



# Proposed Core Team Remedial Actions and Regulatory Strategy for Remaining SRS Ash/Coal Fines Waste Units (U)

April 19, 2022 (revised post Core Team meeting)

SRNS-RP-2022-00205 Rev. 1 Redline

# Agenda

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- **Purpose and Objectives**
- **Overview of SRS Ash and Coal Fines Waste Units**
- **Waste Unit Groupings**
- **Recommended Remedial Action Strategy**
  - Beneficial Reuse
    - *Justification*
    - *Uncertainties & Associated Management Actions*
    - *Alternatives to Beneficial Reuse*
  - Land Use Controls (LUCs)
    - *Justification*
    - *Uncertainties/Considerations*
    - *Alternatives to LUCs*
- **Recommended Administrative Strategies**
- **Summary**
- **Recommended Schedule for 2022**
- **Action Items**

# Purpose and Objectives

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- **Purpose:**

- Reach Core Team agreement on an end state vision for the remaining ash waste units at SRS

- **Objectives**

- Agree on preferred remedial strategy for waste units/groupings.
- Agree on administrative strategy for each waste unit/groupings.
- Develop preliminary schedule/sequence for field starts of remaining waste units based on preferred strategy including decision documents and necessary supporting documents.

# Ash/Coal Fines Waste Unit History/Background

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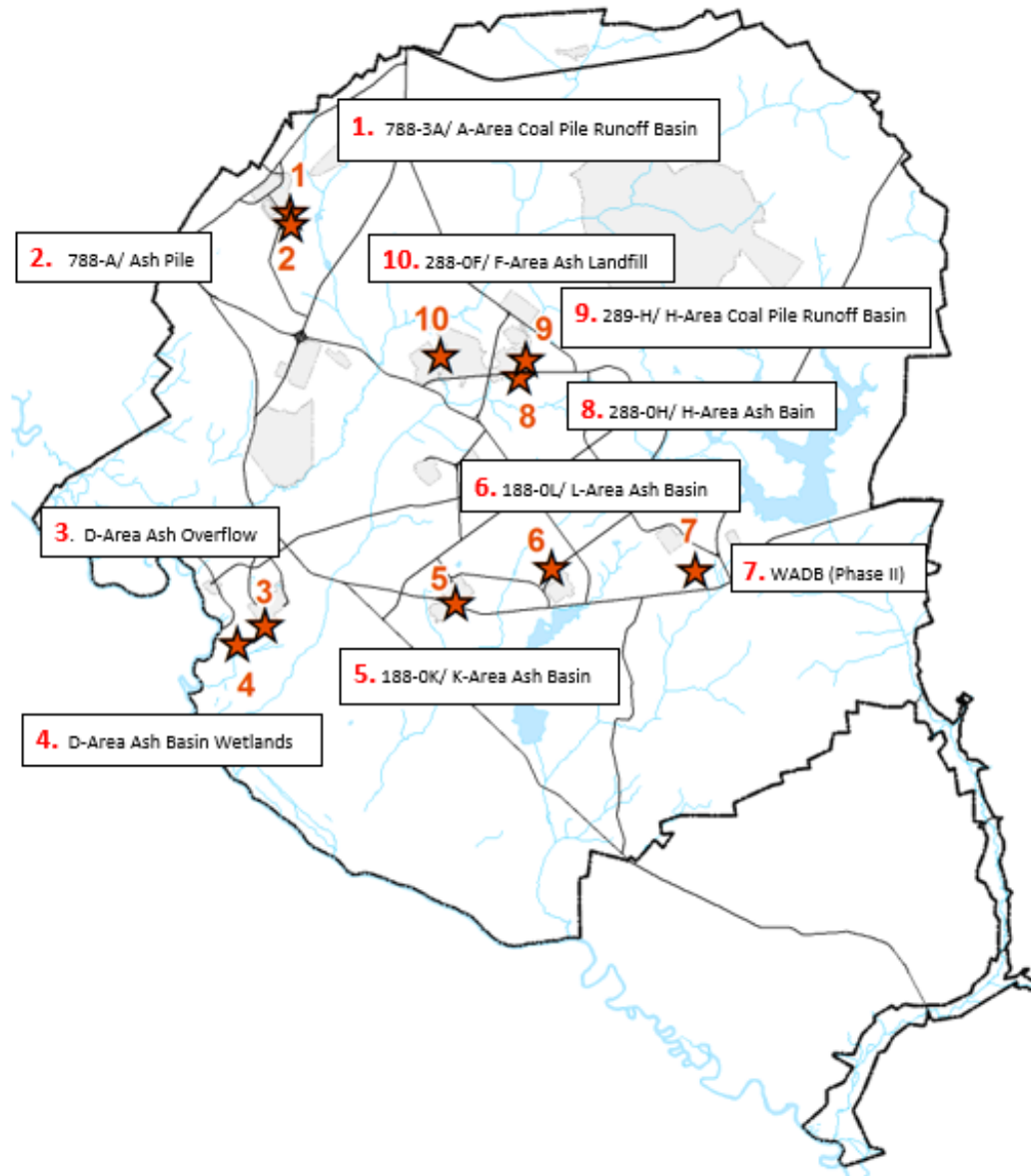
- Completed remedial actions for SRS ash and coal fines waste site closures

