United States Department of Energy

Savannah River Site

Statement of Basis/Proposed Plan for the Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit (U)

CERCLIS Number: 71

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Revision 1

September 2013

Prepared by:
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Aiken, SC 29808

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

CERTIFICATION

**Statement of Basis / Proposed Plan (SB/PP)
for the Wetland Area at Dunbarton Bay In Support of
Steel Creek Integrator Operable Unit (U)**

**CERCLIS Number: 71
SRNS-RP-2013-00115, Revision 1, September 2013**

[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."

Alice C. Doswell

12/3/2013
Date Signed

Alice C. Doswell, Senior Vice President
Environment, Safety, Security & Health
for Savannah River Nuclear Solutions, LLC
as the Co-Operator with the U. S. Department of Energy
Savannah River Operations Office

A. D. Adams

12/10/2013
Date Signed

Angelia D. Adams
Acting Assistant Manager for Infrastructure and
Environmental Stewardship
U. S. Department of Energy
Savannah River Operations Office
Co-Operator and Owner

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LIST OF ABBREVIATIONS AND ACRONYMS

ac	Acre
ARAR	Applicable or Relevant and Appropriate Requirement
ARF	Administrative Record File
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CMI	Corrective Measures Implementation
CMS/FS	Corrective Measures Study/Feasibility Study
COC	Constituent of Concern
CWA	Clean Water Act
+D	Plus daughters
FFA	Federal Facility Agreement
ft	Feet
ha	Hectare
IOU	Integrator Operable Unit
LLC	Limited Liability Company
LUCs	Land Use Controls
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
m, m^3	Meters, cubic meters
mi, mi^2	Miles, square miles
MCL	Maximum Contaminant Level
NPL	National Priorities List
OU	Operable Unit
PAB	P-Area Ash Basin
PTSM	Principal Threat Source Material
RAIP	Remedial Action Implementation Plan
RAO	Remedial Action Objective
RCOC	Refined Constituents of Concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGO	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
SB/PP	Statement of Basis/Proposed Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WADB	Wetland Area at Dunbarton Bay in Support of Steel Creek Integrator Operable Unit
WSRC	Washington Savannah River Company, LLC
yd^3	Cubic yards

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I. INTRODUCTION AND BACKGROUND

Introduction

This Statement of Basis/Proposed Plan (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 Health and Environmental Control (SCDHEC). The purpose of this SB/PP is to describe the preferred remedial alternative(s) for the Wetland Area at Dunbarton Bay (WADB) in Support of the Steel Creek Integrator Operable Unit (IOU), and to provide for public involvement in the decision-making process.

SRS occupies approximately 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 25 miles (mi) southeast of Augusta, Georgia, and 20 mi south of Aiken, South Carolina.

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

The WADB is located at the SRS in Barnwell County, South Carolina (see Figure 1). A remedial action is needed at the WADB because arsenic, cesium-137(+D), potassium-40, and radium-226(+D) are present in surface ash/soil media that may pose a threat to human health and the environment. The preferred remedial alternative for the WADB is Alternative A-3b: Excavation of 16,820 cubic meters (m^3 [22,000 cubic yards {yd^3}]) of ash and ash-contaminated soil media from the P-Area Ash Basin (PAB) to the edge of the 30-meters (m [100-feet {ft}]) buffer around the Dunbarton Bay and transport to an approved off-SRS containment facility. Land Use Controls (LUCs) were also selected as part of the remedy to prevent unrestricted use and exposure for an area within Dunbarton Bay, where ash will not be removed to protect the sensitive Dunbarton Bay ecosystem. Dunbarton Bay is also commonly referred to as a Carolina Bay which is a distinctive type of wetland found on the southeastern Atlantic coastal plain characterized by shallow elliptical depressions. Within a regional landscape, Carolina Bays offer seasonal or semi-permanent aquatic habitats especially rich in biodiversity.

The preferred alternative complies with federal and state solid waste disposal requirements for ash. As part of the selected remedy, the future land use for the WADB will be unrestricted (i.e., no LUCs) where contaminated ash/soil media is excavated (4.8 hectare [ha {12 acres} {ac}]) and restricted by LUCs where the contaminated ash/soil media will remain in place (10 ha [25 ac]).

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 WADB 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 September 30, 2003 (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, 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 WADB as a RCRA/CERCLA subunit of the Steel Creek IOU 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 2011a) 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. This will be the final action for the WADB subunit. However, a permit modification is required for the surface ash/soil media because the action for this media is considered to be a final 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 ARF. Community involvement in consideration of this evaluation of alternatives for the WADB 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 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:

US Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

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

Reese Library
Government Information Section
Georgia Regents University
2500 Walton Way
Augusta, Georgia 30910
(706) 737-1744

Asa H. Gordon Library
Savannah State University
Tompkins Road
Savannah, Georgia 31404
(912) 356-2183

The RCRA ARF for SCDHEC is available for review by the public at the following locations:

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

South Carolina Department of Health and
Environmental Control
Midlands EQC Region - Aiken
206 Beaufort Street, N.E.
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 *Allendale Citizen Leader*, the *Augusta Chronicle*, the *Barnwell 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:

Janet Griffin
Savannah River Nuclear Solutions, LLC
Public Involvement
Savannah River Site
Building 730-1B
Aiken, South Carolina 29808
(803) 952-8467
janet.griffin@srs.gov

South Carolina Department of Health and
Environmental Control
Attn: Rodney Wingard
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 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 this operable unit and include responses to oral and written comments received during the public comment period in the Responsiveness Summary.

III. OPERABLE UNIT BACKGROUND

SRS began early infrastructure development between 1951 and 1955 including the construction of P Reactor. P Reactor operated between 1954 and 1991. Similar to each reactor area at SRS, P Area utilized a coal-fired powerhouse to generate steam and electricity, with coal ash (coal combustion products) produced as a waste of boiler operations. In P Area, this ash was disposed via a sluice line to the PAB. In the summer of 2010, an area of ash overflow was initially discovered during the removal activities at the PAB.

The ash overflow area begins on the southern edge of the PAB and extends ~762 m (~2,500 ft) into Dunbarton Bay located south of Powerline Road. Dunbarton Bay (Figures 2 and 3) has been identified as designated wetlands.

The Core Team met on August 5, 2010 to discuss and evaluate the need for a remedial action with regard to the ash overflow area at Dunbarton Bay. The Core Team agreed that this additional area was outside the scope of the remedial action for the PAB, and the newly discovered ash overflow area in Dunbarton Bay was administratively assigned to the Steel Creek IOU in the SRS FFA and named the WADB. The Core Team agreed to the development of a Sampling and Analysis Plan (SGCP 2010) to investigate the nature and extent of ash contamination. Sampling included groundwater, surface water within Dunbarton Bay, ash/soil media, and ecological media. Sample collection at the WADB was conducted in 2010 and 2011. Human health risk assessment/principal threat source material, ecological risk assessment, groundwater quality, and contaminant migration evaluations were performed with the collected definitive level analytical data.

The Focused Corrective Measures Study/Feasibility Study (CMS/FS) Report (SRNS 2012) was developed to evaluate remedial alternatives for radiological and hazardous substances existing at the WADB subunit. The goals of remedial actions are to protect human health and the environment and to mitigate the effects of contamination. The focused CMS/FS developed the remedial action objectives (RAOs) and remedial goal options (RGOs) for the remedial action(s). Three remedial alternatives, including four sub-alternatives, were carried forward into the detailed analysis. All the alternatives, except the No

Action alternative, can meet the remedial action objective.

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 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 Operable Unit (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 WADB subunit is located within the Steel Creek IOU (see Figure 1).

The purpose of this SB/PP is to select and describe the preferred remedial alternative(s) for protecting health and environment at the WADB and to provide for public involvement in the decision-making process. This document will describe the remedial alternatives evaluated in the focused CMS/FS and the rationale for selecting the preferred alternative. Estimated present worth costs will also be presented for each of the alternatives which were evaluated.

V. SUMMARY OF SITE RISKS

The ash flow area begins on the southern edge of the PAB and extends ~762 m (~2,500 ft) into Dunbarton Bay located south of Powerline Road (Figure 3). The maximum width at the leading edge of the ash deposition area is ~300 m (~985 ft). The depth of ash deposition is variable and ranges from 0.15 to 0.9 m (0.5 to 3 ft) in thickness (Figure 3). The entire WADB subunit covers an area of approximately 15 ha (38 ac) and contains an estimated volume of 61,332 m^3 (80,220 yd^3) of ash.

Summary of Human Health Risk Assessment

The Human Health Risk Assessment/Principal Threat Source Material (HHRA/PTSM) evaluation used the definitive level data that was collected in 2010 for the ash/soil media. This dataset consisted of ten sample locations within Dunbarton Bay. In addition, the data collected and analyzed by the Savannah River Ecology Laboratory in 2011/2012 was considered in the weight-of-evidence evaluation. The HHRA considered the standard future resident and future industrial worker receptor scenarios. In addition, IOU onsite worker and adolescent trespasser scenarios were also evaluated. The conclusions of the HHRA determined that the risk to all four (4) receptors would exceed 1.0E-06 for exposure to arsenic, cesium-137(+D), potassium-40, radium-226(+D) in ash/soil media. These constituents were identified as refined constituents of concerns (RCOCs) that require a remedial action. The highest risk was 3.9E-04 for the residential scenario and the lowest risk was 6.7E-05 for the adolescent trespasser scenario. The IOU onsite worker (risk = 9.9E-05) was selected as the most appropriate receptor for the WADB Subunit. The range of cleanup goals or

RGOs were developed and are driven by background values since SRS background concentrations are higher than the most restrictive (risk = 1.0E-06) RGOs.

There was no surface water present during the 2011 sampling event. Surface water media that is intermittently present within the WADB does not represent a sustainable exposure scenario that warrants a detailed human health risk assessment.

Summary of Groundwater Quality Assessment

Thirteen (13) monitoring wells were used to assess groundwater quality from April 2011 until February 2012. Groundwater samples were collected from 9 ft above mean sea level (MSL) to 207 ft above MSL, beneath and near the WADB subunit. The number of samples collected provides for statistical stability and representativeness in monitoring trends of groundwater quality. A single detection of naturally occurring beryllium and gross alpha particles exceeded their respective maximum contaminant level (MCL) in one well. Four subsequent sampling events from the same well did not detect any further concentrations which exceeded their respective MCL. Therefore, groundwater RCOCs have not been identified for the WADB subunit.

Summary of Ecological Risk Assessment

Trophic-level modeling was conducted and reported in the focused CMS/FS using the definitive level data and site-specific data collected and analyzed by the Savannah River Ecology Laboratory in 2010/2011. There is no clear evidence that the ash media in the WADB has negatively impacted ecological receptors. The ecological receptors represent a healthy and diverse ecosystem when compared to similar areas adjacent to it that are not contaminated. The overall weight-of-evidence leads to the conclusion that naturally occurring trace metals associated with the coal ash present within the Dunbarton Bay system do not pose an unacceptable risk to representative populations inhabiting or utilizing the area or to special species of concern. Therefore, no ecological RCOCs are identified and there are no problems warranting action from an ecological risk perspective.

Summary of Contaminant Fate and Transport Analysis

The contaminant migration evaluation used the definitive level data that was collected in 2010 for the ash/soil media. There are no constituents that have the potential to migrate to the aquifer and exceed MCLs or in the absence of a MCL, Regional Screening Level/Preliminary Remediation Goals (RSL/PRGs), within 1,000 years. Therefore, no contaminant migration RCOCs were identified.

Conclusion

In summary, analysis of all data and weight-of-evidence indicates that problems warranting action only exist for human health receptors from exposure to the surface ash/soil media. No problems warranting action were identified for ecological receptors. Additionally, no problems warranting action were identified for contaminant migration, surface water, or groundwater media. As previously discussed, the HHRA evaluated multiple receptors for risk management purposes; however, problems warranting action are based on the IOU onsite worker selected as the most appropriate receptor for the WADB subunit.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the Preferred Alternative or one of the other active measures considered, may present a current or potential threat to human health or the environment.

VI. 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 WADB Subunit is located outside any industrial buffer zones as defined by the SRS Land Use Control Assurance Plan (LUCAP) (WSRC 2011b). However, no current/future use or development is anticipated for the WADB area based on the SRS land use policy. Although the IOU Onsite Worker was selected as the most appropriate receptor scenario, the focused CMS/FS also evaluated residential, industrial worker, and adolescent trespasser scenarios to support risk management decision-making. The area to be excavated will require no land use restrictions, and the area where waste remains in place will be restricted by LUCs.

The RAO for the WADB subunit is:

- Prevent the IOU Onsite Worker from exposure to RCOC contaminants in surface ash/soil exceeding 1.0E-06 risk or SRS background concentrations.

