D Ash Landfill to the DAOU to satisfy substantive technical objectives of the Solid Waste Closure Plan requirements for the Class Two Solid Waste Landfill permit.

In 2012, coal from the D-Area Coal Storage Area (484-17D) was excavated and placed into the 488-4D Ash Landfill for disposal. This excavated material may have included coal-reject material that contained manganese and arsenic at concentrations exceeding the regulatory threshold for a Class Two Solid Waste Landfill. In May 2013, SCDHEC approved the disposal of non-hazardous solids from the nearby D-Area Surge Basin (483-6D) into the 488-4D Ash Landfill. Characterization of the surge basin solids indicated that manganese, aluminum, and iron exceeded the regulatory threshold for a Class Two Solid Waste Landfill. As a result, SCDHEC reiterated in 2013 their requirement that the 488-4D Landfill be closed with a SCDHEC Class Three Landfill cover.

The *Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for the D-Area Ash Landfill (488-4D)* (SRNS 2014d) was submitted in June 2014. The removal action for the 488-4D Ash Landfill was conducted in accordance with the *Removal Action Design Plan for the 488-4D Ash Landfill and the 488-2D Ash Basin* (SRNS 2015b). The AM and Responsiveness Summary for the Non-Time Critical Removal Action for the D-Area Ash Landfill (488-4D) was submitted on 08/11/14 (USDOE 2014c). The Removal Action Start Date was 09/02/14 (USDOE 2014d).

Under the removal action, excavated ash from the 488-2D Ash Basin was placed in the 488-4D Ash Landfill. The landfill was graded to achieve proper slope elevations and the infiltration basin located at the western end of 488-4D Ash Landfill was dewatered and filled in. Side slopes were graded to obtain proper

slopes for drainage and stabilization (where necessary). A geosynthetic cover was applied over the entire 488-4D Ash Landfill (~8.9 ha [22 ac] including the infiltration basin). A vegetative layer (sod) was placed over the geosynthetic cover. The cover system is compliant with the SCDHEC Class Three Solid Waste Landfill cover requirements.

No confirmation samples were required at the 488-4D Ash Landfill because there were no excavation activities associated with the removal action for this subunit.

The *Removal Action Report for the 488-2D Ash Basin and 488-4D Ash Landfill* (SRNS 2017a) documents the construction activities and as-built condition of the 488-4D Ash Landfill. Regulatory approval of the RAR documented closure of the operating phase of the SWL permit. Figure 6 is an aerial photograph showing the 488-4D Ash Landfill in October 2013 before initiation of the removal action, and Figure 7 is a photograph of the same area in October 2018 after removal action completion.

Completion of the removal action addresses the problem warranting action to human and ecological receptors in surface ash as well as the potential for contaminant migration to groundwater identified prior to any construction activities.

489-D CPRB (Southern 75%)

The 489-D CPRB is located in the southern portion of the DAOU and is ~5.7 ha (14 ac) in size. During operation of the 484-D Powerhouse, runoff storm water from the 484-17D Coal Storage Area was collected through a network of drainage ditches and flowed to the 489-D CPRB via storm sewers for settling. The *RCRA Facility Investigation/ Remedial Investigation (RFI/RI) Work Plan and RFI/RI Report with Baseline Risk Assessment for the D-Area Operable Unit (U)* (SRNS 2009) concluded that arsenic in 489-D CPRB sediment posed an unacceptable risk for future industrial workers, and arsenic and 2-methylnapthalene posed a risk for ecological receptors. In addition, metals and low pH presented an ecological risk for aquatic receptors in surface water. On 12/21/09, an AM was issued to document the preferred removal action for the 489-D CPRB to include consolidation of contaminated sediments, placement of a soil cover, and LUCs (USDOE 2009).

Because the 484-D Powerhouse would still be active when the removal action began in April 2011, a revised AM was issued on 08/26/10 to segment the 489-D CPRB into a northern and southern section (USDOE 2010). The Northern 25% section of the 489-D CPRB was addressed by the removal action, and the Southern 75% section remained active during 484-D Powerhouse operations. As documented in the August 2010 Revised AM, the second phase for remediation of the Southern 75% section would be implemented after the operations of the 484-D Powerhouse ceased, and storm water runoff was no longer received from the active 484-17D Coal Storage Area. In 2013, all storm water from the 484-17D Coal Storage Area was diverted from the 489-D CPRB.

The Revision 3 AM for the Non-Time Critical Removal Action for the D-Area CPRB (489-D), dated 08/11/2015, identified the removal action of excavation and disposal with unrestricted land use for the Southern 75% section (USDOE 2015a), and a

Removal Action Start Date of 09/10/15 was achieved (USDOE 2015b).

The removal action for the Southern 75% of the 489-D CPRB was completed in accordance with the *Removal Action Design Plan (RADP) for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin* (SRNS 2016b). After dewatering, ~17,620 m^3 (23,050 yd^3) of coal fines and contaminated sediments from the basin were excavated, transferred and consolidated within the eastern end of the 488-1D Ash Basin. The material was TCLP sampled prior to transporting the material to the 488-1D Ash Basin. No sample results of the coal fines exceeded the TCLP limits.

Confirmation sampling to verify that the coal fines were successfully removed was conducted in accordance with the *Confirmation Sampling and Analysis Plan (SAP) for Coal and/or Ash Removal at the Savannah River Site* (SRNS 2014c) and the *Field Sampling Plan (FSP) for the 489-D Coal Pile Runoff Basin* (SRNS 2015d). In addition to the 11 samples outlined in the FSP, 12 additional samples were collected at locations where soil/coal fines were previously staged for TCLP sampling. The *Human Health and Ecological Evaluation for Confirmation Sampling at the 489-D Coal Pile Runoff Basin* (SRNS 2017b) evaluated a total of 23 confirmation sample results to demonstrate that the coal had been successfully removed from the basin and the remaining soils are below human health and ecological risk-based threshold levels. Twenty-four metals, six radionuclides and one organic compound were analyzed and evaluated. The residual concentrations of these analytes met the pre-established cleanup levels documented in the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River* Site (SRNS 2014c) for unrestricted land use.

Once the coal fine removal was confirmed, clean soil was placed in the basin and the area was contoured and re-graded as described in the RADP (SRNS 2016b). The remediated basin is defined as a storm water retention structure in the end-state condition. (A retention structure is a permanent structure whose primary purpose is to permanently store a given volume of storm water runoff; release of the given volume is by infiltration and/or evaporation). The *Removal Action Report (RAR) for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin*, documents the construction activities and as-built condition of the Southern 75% of the 489-D CPRB (SRNS 2019b). Figure 6 is an aerial photograph showing the 489-D CPRB in October 2013 before initiation of the removal action, and Figure 7 is a photograph of the same area in October 2018 after removal action completion.

Completion of the removal action addressed both the surface sediment and surface water problems warranting action to human and ecological receptors identified prior to any construction activities.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Due to the complexity and size of multiple waste units located in different areas of the SRS, the Site is divided into watersheds for the purpose of managing a comprehensive cleanup strategy. The SRS is segregated into six watersheds: Upper Three Runs, Lower Three Runs, Fourmile Branch, Steel Creek, Pen Branch, and the Savannah River and Floodplain Swamp. In addition, the SRS also identifies six

Integrator Operable Units (IOUs) which are the surface water bodies and associated wetlands that correspond to the six respective watersheds. Waste units within a watershed may be evaluated and remediated individually or grouped with other waste units and evaluated as part of a larger Area OU. Upon disposition of all the waste units within a watershed, a final comprehensive Record of Decision (ROD) for the corresponding IOU (i.e., surface water and associated wetlands) will be pursued with additional public involvement. The DAOU is located within the Savannah River and Floodplain Swamp watershed (Figure 2).

In 2003, a new completion strategy for environmental restoration at SRS was developed to accelerate cleanup completion. A key component of the plan is to implement an area-by-area remediation strategy. Through the sequencing of environmental restoration and decommissioning activities, environmental cleanup can be completed for entire areas of the SRS. The USDOE, USEPA, and SCDHEC have agreed that using the Area OU strategy to manage surface units at the DAOU was appropriate and the waste units and facilities in the area were consolidated to form a single Area OU.