Remediation	Waste Unit	Regulatory Program
Class II Soil Cover	P-Area Ash Basin, R-Area Ash Basin, A-Ash Pile (788-2A)	NTC Removal Action/EA ROD, ROD
Class III Geosynthetic Cover System	D-Area Ash Basins	IWT/NTC Removal Action/EA ROD
Excavate and Haul	Coal Pile Runoff Basins (C-, K-, L-, P- and F-Areas), WADB (Phase I), C-Area Ash Piles	NTC Removal Action/ROD
LUCs	WADB (Dunbarton Bay and Buffer Area)	ROD

- 10 additional units have a presumed similar problem warranting action(s)

# Remaining Ash and Coal Fines Waste Units

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# Remaining Ash and Coal Fines Waste Units

Ash/Coal Fine Unit	Depth to Groundwater	Area	Estimated Volume	FFA Appendix E RA START	Comments
	(ft)	(ac)	(yd <sup>3</sup> )		
A-Area Coal Pile Runoff Basin, 788-3A	100-110	2.62	10,000 <sup>a</sup>	Mar 2026	Inactive. Coal fines present – not ash.
A-Area Ash Pile 788-A	100-110	2.55	70,000 <sup>b</sup>	Mar 2026	Ash was trucked from the power plant and piled from 1950-1980 (approx.). Draft Proposed Plan to consolidate in Coal Pile Runoff Basins (CPRB).
D-Area Ash Overflow (DAO) Savannah River Floodplain Swamp Integrated Operable Unit (IOU) (D-Area SRFP IOU)	0-15	33	>50,000 (ROM)	Sep 2065	Part of IOU. Overflow from previous operations prior to ash basin closure (probably >25 % moisture content).
D-Area Ash Basin Wetlands (DABW) D-Area SRFP IOU	0-15	90	739,000	Sep 2065	Ash was sluiced from powerhouse. Overflow from previous operations prior to ash basin closure.
K-Area Ash Basin, 188-K	61	11.16	273,000	Dec 2028	Ash was sluiced into this basin from 1950-1990. Currently, the basin is heavily vegetated with no standing water. Potential Consolidation location. Active IWT.
L-Area Ash Basin, 188-L	17-50	18	323,000	Nov 2029	Ash was sluiced into this basin from 1950-1968. Currently, the basin is heavily vegetated and holds some standing water in the northeast portion of the basin. Potential consolidation location.
Wetland Area at Dunbarton Bay (WADB) – Phase II	17	4.5	22,000	TBD	Phase II includes the South Ash Remediation Area, south of the powerline road. WADB Phase I included excavate and haul to TRL for non-wetlands and LUCs for Dunbarton Bay wetlands and buffer area. The SARA was >30% moisture and exceeded the capacity of the TRL ash cell.
H-Area Ash Basin, 288-H	22	13	259,000	Dec 2034 (SER) <sup>d</sup>	Ash was sluiced into this basin from 1950-1990. Some standing water on the east and south sides of the basin. Active IWT.
H-Area Coal Pile Runoff Basin, 289-H	10	1.27	7,000 <sup>c</sup>	Apr 2043	Coal fines present – not ash. Currently active industrial stormwater permit.
F-Area Ash Landfill, 288-F	70-80	7	358,000	Dec 2024 (SER) <sup>d</sup>	Ash is currently being moved from the periphery into an unlined landfill. Active SCDHEC Solid Waste Landfill Permit.