Remedial Goal Options

RGOs serve to provide a range of cleanup goals for each constituent of concern 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 Applicable, or Relevant and Appropriate Requirements (ARARs). Following public comment and approval of the SB/PP, the RGOs for the selected remedy are documented as final cleanup goals or remedial goals (RGs) in the ROD.

The focused CMS/FS (SRNS 2012) presents a range of human health RGOs corresponding to target cancer risks of 1×10^{-6} and target hazard quotients of 1. RGOs were calculated for all human receptors, including the IOU Site Worker and are presented in Table 1.

Since RCOCs are identified for human receptors only, the most restrictive RGO is identified as the lowest of the HHRA RGOs. There are no PTSM, ecological risk assessment, contaminant migration or groundwater RGOs identified for the WADB subunit.

In contrast to the most restrictive RGOs, the most likely RGOs also consider a comparison to background levels. With the exception of Cs-137(+D), RCOCs identified for the ash media are also common constituents in SRS background soil at similar concentrations. Because of the inherently conservative nature of the risk assessment and RGO calculations, it is possible for the risk-based RGOs to be less than what occurs naturally in background soil.

In order to practically achieve the cleanup level for these common constituents, the RGO is set as the 95th percentile concentration in SRS background soil. The 95th percentile is selected because it provides an accurate picture of where 95 percent of SRS background concentrations for these constituents are expected to fall, as opposed to an average or maximum concentration that could either overstate or understate the cleanup level. This is particularly important when concentrations in the "contaminated" media are similar to background concentrations and an outlier or slight fluctuation in the lab analysis could result in unnecessary remediation of soils containing naturally-occurring constituents at levels that are found in background.

The Most Likely RGOs (i.e., 95th percentile of SRS background concentrations) for each of the RCOCs equate to a risk of < 1E-04 which are within the USEPA target risk range for a residential scenario (i.e., unrestricted land use): arsenic risk = 2.1E-05, potassium-40 risk = 2.2E-05, radium-226(+D) risk = 9.4E-05, uranium-238 (+D) risk = 1.7E-06 and cesium-137(+D) risk = 1.1E-05.

For Cs-137(+D), the 95th percentile detected in SRS background soils is 0.34 pCi/g which is very low when compared to "typical" anthropogenic fallout levels generally recognized at 1 pCi/g or less. To account for the variability in background concentrations of Cs-137(+D) and for consistency with generally recognized fallout levels, the RGO for this RCOC is set at two times (2x) the 95th percentile of SRS background soil represented at 0.68 pCi/g.

Following the ash removal and visual inspection that no ash remains, confirmation samples will be obtained from the excavation area. To confirm that RGOs have been met in the excavation area, the mean concentration of all confirmation samples will be compared to the Most Likely RGOs provided in Table 1. In addition, SRS will ensure that no single confirmation sample result will exceed the SRS maximum background concentration for each constituent.

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 and summarizes the remedial alternatives studied in detail in the focused CMS/FS.

According to USEPA guidance, if there is no current or potential threat to human health or the environment and no action is warranted, the CERCLA 121 requirements are not triggered and there is no need to evaluate other remedial alternatives or to evaluate the No Action alternative against the nine remedy selection criteria under CERCLA. These nine criteria are used as a basis for selecting cleanup remedies that are protective of human health and the environment, implementable, cost-effective, and acceptable to the state regulatory agency.

As previously discussed human health risk RCOCs were identified for the WADB subunit. Therefore, a remedial action is required to prevent an unacceptable exposure to human health receptors.

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 analysis in the CMS/FS. The range of alternatives includes options that 1) immobilize contaminants, 2) reduce contaminant volume, or 3) reduce the need for long-term, onsite management. Some alternatives have been developed that involve little or no treatment yet provide protection to human health and the environment by preventing or controlling exposure to contaminants through LUCs.

The following remedial alternatives have been identified at the WADB subunit.

1. Alternative A-1: No Action
2. Alternative A-2: Land Use Controls for 15 ha (37 ac)
3. Alternative A-3: Excavation and Ex situ Containment

   A-3a: Excavation of 16,820 m^3 (22,000 yd^3) of Ash and On-SRS Containment with LUCs for 10 ha (25 ac) not excavated

   A-3b: Excavation of 16,820 m^3 (22,000 yd^3) of Ash and Off-SRS Containment with LUCs for 10 ha (25 ac)

   A-3c: Excavation of 61,332 m^3 (80,220 yd^3) of Ash and On-SRS Containment

   A-3d: Excavation of 61,332 m^3 (80,220 yd^3) of Ash and Off-SRS Containment

Under Alternative 3, ex situ containment refers to transport and containment of the ash from the WADB waste unit. Ex situ containment was evaluated for both on-SRS and off-SRS facilities.

Alternative A-1: No Action

As required by the NCP, the No Action alternative is provided as a baseline for comparison against the other alternatives. No action is taken to restrict access, limit exposure, or reduce contaminant toxicity, volume, or mobility. LUCs are not in place and monitoring and reporting are not conducted. No resources would be expended in reducing contamination and contaminants would remain in place.

Total Present Worth Cost *$0*

Alternative A-2: Land Use Controls

This alternative involves only the use of LUCs to limit access to the area of the WADB where waste (ash) has not been removed. LUCs includes both institutional controls (i.e., excavation permit restrictions, deed restrictions, requiring health and safety plans for entry, etc.) and physical access controls (i.e., physical barriers, warning signs, no trespassing signs, access controls, fencing, etc.) to minimize the potential for human exposure to contaminants by limiting land access or resource use at the waste unit. LUCs meet the threshold and balancing criteria requirements and are the least expensive alternative besides the No Action alternative that is protective of human health and the environment and can meet the RAO. No ARARs are invoked by LUCs. The extent of the area proposed to be under LUCs is provided in Figure 3 and apply to remedial alternatives A-2; 15 ha (37 ac), A-3a; 10 ha (25 ac), and A-3b; 10 ha (25 ac). LUCs are not required for remedial alternatives A-3c and A-3d since excavation would remove all the waste (ash/soil media) from the waste unit. Because of the long-lived nature of the contaminants, LUCs would need to be maintained until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure and would require five year remedy reviews, inspections, and monitoring.

Total Present Worth Costs *$1,824,099*

Alternative A-3 Excavation of Ash with Ex Situ Containment

Alternative 3 consists of four sub-alternatives which all use excavation and ex situ containment, but differ in the location of ex situ containment (on-SRS vs. off-SRS), the volume of ash/contaminated soil which is excavated, and the use of LUCs. This alternative involves excavating the contaminated media (ash) in the WADB from the surface of the ash down to the native soil interface. Soil samples will be collected and analyzed to confirm if the RAO or SRS background concentrations have been achieved by the cleanup. A sampling and analysis plan, which will include a sampling design as well as sample collection and analytical methods, will be developed and presented in the Corrective Measures Implementation/Remedial Action Implementation Plan (CMI/RAIP). This remedial alternative includes clearing and grubbing vegetation, road building, erosion control, grading, excavation of ash and contaminated soil, and then hauling it to an approved on-SRS or off-SRS ex situ containment facility. Sub-alternatives A-3a and A-3b use a 30-m (100-ft) buffer area surrounding the Dunbarton Bay (a wetland) and two sub-alternatives A-3c and A-3d evaluate excavation of the total volume of ash and contaminated soil. The 30-m (100-ft) buffer is used to protect Dunbarton Bay's sensitive ecosystem from damage caused by excavation and construction activity. All four sub-alternatives can meet the threshold and balancing criteria requirements and are protective of human health and the environment. The four sub-alternatives can also meet the ARARs (see Table 2) and the RAO.

Alternative A-3 must comply with ARARs. All sub-alternatives will need to comply with South Carolina Hazardous Waste Management (Regulation SC R61-79) and Identification of and Listing of Hazardous Waste (40 CFR 261) will be followed. A storm water permit will also need to be approved prior to the

commencement of construction. Sub-alternatives A-3c and A-3d will have the potential to trigger and need to comply with a variety of rules and regulations to perform work in a designated wetland, i.e., Dunbarton Bay. Sub-alternatives A-3a and A-3c could trigger various federal and South Carolina regulations for an on-SRS ash disposal facility, and for the characterization and disposal of solid waste and/or hazardous waste, if any is generated.

A-3a: Excavation of 16,820 m^3 (22,000 yd^3) of Ash and On-SRS Containment with LUCs

Proposes to excavate an approximate 5 ha area (4.9 ha [~12 ac]) of ash and contaminated soil from the boundary of the PAB to the edge of the 30-m (100-ft) buffer around the Dunbarton Bay and transport the waste to an approved ex situ containment facility located on-SRS property. This option employs LUCs for 10 ha (25 ac) since the entire volume of ash will not be excavated and a portion left in place.

Present Worth Cost *$8,275.378*

A-3b: Excavation of 16,820 m^3 (22,000 yd^3) of Ash and Off-SRS Containment and LUCs

Proposes to excavate 16,820 m^3 (22,000 yd^3) of ash and contaminated soil media from the boundary of the PAB to the edge of the 30-m (100-ft) buffer around the Dunbarton Bay and transport the waste to an approved ex situ containment facility located off-SRS property. This option employs LUCs for 10 ha (25 ac) since the entire volume of ash will not be excavated and a portion left in place.

Present Worth Cost *$11,535,146*

A-3c: Excavation of 61,332 m^3 (80,220 yd^3) of Ash and On-SRS Containment

Proposes to excavate entire volume of ash and contaminated soil including the Dunbarton Bay (80,220 yd^3) and transport the waste to an approved ex situ containment facility located on-SRS property. This option does not employ LUCs because all waste will be excavated and removed.

Present Worth Cost *$13,055,204*

A-3d: Excavation of 61,332 m^3 (80,220 yd^3) of Ash and Off-SRS Containment

Proposes to excavate entire volume of ash and contaminated soil including the Dunbarton Bay (80,220 yd^3) and transport the waste to an approved ex situ containment facility located off-SRS property. This option does not employ LUCs because all waste will be excavated and removed.

Present Worth Cost *$21,428,462*

VIII. EVALUATION OF ALTERNATIVES

This section summarizes the results of the detailed analysis of the remedial alternatives in the WADB subunit focused CMS/FS.

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 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 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

With the exception of the No Action alternative, Alternative A-2 and sub-Alternatives A-3a, A-3b, A-3c, and A-3d are all protective of human health and the environment and each can achieve the RAO.

Alternative A-2 provides for LUCs to prevent exposure to metallic and natural radionuclide contaminants in the ash/soil media. With rigorous adherence to the LUCs this alternative is protective of the IOU onsite worker and would leave all hazardous substances in place. Residual risk would still exceed 1E-06 or SRS background concentrations.

Sub-alternatives A-3a, A-3b, A-3c, and A-3d are all more protective of the IOU onsite worker than Alternative A-2 because either a portion or all of the ash/soil media is excavated from the WADB subunit and interred in an approved and permitted ex situ containment waste disposal facility. Sub-alternatives A-3c and A-3d are even more protective of the IOU onsite worker than sub-alternatives A-3a and A-3b since all 61,332 m^3 (80,220 yd^3) of the ash and contaminated soil is removed from the WADB including the Dunbarton Bay leaving no hazardous substances in place.

However, sub-alternatives A-3a and A-3b have the advantage for the protection of the environment since construction activities will not occur within the 30 m (100-ft) buffer around the Dunbarton Bay and will prevent damage to and destruction of the sensitive ecosystem of the bay. Therefore, sub-alternatives A-3a and A-3b will provide better protection of the environment than A-3c or A-3d. Sub-alternatives A-3a and A-3b excavate 16,820 m^3 (22,000 yd^3) of ash/soil media and are also combined with LUCs to prevent IOU onsite worker exposure to hazardous substances remaining in the Dunbarton Bay as a mitigating control.

Compliance with ARARs

Chemical-Specific ARARs: All alternatives (2, 3a, 3b, 3c, and 3d) have no Chemical-Specific ARARs identified.

Location-Specific ARARs: Alternative 2 does not have to comply with any location specific ARARs because there is no excavation, treatment, or removal of ash or contaminated soil media and only LUCs are used to control access and land use for the entire area where ash has been deposited.

Since a portion of the ash is located in a designated wetland (Dunbarton Bay), Sub-alternatives A-3c and A-3d will need to comply with a variety of rules and regulations to perform work in a designated wetland. Compliance with the substantive requirement of the

Clean Water Act (CWA) will be required. Section 404 of the CWA states: "no activity that impacts waters of the United States shall be permitted if a practical alternative that has less adverse impacts exist. If there is not another viable alternative, the impacts to the wetlands must be mitigated."