Completion of the DAOU is being implemented through a series of removal actions and early final actions to accommodate response implementation commensurate with changing missions and evolving budgets. An EA ROD (SRNS 2011) was approved in August 2011 to document final remedial decisions for portions of the DAOU. The future missions of the 484-D Powerhouse and ancillary facilities are still being developed at this time and issuance of a final ROD for all remaining portions of the DAOU was not achievable by the (previously) approved FFA ROD issuance date in 2016. For this reason, the USDOE, USEPA and SCDHEC agreed to issuance of a Second EAROD in November 2020 to document the final remedial actions for the remaining portions of the DAOU with the exception of the 484-D Powerhouse and ancillary facilities. The final action ROD issuance date for completion of the DAOU is scheduled for January 2046 and is based on the remedial decisions for the remaining DAOU subunits and completion of deactivation and decommissioning in D Area. The administrative paths for all D-Area components are identified in Table 1.

V. SUMMARY OF SITE RISKS

Residual risks remaining at the DAOU after completion of the removal actions will be addressed by a final action. A summary of the site risks for each subunit is provided below.

488-1D Ash Basin (including Inlet Basins)

488-1D Ash Basin: Summary of Human Health Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic and coal-related radionuclides were identified as historic COCs in SRS surface ash that may pose a risk to human receptors (future industrial worker risk less than (>) 1E-06).

Completion of the removal action (i.e., excavate ash and contaminated sediment from the western section of the 488-1D Ash Basin and the Inlet Basins and placement of a geosynthetic cover system in the eastern section of the 488-1D Basin) addressed the surface ash problems warranting action to human receptors that were identified prior to any construction

activities. Coal-related contaminants beneath the geosynthetic cover (eastern end) poses a risk to human receptors (future industrial worker risk >1E-06) if direct exposure were to occur.

In addition, coal-related constituents remain in soil in the western end of the basin that would pose a risk to human receptors (hypothetical future resident risk >1E-06). The confirmation sampling results located in the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins* (SRNS 2019a) report concluded that the residual concentrations of all analytes, except hexavalent chromium, met the pre-established cleanup levels for unrestricted land use. The concentration of hexavalent chromium (maximum = 1.94 mg/kg) did not exceed the threshold level for an industrial use scenario (6.3 mg/kg). The residential threshold for hexavalent chromium is 0.29 mg/kg. The report recommended that LUCs to prevent unrestricted use (i.e., residential) be implemented at the 488-1D Ash Basin and Area East of the 488-4D Ash Landfill. For the Inlet Basins portion of the 488-1D Ash Basin subunit, the residual concentrations of all analytes met the cleanup levels for unrestricted land use.

488-1D Ash Basin: Summary of Ecological Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic was identified as a historic COC in SRS surface ash that may pose a risk to ecological receptors (hazard quotient [HQ] >1).

Completion of the removal action addressed the surface ash problems warranting action to ecological receptors that were identified prior to any construction activities. Coal-related contaminants beneath the geosynthetic cover (eastern end) poses a risk to ecological receptors (HQ >1) if direct exposure were to occur.

The *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins* (SRNS 2019a) concluded that the residual concentrations of the remaining soils in the western portion of the 488-1D Ash Basin and the Inlet Basins did not pose an unacceptable risk to ecological receptors.

488-1D Ash Basin: Summary of Contaminant Fate and Transport Analysis

Prior to completion of the non-time critical removal action, there was a potential for migration of contaminants to groundwater above groundwater protection standards due to the uncertainty in groundwater elevation and flow path changes over time.

Completion of the removal action addressed the potential contaminant migration problems warranting action that were identified prior to any construction activities. Coal-related contaminants beneath the engineered cover system pose a potential for migration of contaminants to groundwater above protection standards if leaching of the source material were to occur.

No principal threat source material (PTSM) was identified at the 488-1D Ash Basin.

488-1D Ash Basin: Conclusion

Coal-related contaminants beneath the engineered cover system (eastern end) pose a risk to human receptors (future industrial worker risk >1E-06) and

ecological receptors (HQ >1) if direct exposure were to occur. In addition, coal-related contaminants beneath the engineered cover system pose a potential for migration of contaminants to groundwater above protection standards if leaching of the source material were to occur.

Following the removal action, coal-related constituents remain in soil in the western end of the basin that would pose a risk to human receptors (hypothetical future resident risk >1E-06). The western end of the basin does not pose an unacceptable risk to ecological receptors.

There are no human health, ecological or contaminant migration problems warranting action following the non-time critical removal action at the Inlet Basins. The Inlet Basins meet the criteria for unrestricted land use.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the Preferred Alternative, may present a current or potential threat to public health, welfare, or the environment

488-2D Ash Basin

488-2D Ash Basin:
Summary of Human Health Risk Assessment

Prior to implementation of the time critical removal action, arsenic and coal-related radionuclides were identified as historic COCs in SRS surface ash that may pose a risk to human receptors (future industrial worker risk >1E-06).

Completion of the removal action (i.e., excavation of ash and contaminated sediment) addressed the surface sediment problems warranting action to human receptors that were identified prior to any construction activities. Confirmation sample results were evaluated to demonstrate that the ash has been successfully removed as reported in the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-2D Ash Basin* (SRNS 2016c). The confirmation report identified uncertainties regarding the evaluation of hexavalent chromium in basin soil concentrations. The results were indeterminate with regards to meeting acceptance criteria for unrestricted (residential) land use because the residential threshold level for hexavalent chromium (0.29 mg/kg) is at (or very near) the method detection limit and there is a potential for analytical interferences resulting in false positives at these trace levels. Consequently, statistical hypothesis testing results and residual risks varied, depending on the analytical method used. The concentration of hexavalent chromium (maximum = 3.78 mg/kg) does not exceed the threshold level for an industrial use scenario (6.3 mg/kg). Therefore, the report recommended that LUCs to prevent unrestricted land use would need to be implemented. Coal-related contaminants may remain in basin soils that pose a risk to human receptors (hypothetical future resident risk >1E-06).

488-2D Ash Basin:
Summary of Ecological Risk Assessment

Prior to implementation of the time critical removal action, arsenic was identified as a historic COC in SRS surface ash that may pose a risk to ecological receptors (HQ >1).

Completion of the removal action (i.e., excavation of ash and contaminated sediment) addressed the surface ash problem warranting action to ecological receptors identified prior to any construction activities. The

Human Health and Ecological Evaluation for Confirmation Sampling at the 488-2D Ash Basin (SRNS 2016c) concluded that the remaining soils did not pose an unacceptable risk to ecological receptors. There are no problems warranting action from an ecological risk perspective.

488-2D Ash Basin:
Summary of Contaminant Fate and Transport Analysis

There were no contaminant migration problems warranting action identified prior to the time-critical removal action.

Completion of the removal action further prevents migration of potential mobile contaminants to groundwater that could exceed groundwater protection standards.

No PTSM was identified at the 488-2D Ash Basin.

488-2D Ash Basin:
Conclusion

It is uncertain if coal-related constituents remain in basin soils following the removal action that would pose a risk to human receptors (hypothetical future resident risk >1E-06). Although there were no exceedances for the future industrial worker, uncertainties regarding the evaluation of hexavalent chromium were inconclusive to support unrestricted land use for the hypothetical future resident. This uncertainty impacts the final remedial action for the 488-2D Ash Basin. To manage this uncertainty, LUCs will be applied to the 488-2D Ash Basin subunit to prevent unrestricted land use.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the Preferred Alternative, may present a current or potential threat to public health, welfare, or the environment.

488-4D Ash Landfill

488-4D Ash Landfill:
Summary of Human Health Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic and coal-related radionuclides were identified as historic COCs in SRS surface ash that may pose a risk to human receptors (future industrial worker risk >1E-06).

Completion of the removal action (i.e., placement of a geosynthetic cover system) addressed the surface ash problem warranting action to human receptors identified prior to any construction activities. Currently there is waste consisting primarily of coal and coal combustion ash beneath the engineered cover system that poses a risk to human receptors (future industrial worker risk >1E-06) if direct exposure were to occur.

488-4D Ash Landfill:
Summary of Ecological Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic was identified as a historic COC in SRS surface ash that may pose a risk to ecological receptors (HQ >1).

Completion of the removal action (i.e., placement of a geosynthetic cover system) addressed the surface ash problems warranting action to ecological receptors identified prior to any construction activities. Currently, there is waste consisting primarily of coal and coal combustion ash beneath the engineered cover system that poses a risk to ecological receptors (HQ >1) if direct exposure were to occur.

488-4D Ash Landfill:
Summary of Contaminant Fate and Transport Analysis

Prior to completion of the non-time critical removal action, there was a potential for migration of contaminants to groundwater for constituents that exceed the regulatory thresholds for a Class Two Solid Waste Landfill.