**Notes:**

- a) SRNS 2012b (AAP/ACPRB RI/BRA)
- b) Ash volume calculated from preliminary design (drawings: C-CG-A-00063, -00064, -00066, -00068) – is slightly higher than volume calculated in Appendix C.
- c) Assumed based on ratio of operating times and volume in ACPRB as calculated in SRNS 2012b
- d) SER – Site Evaluation Report – will determine if this site is moved to Appendix E in the FFA

# Likely Response Actions Evaluated for Remaining Ash Waste Units

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- **In situ Alternatives**

- Land Use Controls (LUCs)
- Individual Cover in Place with SCDHEC Class II Landfill Cover System for Eventual Beneficial Reuse
- In-situ Stabilization with Soil Cover
- Individual Cover in Place with SCDHEC Class III Landfill Cover System

- **Ex situ Alternatives**

- Consolidation at Locations with SCDHEC Class II Landfill Cover System until Eventual Beneficial Reuse
- Consolidate at One Location and Closure with Class III Landfill Cover System
- Excavation and Shipment for Encapsulated Beneficial Reuse
- Excavation and Entombment into 186 Basins with Class III Landfill Cover System
- Excavation and Disposal at TRL

# Ash and Coal Fines Waste Unit Groupings

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**Waste units that contain similar characteristics or permit challenges are grouped for a logical flow for engineering design, cost efficiency, and regulatory approval.**

- **KAB, LAB, HAB, FAL**

- These are basins that received ash via sluicing and have similar remedial benefits and challenges
- FAL has an active SCDHEC Solid Waste Landfill Permit

- **WADB, DAO, DABW**

- Wetlands or near wetland ash depositional areas

- **AAP, ACPRB**

- Location and administrative ties/remedial action schedule pair these units

- **HACPRB**

- Coal fines only
- Active industrial stormwater permit in place and in use.