Sub-alternatives A-3a and A-3b have the advantage since construction would not be performed in the designated wetland and would not trigger ARARs that are associated with Alternatives A-3c or A-3d. Leaving a 30-m (100-ft) buffer at Dunbarton Bay provides additional assurances to avoid any impacts to the wetland.

Other location specific ARARs include applicable statues for endangered, threatened or rare species, as well as, the presence of archeological or cultural artifacts.

Action-Specific ARARs: Alternative 2 does not have to comply with action-specific ARARs since hazardous substances are not being generated, transported, or disposed.

Sub-alternatives A-3a and A-3c would trigger various federal and South Carolina regulations if a permitted, on-SRS solid waste disposal facility is constructed. Sub-alternatives A-3a, A-3b, A-3c, and A-3d would trigger requirements from 40 CFR Part 262, 264, and 268 for the characterization, transportation and disposal of solid waste and/or hazardous waste (if any is generated). Non-hazardous, non-radioactive solid waste could be sent to a permitted, on-SRS solid waste landfill (none currently exist). Non-hazardous, non-radioactive solid waste could be sent to the regional permitted municipal solid waste landfill.

Short-Term Effectiveness

Short term effectiveness is not applicable to Alternative 1 since there is no action.

Alternative 2 presents no risk to workers or the community since no waste is generated, transported, or disposed by implementing LUCs.

Sub-Alternatives A-3a, A-3b, A-3c, and A-3d have the potential to minimally expose remediation workers to hazardous substances during excavation, construction, hauling, and earth moving activities. The removal of contaminated soil and ash would be performed consistent with SRS safety and health procedures to ensure minimal impact to the remediation worker during implementation. There is no risk to the community from these activities since the work area is not located in proximity to any community and is well within the SRS boundary.

A major advantage is recognized by sub-alternatives A-3a and A-3b because excavation and removal of ash and contaminated soil media is only partial and will not occur in a designated wetland. Sub-alternatives A-3a and A-3b will not disturb, destroy, or negatively impact the sensitive ecosystem of the Dunbarton Bay and the buffer area. The buffer area is present to provide a barrier where construction activities will stop and be mitigated, thus preventing negative impact to and protecting the Dunbarton Bay from sedimentation, erosion, and destruction of flora and fauna.

Alternatively, sub-alternatives A-3c and A-3d propose to excavate and remove the entire 61,332 m^3 (80,220 yd^3) of ash and contaminated soil media from WADB subunit. These sub-alternatives (while being

the most effective for reducing receptor risk) are also the most destructive to the environment. In order to implement sub-alternatives A-3c and A-3d, it will require clear cutting all the vegetation and mature trees, cutting and building temporary roads to provide access for heavy construction equipment, and excavation and removal of soil and ash in and around the Dunbarton Bay. The construction activities needed to implement A-3c and A-3d will virtually destroy and eliminate a portion of Dunbarton Bay as a natural resource. The construction activity and level of destruction to the Dunbarton Bay is an unavoidable short-term impact of implementing these two sub-alternatives. Due to the volume and location of the ash and contaminated media, there is no other feasible method or technology to cost-effectively accomplish the excavation without causing extensive and possibly irreversible destruction of the Dunbarton Bay.

Long-Term Effectiveness and Permanence

With the exception of the No Action alternative, all alternatives provide long-term effectiveness and permanence.

For Alternative A-2, LUCs would be maintained until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure. Warning/no trespassing signs would be posted informing personnel not to enter the posted area to prevent contact with hazardous substances. The use of LUCs can prevent the current and future IOU onsite worker from being exposed to hazardous substances in the ash and contaminated soil.

LUCs will prevent human receptor exposure from residual ash remaining in the wetland after excavation and ex situ containment. Alternative A-2 is not a permanent remedy because the ash/soil media would remain in situ. The magnitude of residual risk would still exceed 1E-06 or SRS background concentrations, all 15 ha (37 ac) of the WADB would require LUCs, and 5-year remedy reviews would be required until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure.

Sub-alternatives A-3a and A-3b provide better effectiveness and permanence than is attainable with Alternative 2 because these alternatives excavate ~16,820 m^3 (~22,000 yd^3) of contaminated ash/soil media. The magnitude of residual risk is less than 1E-06 or SRS background concentrations within the removal area, but greater than 1E-06 or SRS background concentrations in Dunbarton Bay. Because residual ash remains in Dunbarton Bay, 10 ha (25 ac) of property will require LUCs until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure.

A-3c and A-3d provide the best effectiveness and permanence than is attainable with all the previous alternatives. These sub-alternatives will permanently remove all of the ash and contaminated soil from the WADB subunit including the designated wetlands and dispose it safely in an approved ex situ containment facility. As such there will be no need for LUCs or 5-year remedy reviews and land use will be unrestricted.

Reduction of Toxicity, Mobility, or Volume through Treatment

The No Action alternative would not provide any reduction in toxicity, mobility or volume of contaminants through treatment.

Alternative 2, LUCs, would not provide any reduction in toxicity, mobility or volume of contaminants through treatment, but would prevent exposure of the onsite worker to hazardous substances by the application of institutional and engineering controls.

Sub-Alternatives A-3a, A-3b, A-3c, and A-3d would not provide reduction in the toxicity, mobility, and volume of waste through treatment.

However, since either a portion or all of the ash would be excavated and removed from the WADB there will be removal of 16,820 or 61,332 m^3 (22,000 or 80,220 yd^3) of contaminated media from the excavation. Excavation of the ash will also reduce mobility of ash the plume. The ash would be interred safely in an approved solid waste disposal facility and there would be no future possibility of exposure of either the onsite worker or community to the contaminants in the excavated ash.

Implementability

No implementation is required under the No Action alternative.

Alternative 2, LUCs have been implemented successfully within SRS at other waste units. There are no administrative or technical impediments for implementing LUCs at SRS.

Sub-Alternatives A-3a and A-3b can also be readily implemented using standard construction techniques for excavation and hauling the ash and contaminated soil media to an approved on-SRS or off-SRS ex situ containment facility.

A major disadvantage of sub-Alternatives A-3c and A-3d is they may not be readily implemented or there may be difficulty associated with the construction because of working in the wetlands. Working conditions in a designated wetlands will be more restrictive to mitigate damage from construction and more costly to restore (if possible) damage caused by the construction.

Another significant disadvantage for sub-Alternatives A-3c and A-3d is if heavy precipitation should occur during the construction period it would cause construction activities to be significantly delayed since Dunbarton Bay has the potential to accumulate precipitation. This condition would stop construction for an unknown period of time until conditions became suitable for earth-moving activities to restart.

Alternatively, permits for implementing sub-alternatives A-3c and A-3d may be more difficult to obtain. Although work performed under these sub-alternatives use standard earth working methods and earth moving equipment, the work will be performed in a designated wetland; thereby, increasing the length of time to mobilize and implement necessary controls.

Permitting for implementation of sub-alternative A-3a may be very difficult to obtain as well as very costly. The additional costs estimated for the engineering and construction work to obtain an approved solid waste disposal facility permit are estimated to be $1.5 to $10 million, based on the selected disposal location. It is not certain if SRS could even expeditiously obtain the appropriate South Carolina solid waste permits so there is high uncertainty if on-SRS ex situ disposal is feasible in a timely manner. Conversely, permitting for

implementing sub-alternative A-3b would not be difficult as the ash/soil media would be excavated and hauled to a currently permitted solid waste disposal facility which already meets all South Carolina regulations. The cost advantage of A-3a would easily be lost by the costs associated with obtaining the permits required to implement this alternative that are not included in the cost analysis. (An additional $1.5 to $10 million for engineering, preparation and siting would need to be added to this alternative). Therefore, a tradeoff for a more certain disposition route for disposal of the ash/soil media is justified instead of a less certain disposition route which has an uncertain outcome with potentially higher costs. This same concern includes sub-alternative A-3c as well.

The time required to implement alternative A-2 is 6 months. The time to implement sub-alternatives A-3a and A-3b is 12 months and the time to implement sub-alternatives A-3c and A-3d is 18 months assuming permits can be readily obtained.

Cost

The evaluation of an alternative must include capital, present-worth operational and maintenance costs. The cost estimates presented herein are based on the best available information regarding the anticipated scope of the alternatives. Changes in the cost of elements are likely to occur as a result of new information and data collected during the engineering design of the selected alternative. This is an order of magnitude engineering cost estimate expected to be within –30 to +50 percent of the actual project cost. The final cost of the project depends on actual labor and material cost, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, weather, diesel fuel cost, disposal fees, and other variables.

The present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned duration.

For the purpose of estimating remedial action costs, the present worth analysis for WADB subunit is based on a standard period of 200 years for comparing costs for sub-alternatives A-2, A-3a, and A-3b and 2 years for sub-alternatives A-3c and A-3d. Discount rates are based on Office of Management and Budget Circular No. A-94, Appendix C, 2012. See Table 5 for detailed estimates.

Remedial Alternative	Total Estimated Cost
A-1 No Action	$0
A-2 Land Use Controls	$1,824099
A-3a Excavate 22,000 yd^3/On-SRS ex situ containment, LUCs	$8,275,378*
A-3b Excavate 22,000 yd^3/Off-SRS ex situ containment, LUCs	$11,535,146
A-3c Excavate 80,220 yd^3/On-SRS ex situ containment	$13,055,204*
A-3d Excavate 80,220 yd^3/Off-SRS ex situ containment	$21,428,462

*Does not include costs associated with On-SRS receiving facility (i.e., preparation, permitting or receiving waste). Estimates range between $1.5 to $10 Million additional costs.

IX. PREFERRED ALTERNATIVE

Sub-alternative A-3b is the preferred alternative for the WADB subunit. Alternative A-3b includes excavating 16,820 m^3 (22,000 yd^3) of ash and

contaminated soil media from the boundary of the PAB to the edge of the 30-m (100-ft) buffer around the Dunbarton Bay and transporting the waste to an approved ex situ containment facility located off-SRS property. This option employs LUCs for 10 ha (25 ac), since the entire volume of waste will not be excavated and some materials would be left in place at the Dunbarton Bay (wetland area).

Sub-alternative A-3b is protective of the IOU on site worker and was evaluated to be the optimal alternative because it can achieve protection of the environment and attain ARARs by removal of 4.8 ha (12 ac) of ash and contaminated soil media. This sub-alternative is one of the least expensive of all the excavation sub-alternatives and is also the optimal sub-alternative for protection of the environment by establishing a 30-m (100-ft) buffer at Dunbarton Bay to prevent damage of the sensitive ecosystem of the bay from excavation activities. LUCs for 10 ha (25 ac) are combined with this sub-alternative to prevent human exposure to the ash and contaminated soil media that will remain in the Dunbarton Bay and will be in place until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure. Sub-alternative A-3b (off-SRS containment) is preferable to sub-alternative A-3a (on-SRS containment) because a regulatory approved solid waste disposal facility does not exist on SRS property. This would require additional costs and construction of an approved solid waste disposal facility prior to implementation of A-3a. The additional cost for the engineering and construction work to obtain an approved solid waste disposal facility permit is estimated to be $1.5 to 10 million, based on the selected disposal location. Therefore, A-3b is the better tradeoff for its guaranteed path for solid waste disposal is at a currently approved solid waste disposal facility. A-3b avoids the uncertainty of incurring an additional $1.5 to $10 million for permitting, engineering and construction of a regulatory approved solid waste facility on SRS property.

Land use controls for the WADB subunit will be in effect until concentrations of hazardous substances are at levels that will allow for unrestricted use and exposure and include the following:

- Warning and no trespassing signs at the subunit boundaries to prevent unrestricted use and access to the Dunbarton Bay.
- Notifying USEPA and SCDHEC in advance of any major changes in land use that would necessitate re-evaluation of the remedy or excavation of waste.
- Institutional controls (i.e., administrative controls) and use restrictions for onsite 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 2000 RCRA Part B 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 WADB subunit leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for an indefinite period of time. 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) to ensure that land use restrictions are maintained and periodically verified. The unit-specific Land Use Control Implementation Plan (LUCIP) that will be referenced in the ROD for this WADB subunit 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 SB/PP. The LUCIP, developed as part of this action, will be submitted concurrently with the CMI/RAIP, as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the WADB subunit 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 SCDHEC is required for any modification or termination of the LUCs.

The Preferred Alternative can change in response to public comment or new information.

With the exception of the No Action Alternative, all the alternatives meet the threshold criteria and the balancing criteria and represent a range of remedial alternatives focused to the scope and subtleties of the problem. Alternative A-2 and sub-alternatives A-3a, A-3b, A-3c, and A-3d are all protective of the IOU onsite worker and can meet the RAOs for the WADB, but all alternatives are not equal for protection of the environment.