Completion of the removal action (i.e., placement of a geosynthetic cover system) addressed the potential contaminant migration problem warranting action identified prior to any construction activities. Waste beneath the engineered cover system poses a potential for migration of contaminants to groundwater above protection standards if leaching of the source material were to occur.

No PTSM was identified at the 488-4D Ash Landfill.

488-4D Ash Landfill:
Conclusion

Waste consisting primarily of coal and coal-combustion ash beneath the engineered cover system poses a risk to human receptors (future industrial worker risk >1E-06) and ecological receptors (HQ >1) if direct exposure were to occur. In addition, waste beneath the engineered cover system poses a potential for migration of contaminants to groundwater above protection standards if leaching of the source material were to occur.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the Preferred Alternative, may present a current or potential threat to public health, welfare, or the environment.

489-D CPRB (Southern 75%)

489-D CPRB:
Summary of Human Health Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic was identified as a human health COC in surface sediment at concentrations that pose an unacceptable exposure risk to a hypothetical future resident (risk = 5.0E-05).

Completion of the removal action (i.e., excavation of coal fines and contaminated sediment) addressed the surface sediment problems warranting action to human receptors identified prior to any construction activities. The *Human Health and Ecological Evaluation for Confirmation Sampling at the 489-D Coal Pile Runoff Basin* (SRNS 2017b) concluded that residual concentrations of coal-related constituents met the pre-established cleanup levels for unrestricted land use. There are no human health problems warranting action.

489-D CPRB:
Summary of Ecological Risk Assessment

Prior to implementation of the non-time critical removal action, arsenic (HQ = 2.8) and 2-methynaphthalene (HQ = 9.7) were identified as COCs to benthic organisms; and surface water was impacted with aluminum (HQ = 791), beryllium (HQ = 45), cobalt (HQ = 17), copper (HQ = 13), iron (HQ = 127, manganese (HQ = 41) and zinc (HQ = 5) at concentrations exceeding an HQ of one that posed a risk to aquatic organisms. In addition, the low pH conditions posed a risk to aquatic organisms, mammals and birds.

Completion of the removal action (i.e., water removal and excavation of coal fines and contaminated

sediment) addressed both the surface sediment and surface water problems warranting actions to ecological receptors identified prior to any construction activities. The *Human Health and Ecological Evaluation for Confirmation Sampling at the 489-D Coal Pile Runoff Basin* (SRNS 2017b) concluded that the remaining soils did not pose an unacceptable risk to ecological receptors.

489-D CPRB: Summary of Contaminant Fate and Transport Analysis

There were no contaminant migration COCs identified prior to the non-time critical removal action.

Completion of the removal action (i.e., excavation of coal fines and contaminated sediment) further prevents migration of potential mobile contaminants to groundwater that could exceed groundwater protection standards.

No PTSM was identified at the 489-D CPRB.

489-D CPRB: Conclusion

There are no human health, ecological or contaminant migration problems warranting action following the non-time critical removal action. The 489-D CPRB (Southern 75%) meets the criteria for unrestricted land use.

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 DAOU is assumed to be industrial land use with USDOE maintaining control of the land. The following RAOs have been identified for the DAOU subunits to support the future land use. No RAOs are identified for the Inlet Basins or the 489-D CPRB (Southern 75%) because the residual concentrations of all analytes met the cleanup levels for unrestricted land use.

488-1D Ash Basin (including Inlet Basins)

- Maintain the engineered cover system (eastern end) to eliminate or control all routes of exposure to contaminants beneath the cover that pose a risk to future industrial workers and ecological receptors and/or present a contaminant migration concern.
- Protect hypothetical future residents from exposure to residual contamination in soil in the western end of the basin exceeding 1E-06 risk.

488-2D Ash Basin

- Protect hypothetical future residents from exposure to residual contamination in basin soils exceeding 1E-06 risk.

488-4D Ash Landfill

- Maintain the engineered cover system to eliminate or control all routes of exposure to contaminants beneath the cover exceeding 1E-06 risk to future

industrial workers and exceeding a HQ >1 ecological receptors.

- Maintain the engineered cover system to prevent migration of contaminants to groundwater that could exceed groundwater protection standards.

Remedial Goal Options

Remedial goal options (RGOs) serve to provide a range of cleanup goals for each COC 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.

Post-removal action concentration-based RGOs were not developed for these DAOU subunits. Human health risk-based threshold levels and the associated acceptance criteria for determining if cleanup levels have been met are presented in the *Confirmation Sampling and Analysis Plan (SAP) for Coal and/or Ash Removal at the Savannah River Site (SRS)* (SRNS 2014c). An evaluation of the confirmation sample results relative to human health and ecological threshold levels (cleanup levels) are presented in each of the individual subunit reports (SRNS 2016c, 2017b, and SRNS 2019a).

Applicable or Relevant and Appropriate Requirements

ARARs are cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under Federal, State, or Local environmental laws that 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, 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

This section presents the remedial alternatives that apply to post-removal action conditions at the DAOU. In accordance with the National Contingency Plan (NCP), it is desirable, when practical, to offer a range of diverse alternatives to compare during the detailed analyses.

The range of alternatives includes an option that involves little or no treatment yet provides protection to human health and the environment by preventing or controlling exposure through LUCs. Remedial

alternatives were developed for the 488-1D Ash Basin, 488-2D Ash Basin and 488-4D Ash Landfill to address contamination in the subsurface. No action will be implemented for the 489-D CPRB (Southern 75%) and the Inlet Basin portion of the 488-1D Ash Basin subunit because there are no problems warranting action.

Alternative 1. No Action

The No Action alternative is required by the NCP to serve as a baseline for comparison to other alternatives. Under this alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume. This alternative would leave the DAOU subunits in their current condition with no additional controls. This alternative is not effective in achieving the RAOs, and there are no capital construction or system operation and maintenance costs. The No Action alternative is not sufficient in meeting neither the threshold criteria of protection of human health and environment nor compliance with ARARs. This alternative does not include five-year remedy reviews.

Summary of Costs

Capital Cost	$0
Operations and Maintenance (O&M)	$0
Total Present-Worth Cost	$0

Alternative 2. LUCs

LUCs (i.e., engineering controls [ECs] and institutional controls [ICs]) will be implemented for the 488-1D, 488-2D, and 488-4D subunits of the DAOU to limit access (e.g., land use and disturbance activities) in the area. ECs (i.e., warning signs) and ICs (i.e., excavation permit restrictions and deed restrictions) will be used to restrict access to or activities that can be performed at the impacted areas. Site maintenance (site inspections, mowing, general housekeeping, repair of erosion damage, and other routine maintenance as needed) would be required to maintain the cover systems at the 488-1D Ash Basin and 488-4D Ash Landfill. Groundwater monitoring will be performed to evaluate the long-term effectiveness of the cover systems and the results will be documented in the *Groundwater Monitoring Report for the D-Area Groundwater Operable Unit* (which is a full report issued in the even years), and the *D-Area Groundwater Operable Unit Letter Report* (which is an abbreviated report issued in the odd years). The groundwater sampling and monitoring requirements (including final remedial decisions) will be addressed by the DAG OU; therefore, costs associated with groundwater monitoring and reporting are not included in this estimate. Restrictions on groundwater use to prevent or limit exposure are not included in this remedy. Any remedial groundwater actions, including land use restrictions, will be selected in the remedial assessment for DAG OU. LUCs meet the threshold and balancing criteria requirements. Because this alternative results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unrestricted use, five-year remedy reviews would be performed to ensure that the remedy is and will continue to be protective of human health and the environment. Only LUC costs for the subunits associated with the removal actions are a part of this alternative. Estimated costs include the capital cost, O&M cost, and present worth cost (Table 3).

Capital	$47,520
O&M Cost	$9,846,699
Total Present-Worth Cost	$9,894,219

VIII. EVALUATION OF ALTERNATIVES

This section summarizes the evaluation of alternatives that apply to post-removal action conditions.

The NCP [40 Code of Federal Regulations [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 4.

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 EASB/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 5.

Overall Protection of Human Health and the Environment

Alternative 1 (No Action) is not protective of human health and the environment. Alternative 2 (LUCs) is protective of human health and the environment and addresses the buried coal-related contamination and residual contamination at the DAOU subunits with land use restrictions.

Compliance with ARARs

Chemical-Specific ARARs. There are no chemical-specific ARARs.