## Recommended Strategy – Beneficial Re-use (Plan A)

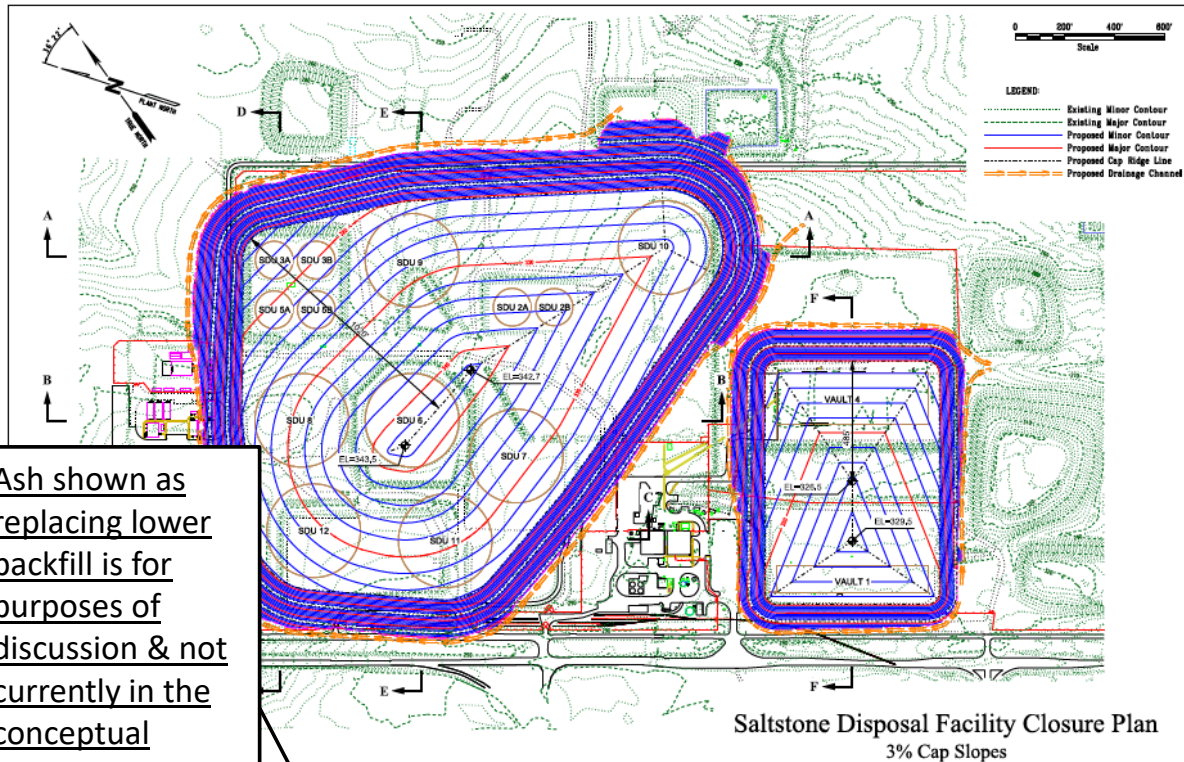
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- **Candidate Ash/Coal Fines Waste Units: FAL\*, HAB, KAB, LAB, AAP, ACPRB**
- **Excavation of ash/coal fines to NFA levels and beneficial reuse of excavated materials**
- **Beneficial Re-Use Opportunity**
  - Use ash and coal fines as lower backfill under a final closure cap – (e.g., Saltstone Disposal Units (SDUs), Burial Grounds, F&H Tank Farms)
  - Use coarser material (i.e., bottom ash) as light weight aggregate for onsite applications (e.g., asphalt paving)
- **Program Efficiencies**
  - Schedule efficiency
  - Less regulatory documentation
  - Significantly decreased design, engineering and construction costs
  - Significant reduction in footprint of ash/coal fines waste units realized, resulting in less surveillance and maintenance (S&M) costs.
  - Reduced need for borrow material
  - Disposal cost avoidance

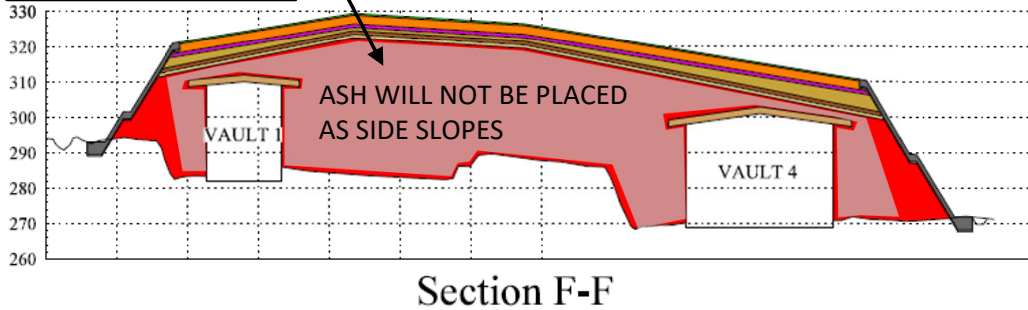
\* FAL currently under a SW Permit and requires modification/suspension to proceed with re-use option

# Beneficial Re-Use Justification: Possible Applications and Why Appropriate

## Use of Ash as Lower Backfill for SDU – Conceptual Design



Ash shown as replacing lower backfill is for purposes of discussion & not currently in the conceptual design



ASH WILL NOT BE PLACED AS SIDE SLOPES

Total Lower Backfill North 3% Cap	4,237,550	CY
Minus Tanks	-944,893	CY
Minus Structures Sand Layer	-88,505	CY
<b>Net Total</b>	<b>3,204,152</b>	<b>CY</b>