Alternative A-2 is the least expensive alternative to be protective of the IOU onsite worker, but leaves 15 ha (37 ac) of hazardous substances in place and residual risk remains greater than 1E-06 or SRS background concentrations.

A-3a and A-3b remove 16,820 m^3 (22,000 yd^3) of ash and soil media and are the optimal sub-alternatives to achieve protection of the environment and attain ARARs. These sub-alternatives are the least expensive of the excavation alternatives and also the optimal alternatives for protection of the environment by establishing a 30-m (100-ft) buffer around the Dunbarton Bay to prevent damage of the sensitive ecosystem of the bay. LUCs are combined with these sub-alternatives to prevent human exposure from the 10 ha (25 ac) of contaminated media that will remain in the Dunbarton Bay.

A-3a is the least expensive excavation sub-alternative because excavated ash and soil would be hauled to an on-SRS ex situ containment facility; however, such a facility currently does not exist due to changes in regulatory permitting requirements. Therefore, A-3b is the best and preferred alternative since it has a guaranteed path of waste disposal at a currently approved solid waste disposal facility. It also avoids a potential additional cost of $1.5 to $10 million that

sub-alternatives A-3a and A-3c would incur for permitting, engineering, construction, and development of an approved solid waste disposal facility on-SRS.

A-3c and A-3d excavate and transport all ash and contaminated soil media 61,332 m^3 (80,220 yd^3) to an ex situ containment facility and are the optimal excavation alternatives to protect human health. All contaminated media from the WADB subunit is excavated and permanently removed. A-3c has the same disadvantage as A-3a, requiring the construction of an on-SRS approved solid waste disposal facility and associated costs. A-3c and A-3d sub-alternatives would be more detrimental to the environment and cause more destruction of the Dunbarton Bay and would also be more difficult to implement than any of the other sub-alternatives because of permitting issues and construction in a designated wetlands. A-3d is more expensive to implement than A-3c because contaminated media is excavated and hauled to an off-SRS ex-situ containment facility requiring payment of landfill tipping fees.

Based on information currently available, the lead agency believes that sub-alternative A-3b (excavating 16,820 m^3 [22,000 yd^3]) of ash and contaminated soil media from the boundary of the PAB to the edge of the 30-m (100-ft) buffer at Dunbarton Bay and transporting the waste to an approved ex situ containment facility located off-SRS property and LUCs, provides the best balance of tradeoffs among the 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 3) be cost-effective. Treatment is not used as a principal element in this remedy because the waste is being excavated and disposed in an approved solid waste facility.

X. POST-ROD SCHEDULE

Figure 4 illustrates the implementation schedule showing ROD date, post-ROD document submittals, and Remedial Action Start date.

XI. REFERENCES

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

SGCP, 2010. *Sampling and Analysis Plan for the Wetland Area at Dunbarton Bay (NBN) in Support of Steel Creek Integrator Operable Unit (U),* SGCP-SAP-2010-00007, Rev. 1, June 2011, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

SRNS, 2012. *Focused Corrective Measures Study/Feasibility Study Report (CMS/FS) for the Wetland at Dunbarton Bay In Support of Steel Creek Integrator Operable Unit (U),* SRNS-RP-2012-00252, Rev. 1, February 2013, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

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

WSRC, 2011b. *Land Use Control Assurance Plan for the Savannah River Site*, WSRC-RP-98-4125, Revision 1.1, August 1999, updated March 2013, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

XII. GLOSSARY

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

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

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

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

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

Corrective Action: A USEPA requirement to conduct remedial procedures under RCRA 3998(h) at a facility when there has been a release of hazardous waste or constituents into the environment. Corrective action may be required beyond the facility boundary and can be required regardless of when the waste was placed at the facility.

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

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

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

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

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

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

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

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

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

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

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

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

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

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 (1.0×10^{-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.

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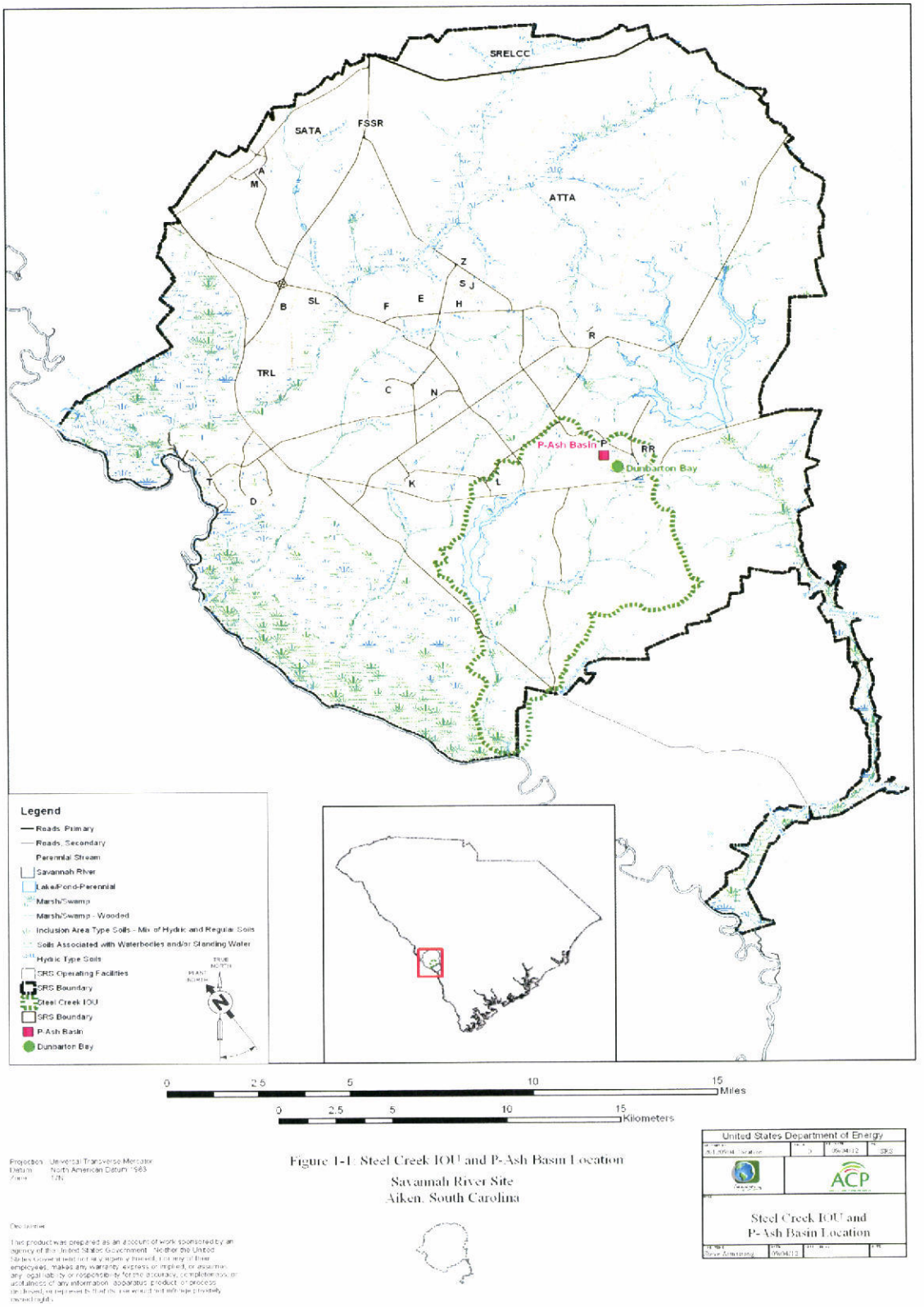

Figure 1-1. Steel Creek IOU and P-Ash Basin Location
Savannah River Site
Aiken, South Carolina

Figure 1. Location of the WADB within the Savannah River Site

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Figure 2. Layout of the WADB

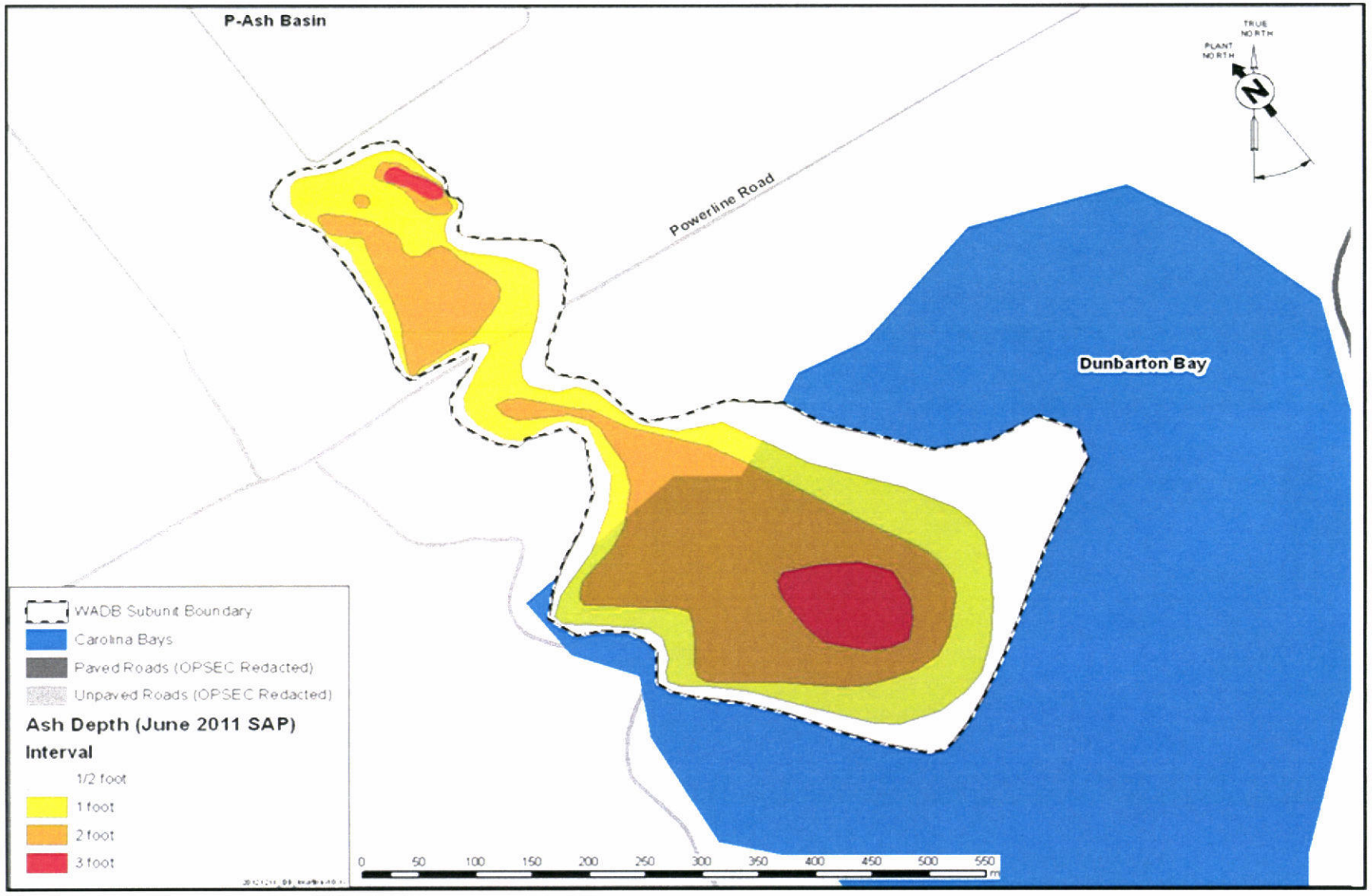


Figure 3. Delineation of the Wetland Area at Dunbarton Bay Subunit and Ash Plume (80,220 yd^3)