Action-Specific ARARs. There are no action-specific ARARs applicable to Alternative 1 (No Action). Alternative 2 (LUCs) would be effective in complying with the action specific ARARs pertaining to the relevant and appropriate closure and monitoring of landfills (i.e., 488-1D Ash Basin and 488-4D Ash Landfill).

Location-Specific ARARs. There are no location-specific ARARs.

Short-Term Effectiveness

Alternative 2 (LUCs) achieves RAOs whereas short-term effectiveness is not applicable to Alternative 1 (No Action) since it does not involve any remedial activities.

Long-Term Effectiveness and Permanence

Alternative 2 (LUCs) is effective in the long term and protects human health. Alternative 1 (No Action) has no long-term effectiveness or permanence since no action is taken to mitigate the residual risk.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives reduce toxicity, mobility, or volume through treatment.

Implementability

Alternative 2 can be readily implemented due to its simplicity. Alternative 1 (No Action) involves no implementation.

Cost

Alternative 1 (No Action) is the least expensive alternative of the two alternatives for the DAOU ($0). Alternative 2 (LUCs) is a more costly alternative at $9,894,219.

IX. PREFERRED ALTERNATIVE

Table 6 presents a Comparative Ranking of DAOU Final Action Alternatives. The preferred alternative for the 488-1D Ash Basin, 488-2D Ash Basin and 488-4D Ash Landfill is Alternative 2 – LUCs. No action for the 489-D CPRB (Southern 75%) and the Inlet Basins is required.

This alternative was proposed because it effectively protects against unrestricted use (hypothetical future residential exposure). LUCs for the 488-1D Ash Basin, 488-2D Ash Basin and 488-4D Ash Landfill include the following:

- LUCs will be implemented to limit access (e.g., land use and disturbance activities) in the area. ECs (i.e., warning signs.) and ICs (i.e., excavation permit restrictions and deed restrictions) will be used to restrict access to or activities that can be performed at the impacted areas. Site maintenance (site inspections, mowing, general housekeeping, repair of erosion damage, and other routine maintenance as needed) would be required to maintain the cover systems at the 488-1D Ash Basin and 488-4D Ash Landfill.
- Notifying the USEPA and SCDHEC in advance of any changes in land use or excavation of waste.
- ICs (i.e., administrative controls) and use restrictions for on-site workers via the Site Use/Site Clearance Program. Other administrative controls to ensure worker safety include work controls, worker training, and worker briefing of health and safety requirements.
- SRS access controls against trespassers as described in the 2013 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.

The preferred remedy for the 488-1D Ash Basin, 488-2D Ash Basin and 488-4D Ash Landfill leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for an indefinite period of time. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs described in this EASB/PP. 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 Land Use Control Implementation Plan (LUCIP) for the 488-1D Ash Basin, 488-2D Ash Basin and the 488-4D Ash Landfill subunits is the Second EA LUCIP for the DAOU and will provide details and specific measures required for the LUCs selected as part of the preferred remedy.

Review and approval by USEPA and SCDHEC for the Second EA LUCIP for the DAOU is required by the FFA. Upon final approval, the Second EA LUCIP will be appended to the LUCAP and is considered incorporated by reference into the Second EAROD for the DAOU, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved Second EA LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The Second EA LUCIP will remain in effect until modified as needed to be protective of human health and the environment. A LUCIP modification will only occur through another CERCLA document. Approval by USEPA and SCDHEC is required for any modification or termination of the LUCs. The preferred alternative can change in response to public comment or new information.

Based on information currently available, only Alternative 2 – LUCs meets the threshold criteria of protection of human health and the environment and complies with ARARs. 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 3) be cost-effective.

No Action is identified as the final remedial action for the 489-D CPRB (Southern 75%) and the Inlet Basins portion of the 488-1D Ash Basin subunit.

X. POST-ROD SCHEDULE

Because the preferred remedy is LUCs, a post-ROD schedule is required to document implementation of LUCs. The schedule for the Second EAROD for the DAOU is shown in Figure 8.

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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.

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

Baseline Risk Assessment (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 SCDHEC) 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. Five media to which a release of contaminants may occur are groundwater, soil, surface water, sediments, and air.

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

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

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

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

Proposed Plan (PP): 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.

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 (SB): 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 (1.0×10^{-4}) and one excess cancer in an exposed population of one million (1.0×10^{-6}). Risks within this range require risk management evaluation of remedial action alternatives to determine if risks can be reduced below one excess cancer in one million (1.0×10^{-6}). Risks greater than 1.0×10^{-4} indicate that remedial action is generally warranted.