Total Lower Backfill South 3% Cap	1,002,109	CY
Minus Vaults	-197,681	CY
Minus Structures Sand Layers	-20,274	CY
<b>Net Total</b>	<b>784,154</b>	<b>CY</b>

**LEGEND:**

- RIPRAP
- STONE BEDDING LAYER
- TOPSOIL
- UPPER BACKFILL
- EROSION BARRIER
- MIDDLE BACKFILL
- LATERAL DRAINAGE LAYER
- FOUNDATION LAYER
- LOWER BACKFILL
- LOWER SAND DRAINAGE LAYER
- APPROXIMATE PRE-CLOSURE GRADE

## Beneficial Re-Use Justification: Possible Applications and Why Appropriate (cont'd)

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- **On-Site Beneficial Uses**
  - SDUs, F&H Tank Farms, and Burial Grounds - preliminary design for final cover systems calls for millions of cubic yards of lower backfill.
  - Large space between SDUs make stability and chemistry issues for lower backfill less of a concern than tanks with steel liners; some SDUs (1 and 4) will also be ready for closure sooner than either tank farm.
  - DOE-HQ providing funding opportunities for research involving beneficial reuse of ash
- **Commercial industry (Duke Energy, SEFA, RPM Solutions, etc.) has investigated and is implementing beneficial reuse.**
  - Reductions in Coal Fired Power Plants will reduce the availability of fly ash used as a supplemental concrete material (SCM)
  - Long history of ponded ash use as structural fill materials for the construction of highway embankments, backfilling of abutments/trenches, etc.

# Beneficial Re-Use – Uncertainties and Associated Management Actions

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- **DESIGN: Current Performance Assessment/Preliminary Design for SDU Cover System did not Consider Ash as the Lower Backfill**
  - SRMC Engineering supports use of ash/coal fines as backfill
  - Testing of material (chemical [i.e., SPLT] and geotechnical) will be needed to make the necessary design changes for the cover systems
  - Organic material will need to be removed from ash to be used as lower backfill
- **EXECUTION: SRNS and SRMC have drafted a functional agreement to use the ash material as practical for SRMC closure missions**
  - SRMC (current contractor) for SDUs is interested in utilizing the ash as lower backfill that is on site, inert, abundant, available for future SRMC closure missions and a significant cost avoidance
- **SCHEDULE: Ash Basin Closure will be tied to Liquid Waste closure schedule and budget**
  - Uncertainty in the Liquid Waste Program timing of Final Cover Construction dictates the schedule for excavation of ash units. Management of uncertainty achieved through land use control of ash units until needed.
- **REGULATORY: Solid Waste regulations, Permits and Closure Plans for receiving facilities**