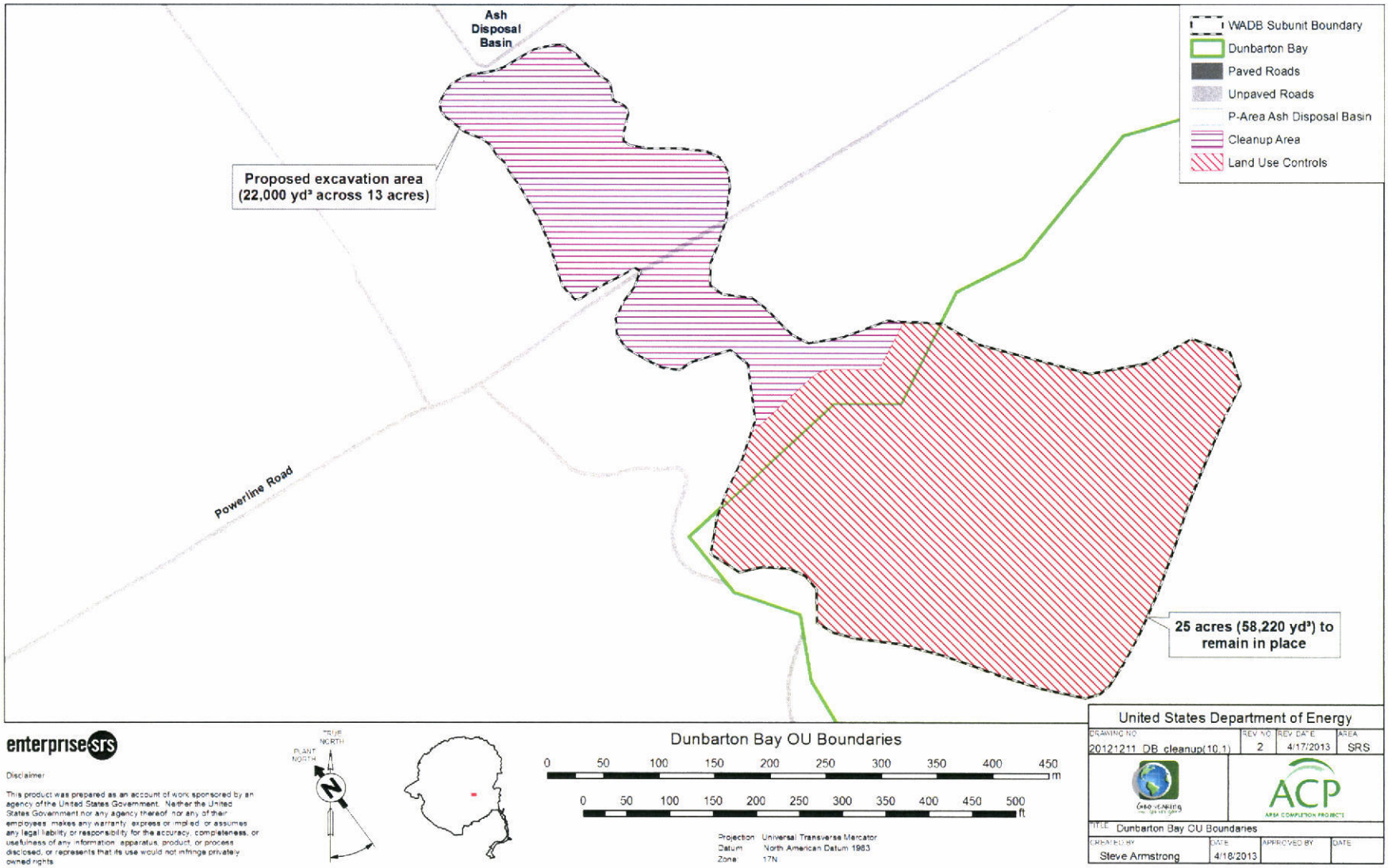
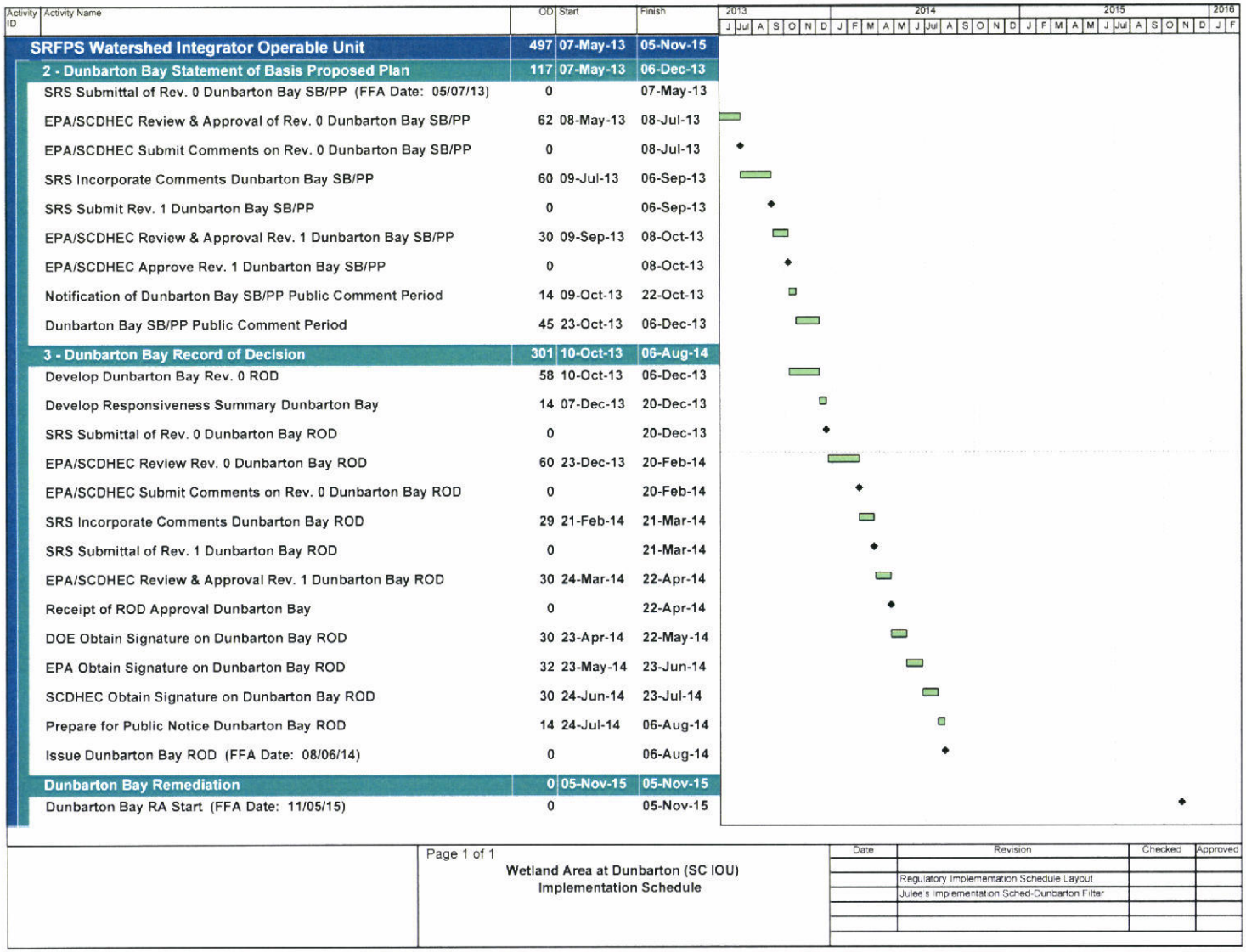


Figure 4. Ash to be Excavated and Showing LUCs Around WADB Subunit



Activity ID	Activity Name	OD	Start	Finish
	SRFPS Watershed Integrator Operable Unit	**497**	**07-May-13**	**05-Nov-15**
	2 - Dunbarton Bay Statement of Basis Proposed Plan	**117**	**07-May-13**	**06-Dec-13**
	SRS Submittal of Rev. 0 Dunbarton Bay SB/PP (FFA Date: 05/07/13)	0		07-May-13
	EPA/SCDHEC Review & Approval of Rev. 0 Dunbarton Bay SB/PP	62	08-May-13	08-Jul-13
	EPA/SCDHEC Submit Comments on Rev. 0 Dunbarton Bay SB/PP	0		08-Jul-13
	SRS Incorporate Comments Dunbarton Bay SB/PP	60	09-Jul-13	06-Sep-13
	SRS Submit Rev. 1 Dunbarton Bay SB/PP	0		06-Sep-13
	EPA/SCDHEC Review & Approval Rev. 1 Dunbarton Bay SB/PP	30	09-Sep-13	08-Oct-13
	EPA/SCDHEC Approve Rev. 1 Dunbarton Bay SB/PP	0		08-Oct-13
	Notification of Dunbarton Bay SB/PP Public Comment Period	14	09-Oct-13	22-Oct-13
	Dunbarton Bay SB/PP Public Comment Period	45	23-Oct-13	06-Dec-13
	3 - Dunbarton Bay Record of Decision	**301**	**10-Oct-13**	**06-Aug-14**
	Develop Dunbarton Bay Rev. 0 ROD	58	10-Oct-13	06-Dec-13
	Develop Responsiveness Summary Dunbarton Bay	14	07-Dec-13	20-Dec-13
	SRS Submittal of Rev. 0 Dunbarton Bay ROD	0		20-Dec-13
	EPA/SCDHEC Review Rev. 0 Dunbarton Bay ROD	60	23-Dec-13	20-Feb-14
	EPA/SCDHEC Submit Comments on Rev. 0 Dunbarton Bay ROD	0		20-Feb-14
	SRS Incorporate Comments Dunbarton Bay ROD	29	21-Feb-14	21-Mar-14
	SRS Submittal of Rev. 1 Dunbarton Bay ROD	0		21-Mar-14
	EPA/SCDHEC Review & Approval Rev. 1 Dunbarton Bay ROD	30	24-Mar-14	22-Apr-14
	Receipt of ROD Approval Dunbarton Bay	0		22-Apr-14
	DOE Obtain Signature on Dunbarton Bay ROD	30	23-Apr-14	22-May-14
	EPA Obtain Signature on Dunbarton Bay ROD	32	23-May-14	23-Jun-14
	SCDHEC Obtain Signature on Dunbarton Bay ROD	30	24-Jun-14	23-Jul-14
	Prepare for Public Notice Dunbarton Bay ROD	14	24-Jul-14	06-Aug-14
	Issue Dunbarton Bay ROD (FFA Date: 08/06/14)	0		06-Aug-14
	Dunbarton Bay Remediation	**0**	**05-Nov-15**	**05-Nov-15**
	Dunbarton Bay RA Start (FFA Date: 11/05/15)	0		05-Nov-15

Figure 5. Post-ROD Schedule

Table 1. Summary of the RGOs for the WADB Subunit

MEDIA	RCOC[1]	UNIT	ARAR [2]	HHRA Future Resident [3]	HHRA Industrial Worker[4]	HHRA IOU Onsite Worker[5]	HHRA Adolescent Trespasser [6]	PTSM [7]	ERA [8]	CM [9]	Most Restrictive RGO[10]	SRS Background 95th %tile[11]	SRS Background Maximum[11]	Most Likely RGO[12]
Ash / Soil	Arsenic	mg/kg	---	0.39	1.6	3.3	7.1	---	---	---	0.39	*8.2*	*22.9*	8.2
	Cesium-137(+D)	pCi/g	---	0.0623	0.103	0.204	0.272	---	---	---	0.0623	*0.34 (0.68)*	*3.3*	0.68
	Potassium -40	pCi/g	---	0.150	0.265	0.552	0.819	---	---	---	0.150	*3.3*	*8.5*	3.3
	Radium-226(+D)	pCi/g	---	0.0127	0.0223	0.0464	0.0688	---	---	---	0.0127	*1.2*	*1.7*	1.2
	Uranium-238(+D)	pCi/g	---	0.725	1.49	NA[13]	NA[13]	---	---	---	0.725	*1.2*	*1.9*	1.2
Surface Water	None	---	---	---	---	---	---	---	---	---	---			---
Ground water	None	---	---	---	---	---	---	---	---	---	---			---

1 - RCOC = refined constituent of concern
2 - ARAR = applicable or relevant and appropriate requirement.
3 - HHRA Resident = human health risk assessment. RGOs calculated for the future resident at a target risk of 1E-06.
4 - HHRA Industrial Worker = human health risk assessment. RGOs calculated for the future industrial worker at a target risk of 1E-06.
5 - HHRA IOU Onsite Worker = human health risk assessment. RGOs calculated for the IOU onsite worker at a target risk of 1E-06.
6 - HHRA Adolescent Trespasser = human health risk assessment. RGOs calculated for the adolescent trespasser at a target risk of 1E-06.
7 - PTSM = principal threat source material evaluation. No RCOCs identified.
8 - ERA = ecological risk assessment. No RCOCs identified.
9 - CM = contaminant migration analysis. No RCOCs identified.
10 - Most Restrictive RGO = the lesser of the ARAR, HHRA, PTSM, ERA and CM RGOs.
11 - SRS background 95th %tile and maximum concentrations from the *SRS Background Soils Statistical Summary Report,* Appendix B-2 (all depths), October 2006. Exception is Cs-137, which is from Appendix B-1 (0-1 ft). Two times (2x) the 95th %tile established as Most Likely RGO for Cs-137 since this is the generally accepted concentration for "typical" anthropogenic fallout.
12 - Most Likely RGO = the most restrictive risk-based RGO if it is greater than background concentrations. If the most restrictive risk-based RGO is less than the background concentration, then the RGO defaults to a SRS background value. Sources of the RGOs in this column are highlighted in italics in the table.
13 - NA = not applicable. U-238(+D) not identified as a HH RCOC for the IOU onsite worker or adolescent trespasser receptor scenarios.