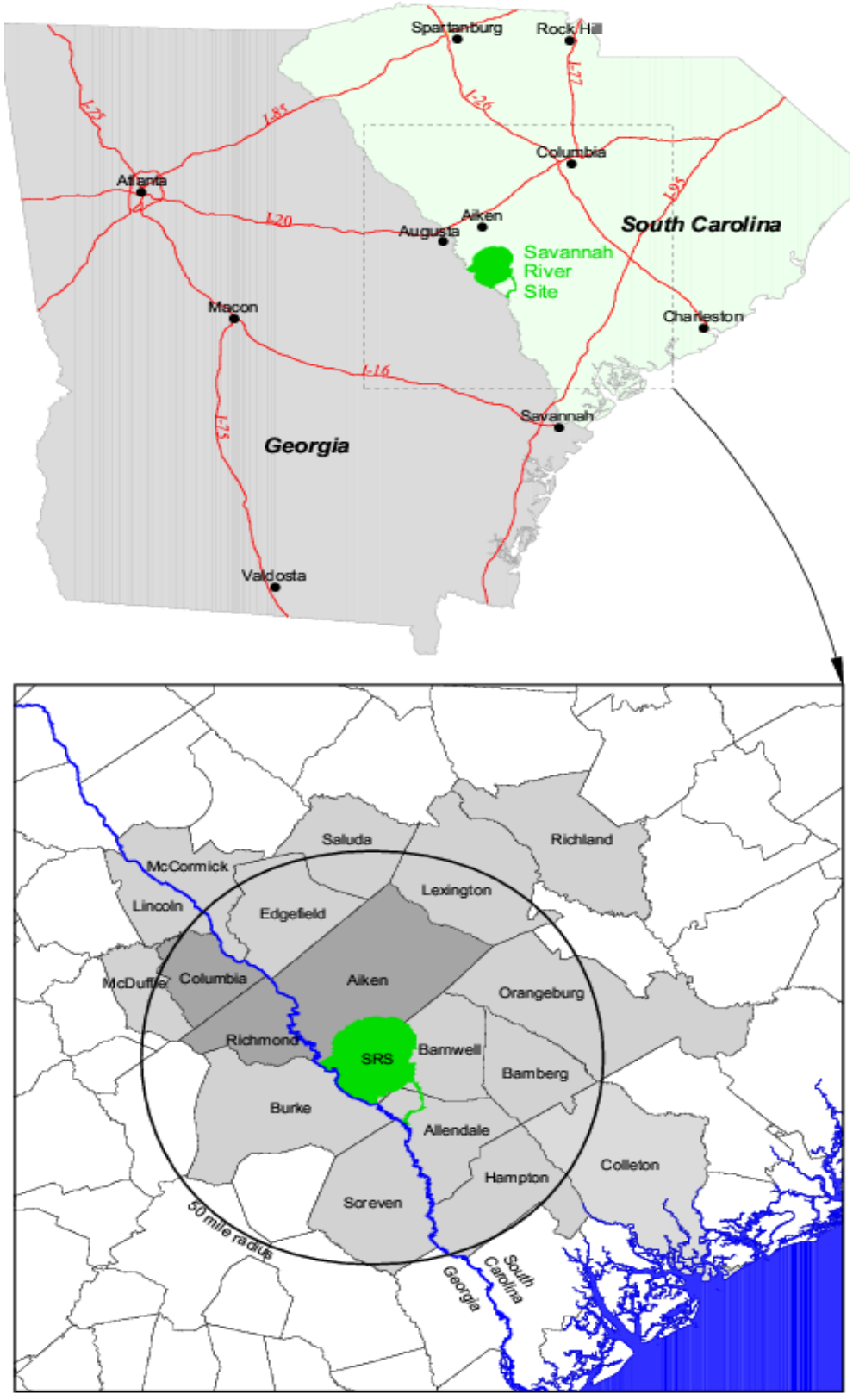

Figure 1. Geographic Proximity of the Savannah River Site

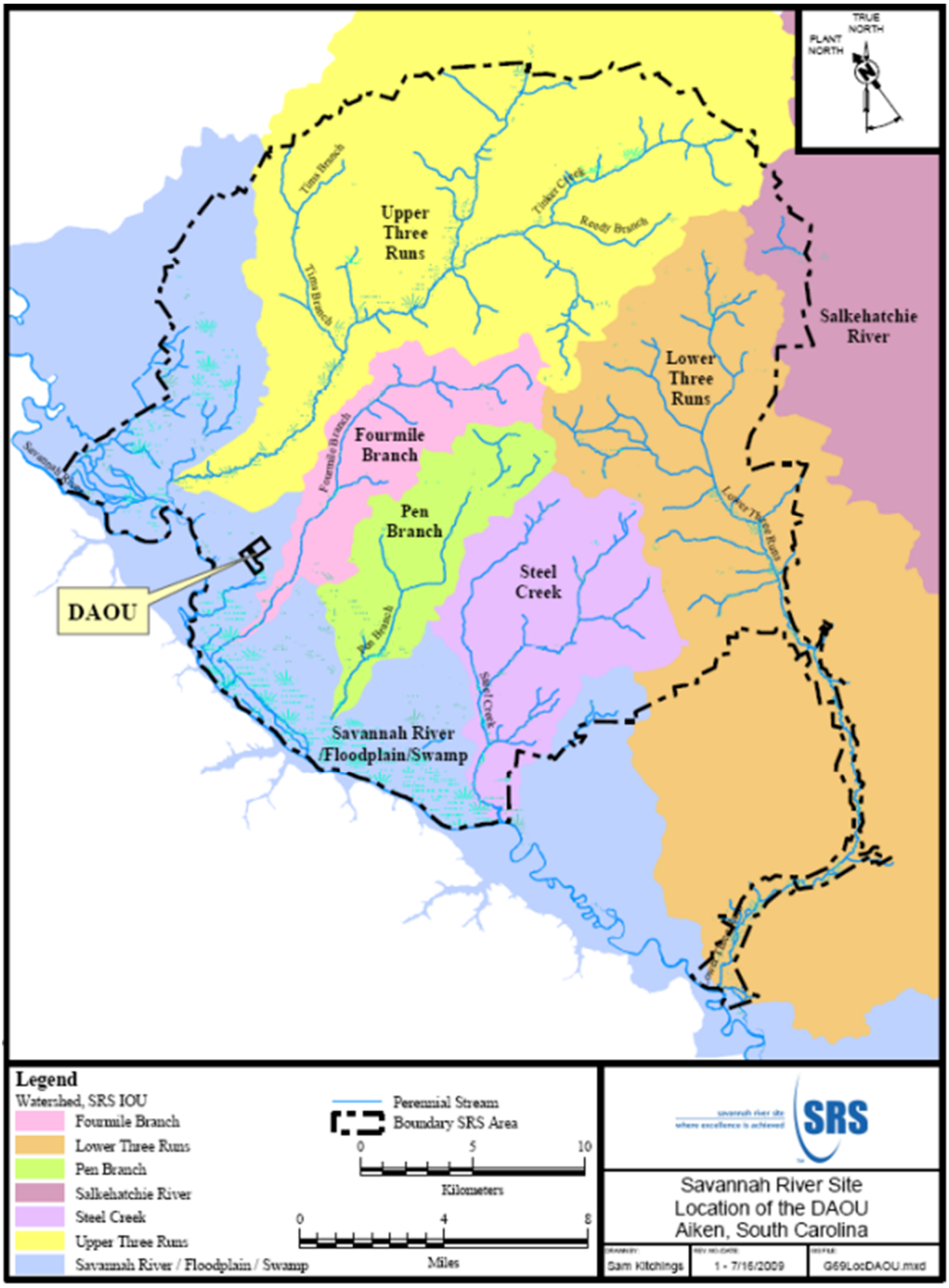

Figure 2. Location of the DAOU within the Savannah River Site

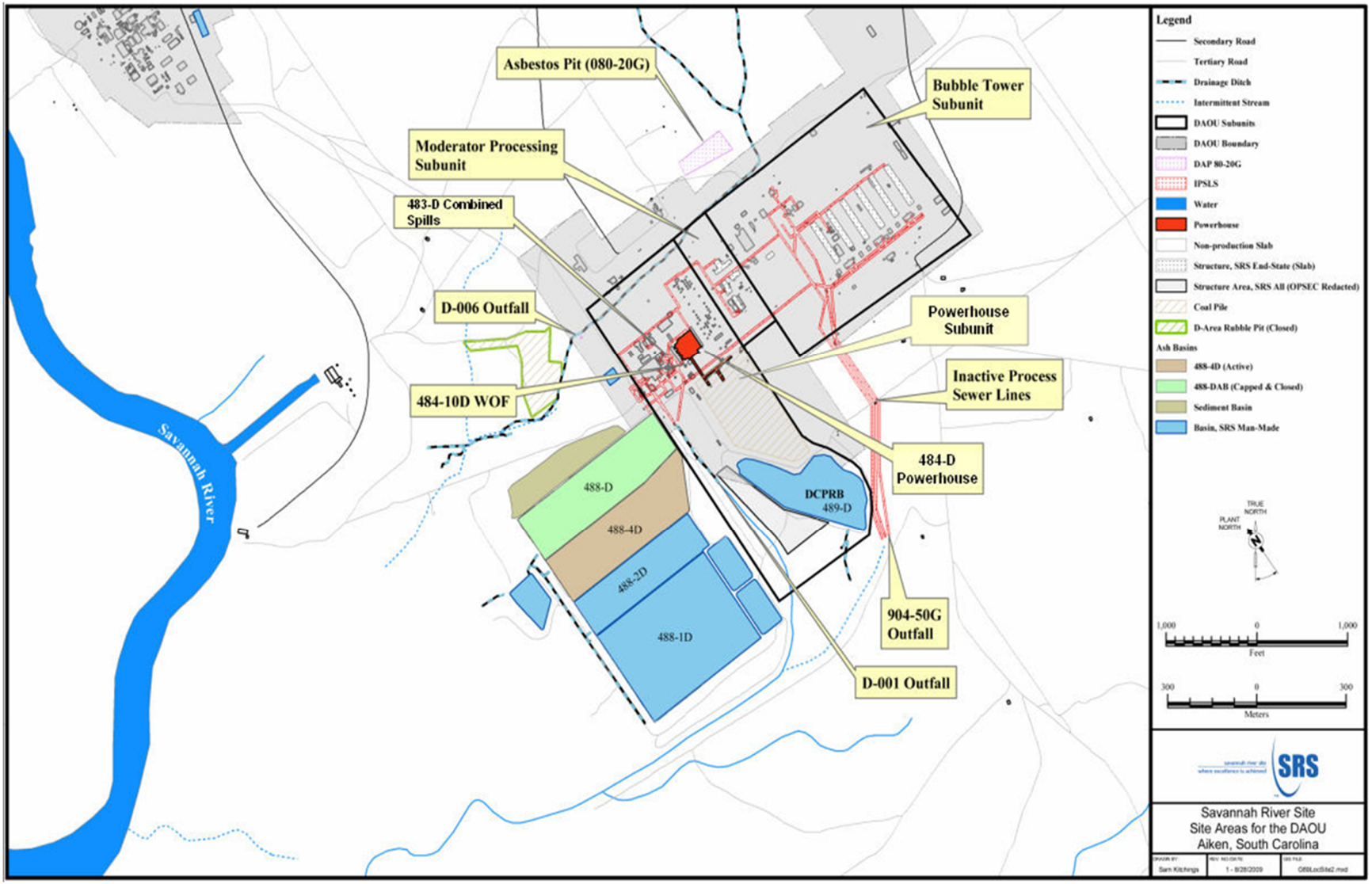

Figure 3. Layout of the DAOU

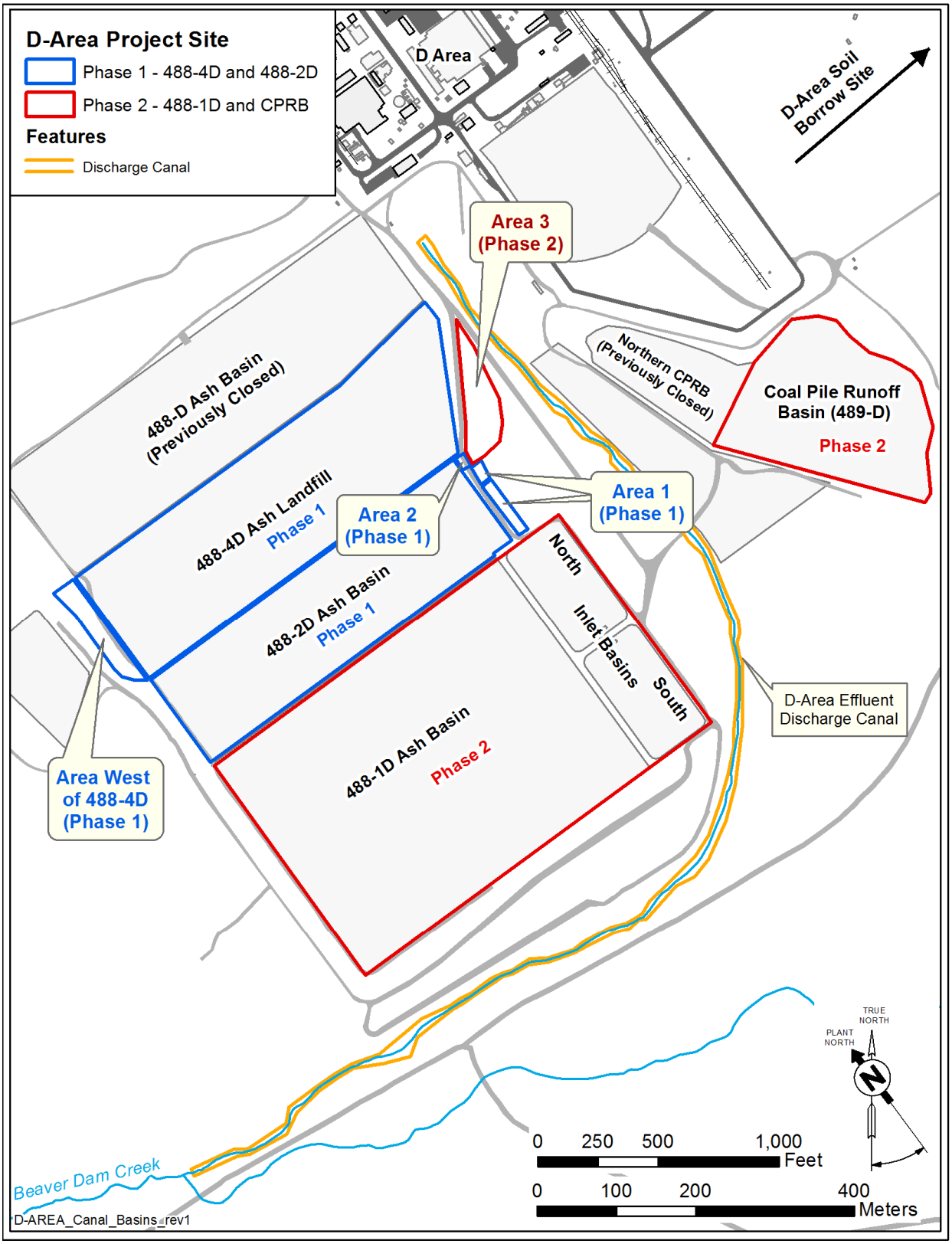