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
	Floodplains and Wetlands		
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)
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. 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.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable** Onsite 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.**	40 CFR 230.10(a) 40 CFR 230.10(d) Nationwide Permit (38) – Cleanup of Hazardous and Toxic Waste 33 *CFR* 323.3(b)

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

LOCATION-SPECIFIC ARARs/TBC *(Cont'd)*			
Location	**Requirements**	**Prerequisite**	**Citation**
***Floodplains and Wetlands** (cont'd)*			
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)
Endangered, Threatened or Rare Species			
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
Historical, Archeological or Cultural Resources			
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.
ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)			
Managing storm water runoff from land-disturbing activities	Must comply with the substantive requirements for stormwater management and sediment control of *NPDES General Permit No. SCR100000* .	Large and small construction activities (as defined in R. 61-9) of more than 1 acre of land – **applicable**	SCDHEC R. 61-9.122.41 NPDES General Permit No. SCR100000

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

ACTION-SPECIFIC ARARs/TBC *(Cont'd)*			
Action	**Requirements**	**Prerequisite**	**Citation**
All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.) *(cont'd)*			
	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**	SCDHEC 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;		SCDHEC 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 of subsections (e)1 and 2.		SCDHEC 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	SCDHEC R. 61-62.6 Section III(a) and Section III(d)- *Control of Fugitive Particulate Matter Statewide*
Waste Characterization and Storage – (e.g., excavated coal ash, contaminated soils/sediments, debris)			
Characterization of *solid* waste	Must determine if the solid waste is a hazardous waste using the following method: Should first determine if waste is excluded from regulation under 40 *CFR* 261.4.	Generation of solid waste as defined in 40 *CFR* 261.2 – applicable	40 *CFR* 262.11(a) SCDHEC R. 61-79 262.11*(a)*
	Must determine if waste is listed as hazardous waste in subpart D of 40 *CFR* Part 261.	Generation of solid waste which is not excluded under 40 *CFR* 261.4(a) – applicable	40 *CFR* 262.11(b) SCDHEC R. 61-79 262.11*(b)*

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

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

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

ACTION-SPECIFIC ARARs/TBC *(Cont'd)*			
Action	**Requirements**	**Prerequisite**	**Citation**
Disposal of Solid Waste Offsite (e.g., excavated ash, contaminated soils/sediment, debris)			
Disposal of *solid waste* off-SRS	Disposal of solid waste at facilities and/or sites permitted or registered by the Department for processing or disposal of that waste stream. Waste must meet state classification system for the permitted facilities.	Generation of solid waste intended for off-SRS disposal – **applicable**	SCDHEC R. 61-107.15
Disposal of Hazardous Waste Offsite (e.g., excavated ash, contaminated soils/sediment, debris)			
Disposal of RCRA-*hazardous waste* in off-site, land-based unit[1]	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste – **applicable**	40 CFR 268.40(a) SCDHEC R. 61-79 268.40*(a)*
	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards, found in 40 CFR 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **applicable**	40 CFR 268.40(e) SCDHEC R. 61-79 268.40*(e)*
	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or Must be treated according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils – **applicable**	40 CFR 268.49(b) SCDHEC R. 61-79 268.49*(b)*

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

ACTION-SPECIFIC ARARs/TBC *(Cont'd)*			
Action	**Requirements**	**Prerequisite**	**Citation**
Disposal of Hazardous Waste Offsite (e.g., excavated ash, contaminated soils/sediment, debris) *(cont'd/end)*			
	To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 CFR 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste. If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 CFR 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified.	Land disposal of RCRA toxicity characteristic wastes (D004-D011) that are newly identified – **applicable**	40 CFR 268.34(f) SCDHEC R. 61-79 268.34*(f)*
Disposal of RCRA-*hazardous waste debris* in off-site, land-based unit[1]	Must be treated prior to land disposal as provided in 40 CFR 268.45(a)(1)-(5) unless EPA determines under 40 CFR 261.3(f)(2) that the debris no longer contaminated with hazardous waste or the debris is treated to the waste-specific treatment standard provided in 40 CFR 268.40 for the waste contaminating the debris.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA-hazardous debris – **applicable**	40 CFR 268.45(a) SCDHEC R. 61-79 268.45*(a)*
Transportation of Wastes			
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and DOT HMR at 49 CFR 171-180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **applicable**	49 CFR 171.1(c)

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued)*

ACTION-SPECIFIC ARARs/TBC *(Cont'd)*			
Action	**Requirements**	**Prerequisite**	**Citation**
Transportation of Wastes (cont'd)			
Transportation of samples (i.e. solid waste, soils and wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • the sample is being transported to a laboratory for the purpose of testing; or • the sample is being transported back to the sample collector after testing. • the sample is being stored by sample collector before transport to a lab for testing.	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition – applicable	40 CFR 261.4(d)(1)(i)-(iii) SCDHEC R. 61-79 261.4(d)(1)
	In order to qualify for the exemption in 40 CFR 261.4 (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements. • Assure that the information provided in (1) thru (5) of this section accompanies the sample. Package the sample so that it does not leak, spill, or vaporize from its packaging.		40 CFR 261.4(d)(2)(i) 40 CFR 261.4(d)(2)(i)(A)and (B) SCDHEC R. 61-79 261.4*(d)* (2)(i)(A) and (B)
Transportation of hazardous waste onsite[1]	The generator manifesting requirements of 40 CFR 262.20 .262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 CFR 262.20(f) SCDHEC R. 61-79 262.20(f)

Table 2. Potential ARARs for the Preferred Remedial Alternative for WADB Subunit *(Continued/End)*

ACTION-SPECIFIC ARARs/TBC *(Cont'd)*			
Action	**Requirements**	**Prerequisite**	**Citation**
***Transportation of Wastes** (cont'd/end)*			
Transportation of hazardous waste *off-site*	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number.	Generator who initiates the off-site shipment of RCRA-hazardous waste – **applicable**	40 CFR 262.10(h) SCDHEC R. 61-79 262.10*(h)*

[1] The requirements from 40 CFR Part 262, 264, and 268 contained in this table regarding characterization, storage, and disposal of hazardous waste will be triggered if any generated wastes, including ash, soil or debris are characterized as RCRA hazardous wastes.

ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
CWA = Clean Water Act
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
LDR = Land Disposal Restrictions
RCRA = Resource Conservation and Recovery Act of 1976
SCDHEC = South Carolina Department of Health and Environmental Control
TCLP = Toxicity Characteristic 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 SCDHEC 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.

Table 4. Comparison of Alternatives Against the CERCLA Evaluation Criteria

	A-1	A-2	A-3a	A-3b*	A-3c	A-3d*
Criterion	**No Action**	**Land Use Controls**	**Excavation On-SRS Containment and LUCs (22,000 yd^3)**	**Excavation Off-SRS Containment and LUCs (22,000 yd^3)**	**Excavation On-SRS Containment (80,220 yd^3)**	**Excavation Off-SRS Containment (80,220 yd^3)**
Overall Protection of Human Health and the Environment						
Human Health	Not protective of the IOU onsite worker because there are no controls or remediation	Minimally protective of the IOU onsite worker because of access controls	More protective of IOU onsite worker because a portion of contaminants are removed	More protective of IOU onsite worker because a portion of contaminants are removed	Optimally protective of the IOU onsite worker because all contaminants are removed	Optimally protective of the IOU onsite worker because all contaminants are removed
Environment	Not protective because contaminants remain in place	Protective of the environment because no ECO/CM/P TSM RCOCs	Optimally protective of environment because Carolina Bay is protected	Optimally protective of environment because Carolina Bay is protected	Least protective and causes more destruction of the Carolina Bay than any of the other sub-alternatives	Least protective and causes more destruction of the Carolina Bay than any of the other sub-alternatives
Compliance with ARARs						
Chemical-Specific	No ARARs exist	No ARARs exist	If soils are found to be hazardous, SC *Hazardous Waste Management Regulation* (SC R61-79); *Listing of Hazardous Waste* (40 CFR-261)	If soils are found to be hazardous, SC Hazardous Waste Management Regulation (SC R61-79); Listing of Hazardous Waste (40 CFR-261)	If soils are found to be hazardous, SC Hazardous Waste Management Regulation (SC R61-79); Listing of Hazardous Waste (40 CFR-261)	If soils are found to be hazardous, SC Hazardous Waste Management Regulation (SC R61-79); Listing of Hazardous Waste (40 CFR-261)
Location-Specific	No ARARs exist	No ARARs exist	Various federal and South Carolina regulations are applicable for protection and mitigation of damage to wetlands	Various federal and South Carolina regulations are applicable for protection and mitigation of damage to wetlands	Various federal and South Carolina regulations are applicable for protection and mitigation of damage to wetlands	Various federal and South Carolina regulations are applicable for protection and mitigation of damage to wetlands
Action-Specific	No ARARs exist	No ARARs exist	Various federal and South Carolina regulations are applicable for management of stormwater and solid waste disposal	Various federal and South Carolina regulations are applicable for management of stormwater and solid waste disposal	Various federal and South Carolina regulations are applicable for management of stormwater and solid waste disposal	Various federal and South Carolina regulations are applicable for management of stormwater and solid waste disposal

Table 4. Comparison of Alternatives Against the CERCLA Evaluation Criteria *(Continued)*

	A-1	A-2	A-3a	A-3b*	A-3c	A-3d*
Criterion	**No Action**	**Land Use Controls**	**A-3a Excavation On-SRS Containment and LUCs (22,000 yd^3)**	**Excavation Off-SRS Containment and LUCs (22,000 yd^3)**	**Excavation On-SRS Containment (80,220 yd^3)**	**Excavation Off-SRS Containment (80,220 yd^3)**
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 remains above $1x10^{-6}$ or SRS background concentrations	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations and not greater than $9.9x10^{-5}$ in Dunbarton Bay; 5 year remedy reviews required; 25 acres require LUCs	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations and not greater than $9.9x10^{-5}$ in Dunbarton Bay: 5 year remedy reviews required; 25 acres require LUCs	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations; no 5 year remedy reviews required, LUCs not required	Residual human health risk less than $1x10^{-6}$ or SRS background concentrations; no 5 year remedy reviews required, LUCs not required
Adequacy of Controls	Not adequately protective of human health receptors	Effective in preventing exposure to human receptors and breaking the exposure pathway. Leaves contaminants in place. LUCs required as long as contaminants are present	Controls are adequate because 22,000 yd^3 of contaminated media is removed from wetland and LUCS are required for Dunbarton Bay	Controls are adequate because 22,000 yd^3 of contaminated media is removed from wetland and LUCS are required for Dunbarton Bay	Controls will not be required because the entire volume of 80,220 yd^3 contaminated media is removed	Controls will not be required because the entire volume of 80,220 yd^3 contaminated media is removed
Permanence	Not permanent. Leaves contaminants ash/soil media in the wetlands	Not permanent. Leaves contaminants ash/soil media in the wetlands	Excavation of 22,000 yd^3 of contaminated media will be permanent; contaminated media remains in Dunbarton Bay to prevent destruction of ecosystem	Excavation of 22,000 yd^3 of contaminated media will be permanent; contaminated media remains in Dunbarton Bay to prevent destruction of ecosystem	Excavation of 80,220 yd^3 of contaminated media will be permanent	Excavation of 80,220 yd^3 of contaminated media will be permanent
Treatment						
Treatment type	No active treatment	No active treatment	No active treatment	No active treatment	No active treatment	No active treatment

Table 4. Comparison of Alternatives Against the CERCLA Evaluation Criteria *(Continued)*

	A-1	A-2	A-3a	A-3b*	A-3c	A-3d*
Criterion	**No Action**	**Land Use Controls**	**Excavation On-SRS Containment and LUCs (22,000 yd^3)**	**Excavation Off-SRS Containment and LUCs (22,000 yd^3)**	**Excavation On-SRS Containment (80,220 yd^3)**	**Excavation Off-SRS Containment (80,220 yd^3)**
Treatment *(Cont'd)*						
Degree of Expected Reduction in Toxicity, Mobility, or Volume	No reduction	No reduction	No reduction via treatment	No reduction via treatment	No reduction via treatment	No reduction via treatment
Short-Term Effectiveness and Performance						
Amount of Hazardous Material Destroyed or Treated	None	None	None	None	None	None
Risk to Remedial Worker	None	None	Minimal; Health and Safety Plan will be implemented to protect remedial workers	Minimal; Health and Safety Plan will be implemented to protect remedial workers	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	None	None	None
Risk to Environment	None	None	Low; Dunbarton Bay is protected by a 100-foot buffer; no construction activity in bay	Low; Dunbarton Bay is protected by a 100-foot buffer; no construction activity in bay	High; likely destruction of Dunbarton Bay and ecosystem	High; likely destruction of Dunbarton Bay and ecosystem
Time to Implement and achieve RAO	Never	6 months	12 months	12 months	18 months	18 months
Implementability						
Availability of Materials, Equipment, Contractors	Not Applicable	Not Applicable	Readily Available	Readily Available	Readily Available	Readily Available
Ability to Construct and Operate the Technology	Not applicable	Not Applicable	Straight forward	Straight forward	May be difficult if precipitation accumulates in wetland	May be difficult if precipitation accumulates in wetland