Figure 4. D-Area Project Site, Phase 1 and Phase 2

Figure 5. D-Area Ash Basins Waste Water Flow Pattern During Operations

Figure 6. D-Area Project in October 2013 (Pre-Removal Actions)

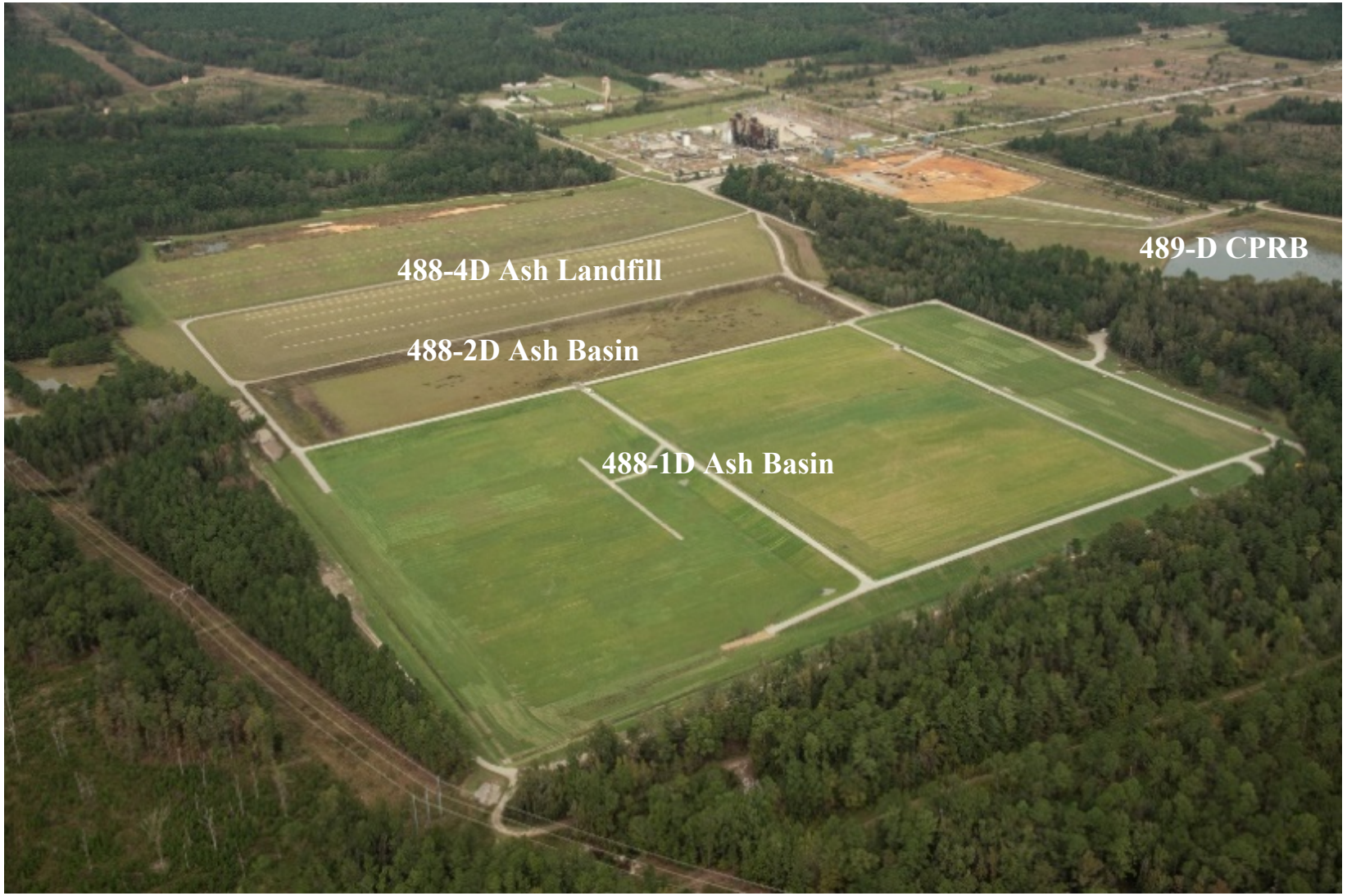

Figure 7. D-Area Project in October 2018 (Post-Removal Actions)

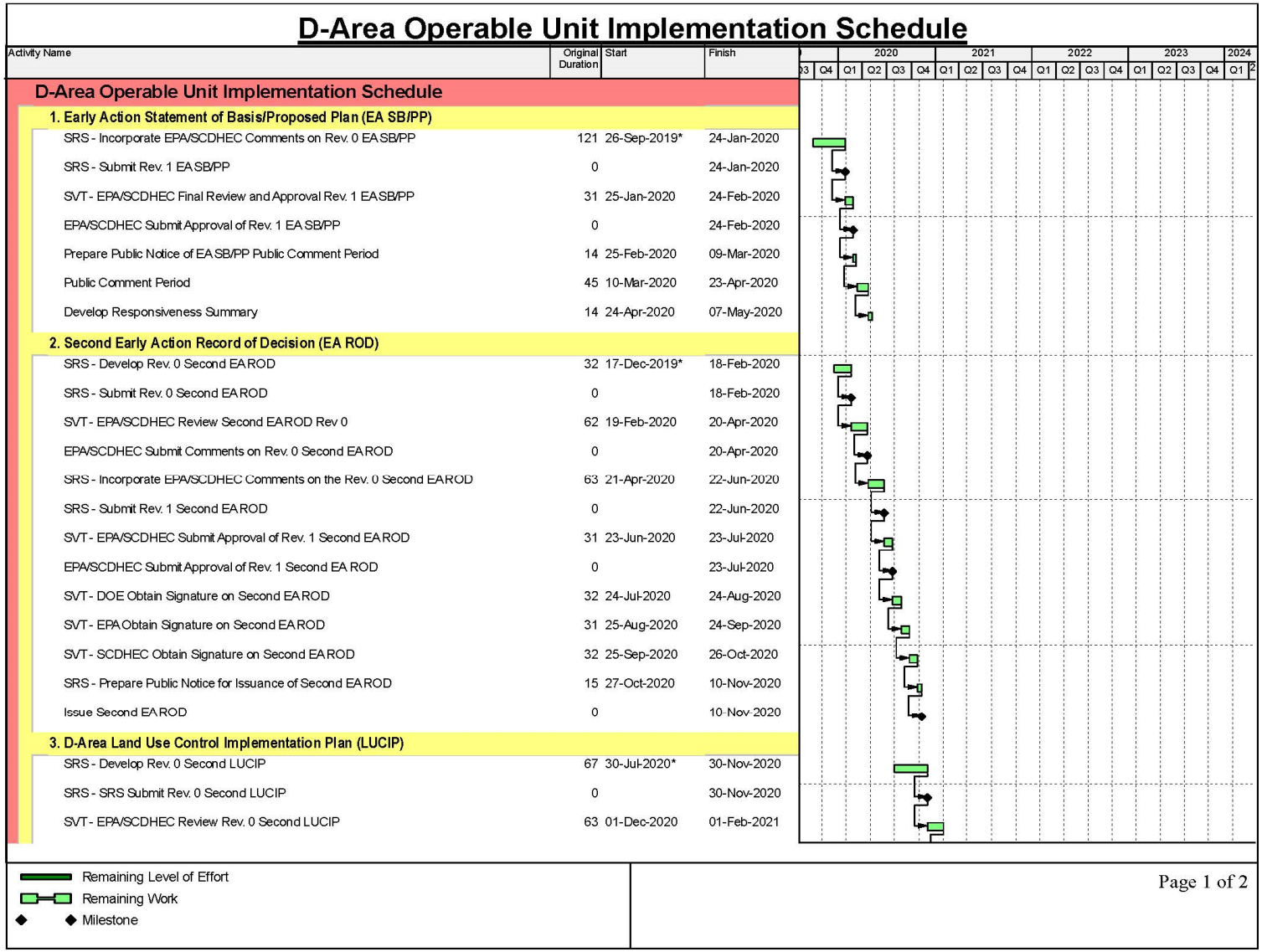

Figure 8. Post-Second EAROD Schedule

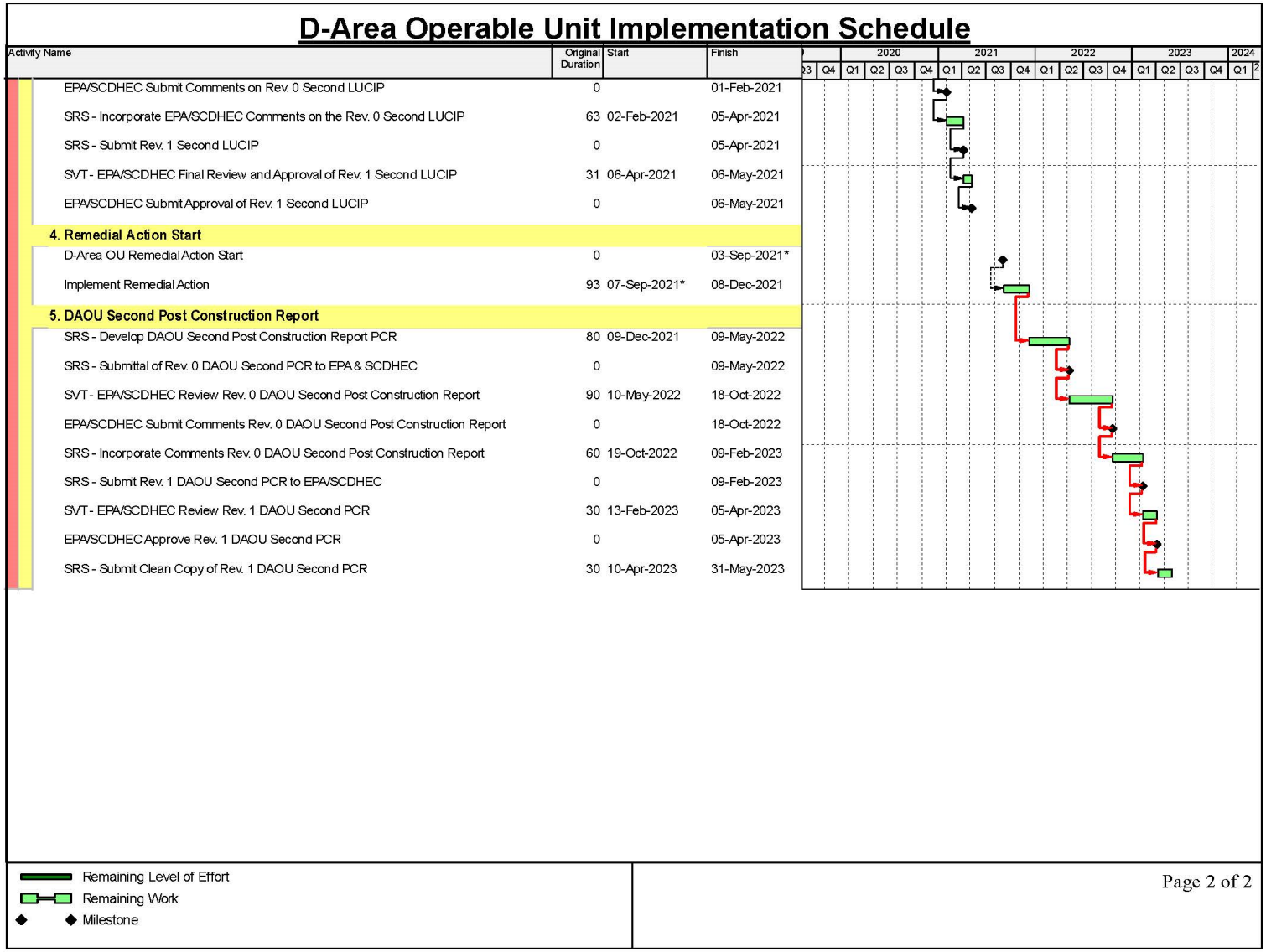

Figure 8. Post-Second EAROD Schedule *(Continued/End)*

Table 1. Summary of Administrative Paths for DAOU Subunits

Subunit/Area	Administrative Path					
	EAROD[1] *(approved)*	Second[2] EAROD	Final ROD	IOU	DAG OU	Remedial Decision
Ash Basin (488-1D) (including Inlet Basins)		X				LUCs preferred; No Action Inlet Basins portion preferred
Ash Basin (488-2D)		X				LUCs preferred
Ash Landfill (488-4D)		X				LUCs preferred
Powerhouse Subunit	X		X			
489-D CPRB - southern 75%		X				No Action preferred
489-D CPRB - northern 25%	X					LUCs
484-D Powerhouse Building			X			
484-10D Waste Oil Facility [WOF] Building			X			
484-10D WOF Environmental Media			X			
Ash Sluice Lines			X			
D-Area Coal Storage Area (484-17D)[3]			X			
483-D Combined Spills			X			
Moderator Processing Subunit	X					LUCs
Bubble Tower Subunit	X					LUCs
Miscellaneous Units						
D-006 Outfall (Petroleum Release Site)				X		
904-50G Outfall	X					No Action
D-Area Asbestos Pit (80-20G)	X					LUCs
D-Area Inactive Process Sewer Lines	X					LUCs
Electrical Transformers	X					No Action
Miscellaneous Buildings	X					No Action
D-Area Rubble Pit (431-2D)						LUCs (D-Area Expanded Operable Unit [DEXOU] ROD 2004)
D-Area Oil Seepage Basin (DAOSB)						Groundwater Monitoring/LUCs (DAOSB ROD 1998)
Ash Basin (488-D)						Geosynthetic Cover/ Groundwater Monitoring/LUCs (DEXOU ROD 2004)
DAG OU					X	
Ash Area Adjacent to and Easterly of D-Area Ash Basins 488-1D and 488-2D				X		

1. EAROD for DAOU, SRNS-RP-2010-00162, Rev 1.1, June 2011.
2. Second EAROD for DAOU, scheduled for submittal in February 2020; subunits highlighted in yellow are the subject of this EASB/PP.
3. D-Area Coal Storage Area (484-17D) also referred to as D-Area Coal Pile in SRS documentation.