Table 4. Comparison of Alternatives Against the CERCLA Evaluation Criteria *(Continued/End)*

	A-1	A-2	A-3a	A-3b*	A-3c	A-3d*
Criterion	**No Action**	**Land Use Controls**	**Excavation On-SRS Containment and LUCs (22,000 yd^3)**	**Excavation Off-SRS Containment and LUCs (22,000 yd^3)**	**Excavation On-SRS Containment (80,220 yd^3)**	**Excavation Off-SRS Containment (80,220 yd^3)**
Implementability *(Cont'd)*						
Ability to Obtain Permits/Approvals from Other Agencies	Not Applicable	Not Applicable	Complicated due to permitting issues with H-Area; Will require lead time to procure required permits; permits required before remedial action can begin	Easy; no impediments	Difficult if wetlands are excavated; Will require lead time to procure required permits; permits required before remedial action can begin	Difficult if wetlands are excavated; Will require lead time to procure required permits; permits required before remedial action can begin
Estimated Cost						
Total Capital Cost	$0	$115,362	$6,566,642	$9,826,409	$12,956,534	$21,329,792
Present Worth O&M Cost	$0	$1,708,737	$1,708,737	$1,708,737	$98,670	$98,670
Total Cost	$0	$1,824,099	$8,275,378*	$11,535,146	$13,055,204*	$21,428,462

* Does not include costs associated with On-SRS receiving facility (i.e., preparation, permitting or receiving waste). Estimates range from $1.5 to $10 Million in additional costs.

Table 5. Summary of the Present Value Costs of the Alternatives

Alternative A-1
No Action
Dunbarton Bay OU Ash
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
No Action					
Subtotal - Direct Capital Cost				$0	*
Mobilization/Demobilization	10%	of subtotal direct capital		$0	*
Site Preparation/Site Restoration	10%	of subtotal direct capital		$0	*
Total Direct Capital Cost		(sum of * items)		**$0**	
Indirect Capital Costs					
Engineering & Design	15%	of direct capital		$0	
Project/Construction Management	25%	of direct capital		$0	
Health & Safety	5%	of direct capital		$0	
Overhead	30%	of direct capital + indirect capital		$0	
Contingency	20%	of direct capital + indirect capital		$0	
Total Indirect Capital Cost				**$0**	
Total Estimated Capital Cost				**$0**	
Direct O&M Costs	2.7%	discount rate for costs > 30 years duration			
Annual Costs (Existing System during Post-ROD Design & Const)	30	year O&M period		*Years 2017 - 2047*	
Subtotal - Annual Costs				$0	
Present Worth Annual Costs				$0	
Five Year Costs	0				
Remedy Review	0	ea	$15,000	$0	
Subtotal - Five Year O&M Costs				$0	
Present Worth Five Year Costs				$0	
Total Present Worth Direct O&M Cost				**$0**	
Indirect O&M Costs					
Project/Admin Management	40%	of direct O&M		$0	
Health & Safety	10%	of direct O&M		$0	
Overhead	30%	of direct O&M + indirect O&M		$0	
Contingency	15%	of direct O&M + indirect O&M		$0	
Total Present Worth Indirect O&M Cost				**$0**	
Total Estimated Present Worth O&M Cost				**$0**	
TOTAL ESTIMATED COST				**$0**	

There are no O&M or 5-year review costs for the No Action alternative, as per EPA-540-R-98-031 guidance.

Table 5. Summary of the Present Value Costs of the Alternatives *(Continued)*

Alternative A-2
Land Use Controls
Wetland at Dunbarton Bay
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Institutional Controls					
Posting of Warning Signs	90	ea	$100	$9,000	
Land Use Control Implementation Plan	1	ea	$20,000	$20,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$34,000	*
Mobilization/Demobilization	25%	of subtotal direct capital		$8,500	*
Site Preparation/Site Restoration	25%	of subtotal direct capital		$8,500	*
Total Direct Capital Cost		(sum of * items)		**$51,000**	
Indirect Capital Costs					
Engineering & Design	14%	of direct capital		$7,140	
Project/Construction Management	25%	of direct capital		$12,750	
Health & Safety	6%	of direct capital		$3,060	
Overhead	30%	of direct capital + indirect capital		$22,185	
Contingency	20%	of direct capital + indirect capital		$19,227	
Total Indirect Capital Cost				**$64,362**	
Total Estimated Capital Cost				**$115,362**	
Direct O&M Costs	0.0%	Discount Rate[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2015 - 2016*	
Access Controls	1	ea	$750	$750	
Subtotal - Annual Costs				$750	
Present Worth Annual Costs (Less than 30-year Duration)				$1,500	
	2.0%	Discount Rate[1]			
Annual Costs (Institutional Controls)	200	years O&M		*Years 2017 - 2217*	
Access Controls	1	ea	$750	$750	
Annual Inspections / Maintenance	1	ea	$5,000	$5,000	
Subtotal - Annual Costs				$5,750	
Present Worth Annual Costs (2.0% Greater Than 30-year Duration)				$282,022	
Periodic Costs: 5-Year Remedy Reviews	40				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs (per EPA 540-R-00-002)				$141,373	
Total Present Worth Direct O&M Cost				**$424,895**	
Indirect O&M Costs					
Project/Admin Management	151%	of direct O&M		$641,592	
Health & Safety	18%	of direct O&M		$76,481	
Overhead	30%	of direct O&M + indirect O&M		$342,890	
Contingency	15%	of direct O&M + indirect O&M		$222,879	
Total Present Worth Indirect O&M Cost				**$1,283,842**	
Total Estimated Present Worth O&M Cost				**$1,708,737**	
TOTAL ESTIMATED COST				**$1,824,099**	

1. Discount Rates from 2012 OMB Circular No. A-94, Appendix C

Table 5. Summary of the Present Value Costs of the Alternatives *(Continued)*

Alternative A-3a
Excavate Ash/Soil P-Ash Basin to Carolina Bay Buffer (22,000 yd^3), Haul to On-SRS Containment Facility & Land Use Controls
Wetlands at Dunbarton Bay
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Surveying & Layout					
Topographic Survey - Existing Condition	40	ac	$600	$24,000	
Layout / Survey Support	1	ls	$120,000	$120,000	
Topographic Survey - As Built	40	ac	$600	$24,000	
Access Road					
Temporary Construction Entrance / Access Road	1	ls	$50,000	$50,000	
Clear and Grubbing					
North Section - Clear Heavy Trees, Grub Stumps and Chip	7.3	ac	$6,000	$43,800	
North Section - Load Chipped Material and Haul For Disposal	1100	cy	$16	$17,600	
Middle Section - Clear Light Trees, Grub Stumps and Chip	6.3	ac	$4,500	$28,350	
Middle Section - Load Chipped Material and Haul For Disposal	500	cy	$16	$8,000	
Contour Site After Clearing and Grubbing	13.6	ac	$1,700	$23,120	
Construction Facilities / Temporary Utilities					
Office Trailer / Storage Trailer Rental	12	mo	$1,000	$12,000	
Power, Lighting, Water, Sanitary, Phones, Radios and Vehicles	12	mo	$14,600	$175,200	
Erosion Control					
Silt Fences - Install, Maintain, Remove	12	mo	$2,000	$24,000	
Dewatering	24	day	$3,000	$72,000	
Swales & Diversions - Install and Remove	1540	lf	$4	$6,006	
Dikes - Install and Remove	1000	lf	$5	$4,550	
Check Dams - Install and Remove	15	ea	$2,500	$37,500	
Permanent Check Dams - Install	25	ea	$2,500	$62,500	
Excavate / Load Ash					
North Section	15556	cy	$4	$57,713	
Middle Section	6340	cy	$4	$23,521	
Haul Ash For Disposal On-Site					
North Section (includes 1.2 swell factor)	18667.2	cy	$15	$276,648	
Middle Section (includes 1.2 swell factor)	7608	cy	$15	$112,751	
Dump / Spread / Light Compact Ash At Disposal Site					
North Section	15556	cy	$6	$88,047	
Middle Section	6340	cy	$6	$35,884	
Stormwater Management (Excavation, Structures, Piping and Backfill)	1750	lf	$39	$68,880	
Perimeter Site Restoration (Grading, Fertilizer, Seeding & Watering)	8556	sy	$3	$25,668	
Wetland Restoration	1	ls	$50,000	$50,000	
Institutional Controls					
Posting of Warning Signs	30	ea	$100	$3,000	
Land Use Control Implementation Plan	1	ea	$20,000	$20,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$1,499,738	*
Mobilization/Demobilization	5%	of subtotal direct capital		$72,737	*
Submittals / Bonds / Subcontract Management	78%	of subtotal direct capital		$1,169,796	*
Total Direct Capital Cost		(sum of * items)		**$2,742,271**	
Indirect Capital Costs					
Engineering & Design	23%	of direct capital		$617,011	
Project/Construction Management	25%	of direct capital		$685,568	
Health & Safety	6%	of direct capital		$164,536	
Overhead	30%	of direct capital + indirect capital		$1,262,816	
Contingency	20%	of direct capital + indirect capital		$1,094,440	
Total Indirect Capital Cost				**$3,824,371**	
Total Estimated Capital Cost				**$6,666,642**	
Direct O&M Costs	0.0%	Discount Rate[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2015 - 2016*	
Access Controls	1	ea	$750	$750	
Subtotal - Annual Costs				$750	
Present Worth Annual Costs (Less Than 30-year Duration)				$1,500	
	2.0%	Discount Rate <30 years duration[1]			
Annual Costs (Institutional Controls)	200	years O&M		*Years 2017 - 2217*	
Access Controls	1	ea	$750	$750	
Annual Inspections / Maintenance	1	ea	$5,000	$5,000	
Subtotal - Annual Costs				$5,750	
Present Worth Annual Costs (Greater than 30-year Duration)				$282,022	
Periodic Costs: 5-Year Remedy Reviews	40				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs (per EPA 540-R-00-002)				$141,373	
Total Present Worth Direct O&M Cost				**$424,895**	
Indirect O&M Costs					
Project/Admin Management	151%	of direct O&M		$641,591	
Health & Safety	18%	of direct O&M		$76,481	
Overhead	30%	of direct O&M + indirect O&M		$342,890	
Contingency	15%	of direct O&M + indirect O&M		$222,879	
Total Present Worth Indirect O&M Cost				**$1,283,841**	
Total Estimated Present Worth O&M Cost				**$1,708,736**	
TOTAL ESTIMATED COST				**$8,275,378**	

1 Discount Rates from 2012 OMB Circular No. A-94, Appendix C

Table 5. Summary of the Present Value Costs of the Alternatives *(Continued)*

Alternative A-3b
Excavate Ash/Soil P-Ash Basin to Carolina Bay Buffer (22,000 yd^3), Haul to Off-SRS Containment Facility & Land Use Controls
Wetlands at Dunbarton Bay
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Surveying & Layout					
Topographic Survey - Existing Condition	40	ac	$600	$24,000	
Layout / Survey Support	1	ls	$120,000	$120,000	
Topographic Survey - As Built	40	ac	$600	$24,000	
Access Road					
Temporary Construction Entrance / Access Road	1	ls	$50,000	$50,000	
Clear and Grubbing					
North Section - Clear Heavy Trees, Grub Stumps and Chip	7.3	ac	$6,000	$43,800	
North Section - Load Chipped Material and Haul For Disposal	1100	cy	$16	$17,600	
Middle Section - Clear Light Trees, Grub Stumps and Chip	6.3	ac	$4,500	$28,350	
Middle Section - Load Chipped Material and Haul For Disposal	500	cy	$16	$8,000	
Contour Site After Clearing and Grubbing	13.6	ac	$1,700	$23,120	
Construction Facilities / Temporary Utilities					
Office Trailer / Storage Trailer Rental	12	mo	$1,000	$12,000	
Power, Lighting, Water, Sanitary, Phones, Radios and Vehicles	12	mo	$14,600	$175,200	
Erosion Control					
Silt Fences - Install, Maintain, Remove	12	mo	$2,000	$24,000	
Dewatering	24	day	$3,000	$72,000	
Swales & Diversions - Install and Remove	1540	lf	$4	$6,006	
Dikes - Install and Remove	1000	lf	$5	$4,550	
Check Dams - Install and Remove	15	ea	$2,500	$37,500	
Permanent Check Dams - Install	25	ea	$2,500	$62,500	
Excavate / Load Ash					
North Section	15556	cy	$4	$57,713	
Middle Section	6340	cy	$4	$23,521	
Haul Ash For Disposal Off-Site (Three Rivers Landfill)					
North Section (includes 1.2 swell factor)	18667.2	cy	$16	$298,675	
Middle Section (Includes 1.2 swell factor)	7608	cy	$16	$121,728	
Three Rivers Landfill Disposal Fee	43736	ton	$45	$1,968,120	
Dump / Spread / Light Compact Ash At Disposal Site					
North Section	15556	cy	$6	$88,047	
Middle Section	6340	cy	$6	$35,884	
Stormwater Management (Excavation, Structures, Piping and Backfill)	1750	lf	$39	$68,880	
Perimeter Site Restoration (Grading, Fertilizer, Seeding & Watering)	8556	sy	$3	$25,668	
Wetland Restoration	1	ls	$50,000	$50,000	
Institutional Controls					
Posting of Warning Signs	30	ea	$100	$3,000	
Land Use Control Implementation Plan	1	ea	$20,000	$20,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$3,498,863	*
Mobilization/Demobilization	2%	of subtotal direct capital		$78,724	*
Submittals / Bonds / Subcontract Management	37%	of subtotal direct capital		$1,294,579	*
Total Direct Capital Cost		(sum of * items)		**$4,872,166**	
Indirect Capital Costs					
Engineering & Design	14%	of direct capital		$682,103	
Project/Construction Management	15%	of direct capital		$730,825	
Health & Safety	4%	of direct capital		$175,398	
Overhead	30%	of direct capital + indirect capital		$1,938,148	
Contingency	17%	of direct capital + indirect capital		$1,427,769	
Total Indirect Capital Cost				**$4,954,243**	
Total Estimated Capital Cost				**$9,826,409**	
Direct O&M Costs	0.0%	Discount Rate[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2015 - 2016*	
Access Controls	1	ea	$750	$750	
Subtotal - Annual Costs				$750	
Present Worth Annual Costs (Less Than 30-year duration)				$1,500	
	2.0%	Discount Rate[1]			
Annual Costs (Institutional Controls)	200	years O&M		*Years 2017 - 2217*	
Access Controls	1	ea	$750	$750	
Annual Inspections / Maintenance	1	ea	$5,000	$5,000	
Subtotal - Annual Costs				$5,750	
Present Worth Annual Costs (Greater Than 30-year duration)				$282,022	
Periodic Costs: 5-Year Remedy Review	40				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs (per EPA 540-R-00-002)				$141,373	
Total Present Worth Direct O&M Cost				**$424,895**	
Indirect O&M Costs					
Project/Admin Management	151%	of direct O&M		$641,591	
Health & Safety	18%	of direct O&M		$76,481	
Overhead	30%	of direct O&M + indirect O&M		$342,890	
Contingency	15%	of direct O&M + indirect O&M		$222,879	
Total Present Worth Indirect O&M Cost				**$1,283,841**	
Total Estimated Present Worth O&M Cost				**$1,708,736**	
TOTAL ESTIMATED COST				**$11,535,146**	

1. Discount Rates from 2012 OMB Circular No. A-94, Appendix C

Table 5. Summary of the Present Value Costs of the Alternatives *(Continued)*

Alternative A-3c
Excavation (20,000 yd^3) and Haul To On-Site Disposal Area
Dunbarton Bay OU Ash
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Surveying & Layout					
Topographic Survey - Existing Condition	40	ac	$600	$24,000	
Layout / Survey Support	1	ls	$120,000	$120,000	
Topographic Survey - As Built	40	ac	$600	$24,000	
Access Road					
Temporary Construction Entrance / Access Road	1	ls	$50,000	$50,000	
Clear and Grubbing					
North Section - Clear Heavy Trees, Grub Stumps and Chip	7.3	ac	$6,000	$43,800	
North Section - Load Chipped Material and Haul For Disposal	1100	cy	$16	$17,600	
Middle Section - Clear Light Trees, Grub Stumps and Chip	6.3	ac	$4,500	$28,350	
Middle Section - Load Chipped Material and Haul For Disposal	500	cy	$16	$8,000	
Carolina Bay Section - Clear Heavy Trees, Grub Stumps and Chip	23.6	ac	$6,000	$141,600	
Carolina Bay Section - Load Chipped Material and Haul For Disposal	3540	cy	$16	$56,640	
Contour Site After Clearing and Grubbing	37.2	ac	$1,700	$63,240	
Construction Facilities / Temporary Utilities					
Office Trailer / Storage Trailer Rental	18	mo	$1,000	$18,000	
Power, Lighting, Water, Sanitary, Phones, Radios and Vehicles	18	mo	$14,600	$262,800	
Erosion Control					
Silt Fences - Install, Maintain, Remove	18	mo	$2,000	$36,000	
Dewatering	48	day	$3,000	$144,000	
Swales & Diversions - Install and Remove	3080	lf	$4	$12,012	
Dikes - Install and Remove	2000	lf	$5	$9,100	
Check Dams - Install and Remove	30	ea	$2,500	$75,000	
Permanent Check Dams - Install	50	ea	$2,500	$125,000	
Excavate / Load Ash					
North Section	15556	cy	$4	$57,713	
Middle Section	14815	cy	$4	$54,964	
Carolina Bay Section	49926	cy	$4	$185,225	
Haul Ash For Disposal On-Site					
North Section (includes 1.2 swell factor)	18668	cy	$15	$276,660	
Middle Section (Includes 1.2 swell factor)	17778	cy	$15	$263,470	
Carolina Bay Section (Includes 1.2 swell factor)	59912	cy	$15	$887,896	
Dump / Spread / Light Compact Ash At Disposal Site					
North Section	15556	cy	$6	$88,047	
Middle Section	14815	cy	$6	$83,853	
Carolina Bay Section	49926	cy	$6	$282,581	
Stormwater Management (Excavation, Structures, Piping and Backfill)	3500	lf	$39	$137,760	
Perimeter Site Restoration (Grading, Fertilizer, Seeding & Watering)	28288	sy	$3	$84,864	
Wetland Restoration	1	ls	$100,000	$100,000	
Subtotal - Direct Capital Cost				$3,762,174	*
Mobilization/Demobilization	2%	of subtotal direct capital		$84,649	*
Submittals / Bonds / Subcontract Management	50%	of subtotal direct capital		$1,881,087	*
Total Direct Capital Cost		(sum of * items)		**$5,727,911**	
Indirect Capital Costs					
Engineering & Design	14%	of direct capital		$801,907	
Project/Construction Management	25%	of direct capital		$1,431,978	
Health & Safety	6%	of direct capital		$343,675	
Overhead	30%	of direct capital + indirect capital		$2,491,641	
Contingency	20%	of direct capital + indirect capital		$2,159,422	
Total Indirect Capital Cost				**$7,228,623**	
Total Estimated Capital Cost				**$12,956,534**	
Direct O&M Costs	0.0%	Discount Rate[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2015 - 2016*	
Access Controls	1	ea	$750	$750	
Subtotal - Annual Costs				$750	
Present Worth Annual Costs (Less Than 30-year Duration)				$1,500	
Total Present Worth Direct O&M Cost				**$1,500**	
Indirect O&M Costs					
Project/Admin Management	2150%	of direct O&M		$32,250	
Health & Safety	2150%	of direct O&M		$32,250	
Overhead	30%	of direct O&M + indirect O&M		$19,800	
Contingency	15%	of direct O&M + indirect O&M		$12,870	
Total Present Worth Indirect O&M Cost				**$97,170**	
Total Estimated Present Worth O&M Cost				**$98,670**	
TOTAL ESTIMATED COST				**$13,055,204**	

1. Discount Rates from 2012 OMB Circular No. A-94, Appendix C

Table 5. Summary of the Present Value Costs of the Alternatives *(Continued/End)*

Alternative A-3d
Excavation (80,200 yd^3) and Haul To Off-Site Disposal Area
Dunbarton Bay OU Ash
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Surveying & Layout					
Topographic Survey - Existing Condition	40	ac	$600	$24,000	
Layout / Survey Support	1	ls	$120,000	$120,000	
Topographic Survey - As Built	40	ac	$600	$24,000	
Access Road					
Temporary Construction Entrance / Access Road	1	ls	$50,000	$50,000	
Clear and Grubbing					
North Section - Clear Heavy Trees, Grub Stumps and Chip	7.3	ac	$6,000	$43,800	
North Section - Load Chipped Material and Haul For Disposal	1100	cy	$16	$17,600	
Middle Section - Clear Light Trees, Grub Stumps and Chip	6.3	ac	$4,500	$28,350	
Middle Section - Load Chipped Material and Haul For Disposal	500	cy	$16	$8,000	
Carolina Bay Section - Clear Heavy Trees, Grub Stumps and Chip	23.6	ac	$6,000	$141,600	
Carolina Bay Section - Load Chipped Material and Haul For Disposal	3540	cy	$16	$56,640	
Contour Site After Clearing and Grubbing	37.2	ac	$1,700	$63,240	
Construction Facilities / Temporary Utilities					
Office Trailer / Storage Trailer Rental	18	mo	$1,000	$18,000	
Power, Lighting, Water, Sanitary, Phones, Radios and Vehicles	18	mo	$14,600	$262,800	
Erosion Control					
Silt Fences - Install, Maintain, Remove	18	mo	$2,000	$36,000	
Dewatering	48	day	$3,000	$144,000	
Swales & Diversions - Install and Remove	3080	lf	$4	$12,012	
Dikes - Install and Remove	2000	lf	$5	$9,100	
Check Dams - Install and Remove	30	ea	$2,500	$75,000	
Permanent Check Dams - Install	50	ea	$2,500	$125,000	
Excavate / Load Ash					
North Section	15556	cy	$4	$57,713	
Middle Section	14815	cy	$4	$54,964	
Carolina Bay Section	49926	cy	$4	$185,225	
Haul Ash For Disposal Off-Site (Three Rivers Landfill)					
North Section (includes 1.2 swell factor)	18668	cy	$16	$298,688	
Middle Section (Includes 1.2 swell factor)	17778	cy	$16	$284,448	
Carolina Bay Section (Includes 1.2 swell factor)	59912	cy	$16	$958,592	
Three Rivers Landfill Disposal Fee	115630	ton	$45	$5,203,350	
Dump / Spread / Light Compact Ash At Disposal Site					
North Section	15556	cy	$6	$88,047	
Middle Section	14815	cy	$6	$83,853	
Carolina Bay Section	49926	cy	$6	$282,581	
Stormwater Management (Excavation, Structures, Piping and Backfill)	3500	lf	$39	$137,760	
Perimeter Site Restoration (Grading, Fertilizer, Seeding & Watering)	28288	sy	$3	$84,864	
Wetland Restoration	1	ls	$100,000	$100,000	
Subtotal - Direct Capital Cost				$9,079,227	*
Mobilization/Demobilization	1%	of subtotal direct capital		$85,345	*
Submittals / Bonds / Subcontract Management	21%	of subtotal direct capital		$1,906,638	*
Total Direct Capital Cost		(sum of * items)		**$11,071,209**	
Indirect Capital Costs					
Engineering & Design	8%	of direct capital		$830,341	
Project/Construction Management	13%	of direct capital		$1,439,257	
Health & Safety	3%	of direct capital		$332,136	
Overhead	30%	of direct capital + indirect capital		$4,101,883	
Contingency	20%	of direct capital + indirect capital		$3,554,965	
Total Indirect Capital Cost				**$10,258,583**	
Total Estimated Capital Cost				**$21,329,792**	
Direct O&M Costs	0.0%	Discount Rate[1]			
Annual Costs (Existing System during Post-ROD Design & Const)	2	years O&M		*Years 2015 - 2016*	
Access Controls	1	ea	$750	$750	
Subtotal - Annual Costs				$750	
Present Worth Annual Costs (Less Than 30-year Duration)				$1,500	
Total Present Worth Direct O&M Cost				**$1,500**	
Indirect O&M Costs					
Project/Admin Management	2150%	of direct O&M		$32,250	
Health & Safety	2150%	of direct O&M		$32,250	
Overhead	30%	of direct O&M + indirect O&M		$19,800	
Contingency	15%	of direct O&M + indirect O&M		$12,870	
Total Present Worth Indirect O&M Cost				**$97,170**	
Total Estimated Present Worth O&M Cost				**$98,670**	
TOTAL ESTIMATED COST				**$21,428,462**	

1 Discount Rates from 2012 OMB Circular No. A-94, Appendix C

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