Table 2. ARARs for the Preferred Remedial Alternative for DAOU

Action	Requirements	Prerequisite	Citation
Onsite Closure/Capping of the 488-1D Ash Basin and the 488-4D Ash Landfill			
Run-on/Run-off control Systems for Landfill Cover	The final cover system shall be designed and constructed to have a storm water conveyance system for the landfill cap designed to ensure that the hydraulic head at any point does not exceed one foot for a 24-hour period as the result of a 24-hour, 25-year storm event on all areas that have received final cover.	Closure of solid waste disposal facility (SC Class III landfill) –**applicable**	SCDHEC R. 61-107.19 Part V Subpart F 258.60(a)(4)
Post-Closure of 488-1D Ash Basin and the 488-4D Ash Landfill			
Post-Closure Care Requirements	Following closure, owner/operator must conduct post-closure care for a minimum of 30 years, except as provided in paragraph b. below, and consistent of at least the following: Maintain the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover	Post-closure care of solid waste disposal facility (SC Class III landfill) – **488-1D: relevant and appropriate** **488-4D: applicable**	40 CFR 258.61(a)(1),(3) SC R.61-107.19 Part V Subpart F 258.61(a)
Post-Closure Groundwater Monitoring	Monitoring the groundwater in accordance with the requirements of subpart E of this Part and maintaining the groundwater monitoring system. *Note:* USDOE will conduct post-closure groundwater monitoring and reporting under the DAOU to document the effectiveness of the cover system. The length of the post-closure care period may be decreased if the permittee can provide technical rationale that the decreased post-closure care period is sufficient to protect human health and the environment. *Note:* USDOE as part of the CERCLA remedy review process (including Five-Year Review under Section 121(c)), must seek SCDHEC and USEPA approval of a modification to the monitoring period.	Post-closure care of solid waste disposal facility (SC Class III landfill) – **488-1D: relevant and appropriate** **488-4D: applicable**	SC R.61-107.19 Part V Subpart F 258.61(a)(3) 40 CFR 258.61(b)(2) SC R.61-107.19 Part V Subpart F 258.61(b)(2)
Post-closure use of Property	Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this Part. *Note:* USDOE is responsible for ensuring LUCs (as part of the CERCLA remedy) to prevent unauthorized activities including disturbance of landfill cover integrity. LUCs will be implemented as part of the final remedial action for the DAOU.	Post-closure care of solid waste disposal facility (SC Class III landfill) – **488-1D: relevant and appropriate** **488-4D: applicable**	SC R.61-107.19 Part V Subpart F 258.61(c)(3)

Table 3. Summary of Present Value Costs for Alternative 2, Land Use Controls

Alternative 2 Early Final Action Land Use Controls D Area OU (488-1D, 2D and 4D) Savannah River Site				
Item	**Quantity**	**Units**	**Unit Cost**	**Total Cost**
Direct Capital Costs				
Land Use Controls				
Posting of Warning Signs	10	ea	$100	$1,000
LUCIP	1	ea	$7,500	$7,500
Deed Restrictions	1	ea	$7,500	$7,500
Subtotal - Direct Capital Cost				$16,000 *
Mobilization/Demobilization	25% of subtotal direct capital			$4,000 *
Site Preparation/Site Restoration	25% of subtotal direct capital			$4,000 *
Total Direct Capital Cost	(sum of * items)			**$24,000**
Indirect Capital Costs				
Engineering & Design	18% of direct capital			$4,320
Project/Construction Management	25% of direct capital			$6,000
Health & Safety	5% of direct capital			$1,200
Overhead	30% of direct capital			$7,200
Contingency	20% of direct capital			$4,800
Total Indirect Capital Cost				**$23,520**
Total Estimated Capital Cost				**$47,520**
Direct O&M Costs	0.7% discount rate for costs >30 years duration[1]			
Annual Costs (Existing System during EAROD Design & Const)	1 years O&M			*Year 2020*
Access Controls	1	ea	$750	$750
Subtotal - Annual Costs				$750
Present Worth Annual Costs (-0.5% Discount Rate)				$754
Annual Costs (LUCs)	200 years O&M			*Years 2021 - 2221*
Access Controls	1	ea	$750	$750
Annual Inspections / Reporting (2 per year)	2	ea	$5,000	$10,000
Annual Mowing and Vegetation / Debris Removal (2 per year)	2	ea	$7,500	$15,000
Annual Maintenance / Repairs (1 per year) Allowance	1	ea	$10,000	$10,000
Subtotal - Annual Costs				$35,750
Present Worth Annual Costs (0.7% Discount Rate)				$3,814,875
Five Year Costs	41			
Remedy Review	1	ea	$20,000	$20,000
Subtotal - Five Year O&M Costs				$20,000
Present Worth Five Year Costs				$428,638
Total Present Worth Direct O&M Cost				**$4,244,267**
Indirect O&M Costs				
Project/Admin Management	50% of direct O&M			$2,122,133
Health & Safety	37% of direct O&M			$1,570,379
Overhead	30% of direct O&M			$1,273,280
Contingency	15% of direct O&M			$636,640
Total Present Worth Indirect O&M Cost				**$5,602,432**
Total Estimated Present Worth O&M Cost				**$9,846,699**
TOTAL ESTIMATED COST				**$9,894,219**

Table 4. 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 SCDHEC agree with the analyses and recommendations by the USDOE. Approval of the ROD 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 SB/PP 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 ROD.

Table 5. Comparison of Alternatives Against the CERCLA Evaluation Criteria

Criterion	Alternative 1 No Action	Alternative 2 Land Use Controls
Overall Protection of Human Health and the Environment		
Protection of Human Health	Not Protective	Protective
Protection of the Environment	Not Protective	Protective
Compliance with ARARs		
Chemical-Specific	Not Applicable	Not Applicable
Action-Specific	Not Applicable	Applicable to long-term maintenance of cover systems
Location-Specific	Not Applicable	Not Applicable
Long-Term Effectiveness and Permanence		
Magnitude of Residual Risks	Risks remain unchanged, not protective	Risks are reduced to acceptable levels by controlling exposure.
Adequacy of Controls	Not Adequate	Adequate
Permanence	Not Permanent	Permanent
Reduction of Toxicity, Mobility, or Volume Through Treatment		
Treatment Process	None	None
Degree of Expected Reduction in Toxicity, Mobility, or Volume	None	No reduction through treatment
Short-Term Effectiveness		
Risk to Remedial Workers	Not applicable; no remedial action involved.	None
Risk to Community	Not applicable; no remedial action involved.	None
Risks to Environment	Not applicable; no remedial action involved.	None
Estimated Time Frame to Achieve RAOs or concentration-based remedial goals (RGs)	Does not achieve RAOs/RGs	1 month
Implementability		
Availability of Materials, Equipment, and Skilled Labor	Not Applicable	Straightforward; no specialized materials, equipment, and labor required
Ability to Construct and Operate the Remedial Technology	Not Applicable	Not Applicable
Ability to Obtain Permits/Approvals from Agencies	Not Applicable	Readily implemented
Ease of Undertaking Additional Actions	Compatible	Compatible
Time to Implement	Readily implementable	1 month

Table 5. Comparison of Alternatives Against the CERCLA Evaluation Criteria *(Continued/End)*

Criterion	Alternative 1	Alternative 2
	No Action	**Land Use Controls**
Cost		
Total Present-Worth Costs	$0	$9,894,219
State Support/Agency Acceptance	Not acceptable	Both USEPA and SCDHEC support the preferred remedy
Community Acceptance	This criterion will be completed following public review	This criterion will be completed following public review

Table 6. Comparative Ranking of DAOU Final Action Alternatives

Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost	Overall Ranking (Range 1 - 20)
1 - No Action	NA	NA	1	NA	1	5	$0	7
2 - Land Use Controls	4	Yes	5	NA	5	5	$9,894,219	19

Note: Numeric range 1 - 5, where 1 = worst and 5 = best