# Alternatives to Beneficial Re-Use (Plan B)

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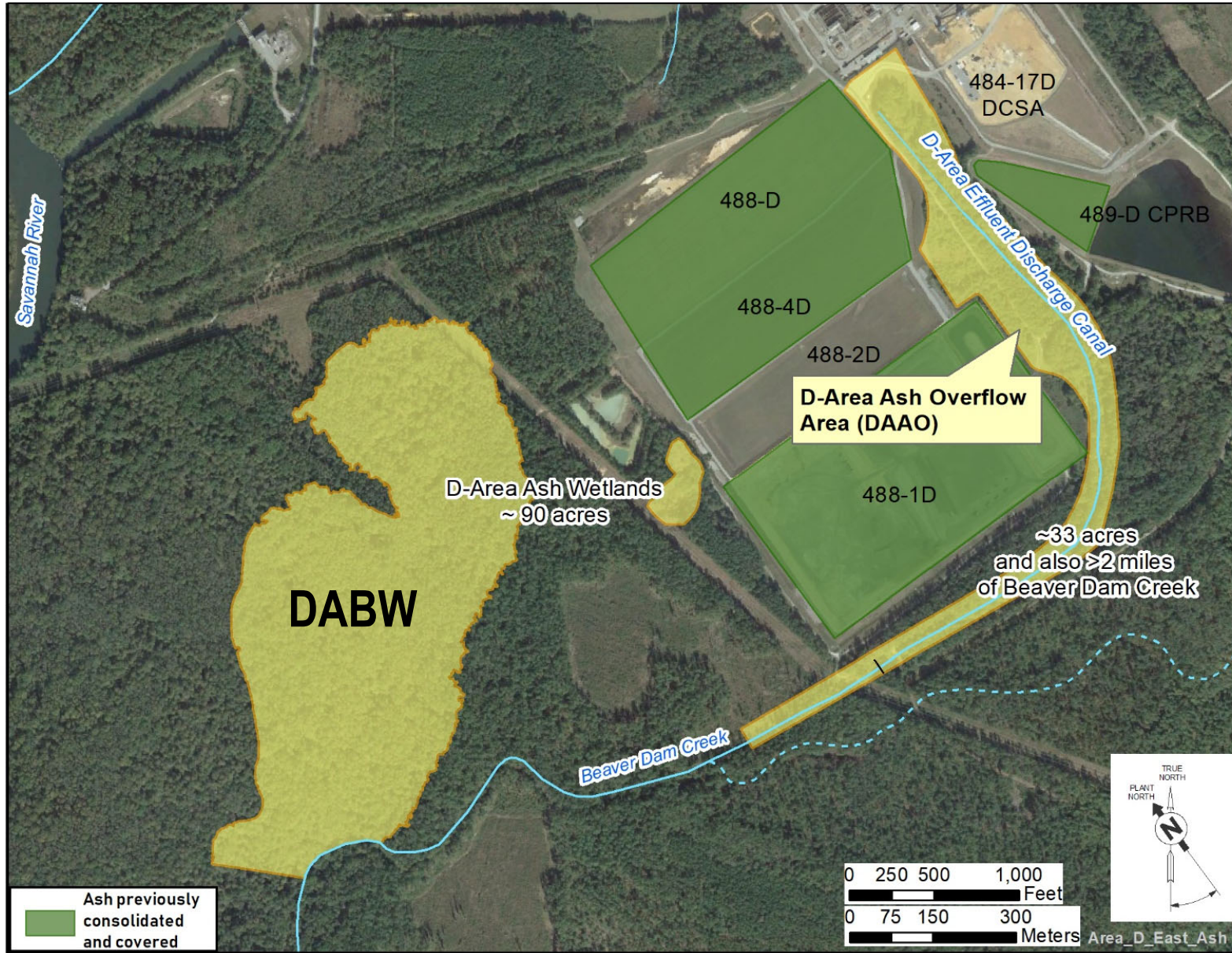
- **What are the Alternatives to Beneficial Reuse if the Uncertainties are Deemed Unmanageable?**
  - Consolidate HAB and LAB into KAB site and cover with Class III Cover system (or keep these waste units separate in FFA with RA start dates of 2034, 2028 and 2029 and revisit consolidation strategy in 5 years)
    - *Allows HAB and LAB to be closed as NFA, eliminating O&M costs*
  - Pursue acceptance of Proposed Plan for placing AAP into ACPRB and cover with Class III Cover System
    - *Allows near term ash removal at AAP*
    - *Liner in ACPRB not required; this is a remedy within an AOC, not disposal*
  - Keep FAL under current landfill permit, close per the approved closure plan (Class II Cover System) outside of FFA/CERCLA framework.

## Recommended Strategy - Wetlands/Overflow Ash Depositional Areas – NFA and LUCs (Plan A)

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- **No Further Action or LUCs as Final Actions** for remote units with sensitive ecological settings that have no or little potential for future development and would benefit from avoidance of construction/excavation activities
  - Candidate Ash Waste Units: DABW and WADB (Phase II)
- **D-Area Ash Basin Wetlands (DABW)**
  - DABW is within the Savannah River floodplain and construction activities would cause extensive harm to the ecosystem if 90+ vegetated acres have ash removed.
  - Ecosystem has been studied by SREL and shows typical species composition for the area.
  - A similar decision left ash in place within and adjacent to Dunbarton Bay (WADB) to protect the sensitive wetlands ecosystem
  - Risk to the IOU worker is expected to be minimal. Verification of risk to be completed to support No Further Action or LUCs if risk exceeds free release criteria.

# Wetlands/Overflow Ash Depositional Areas

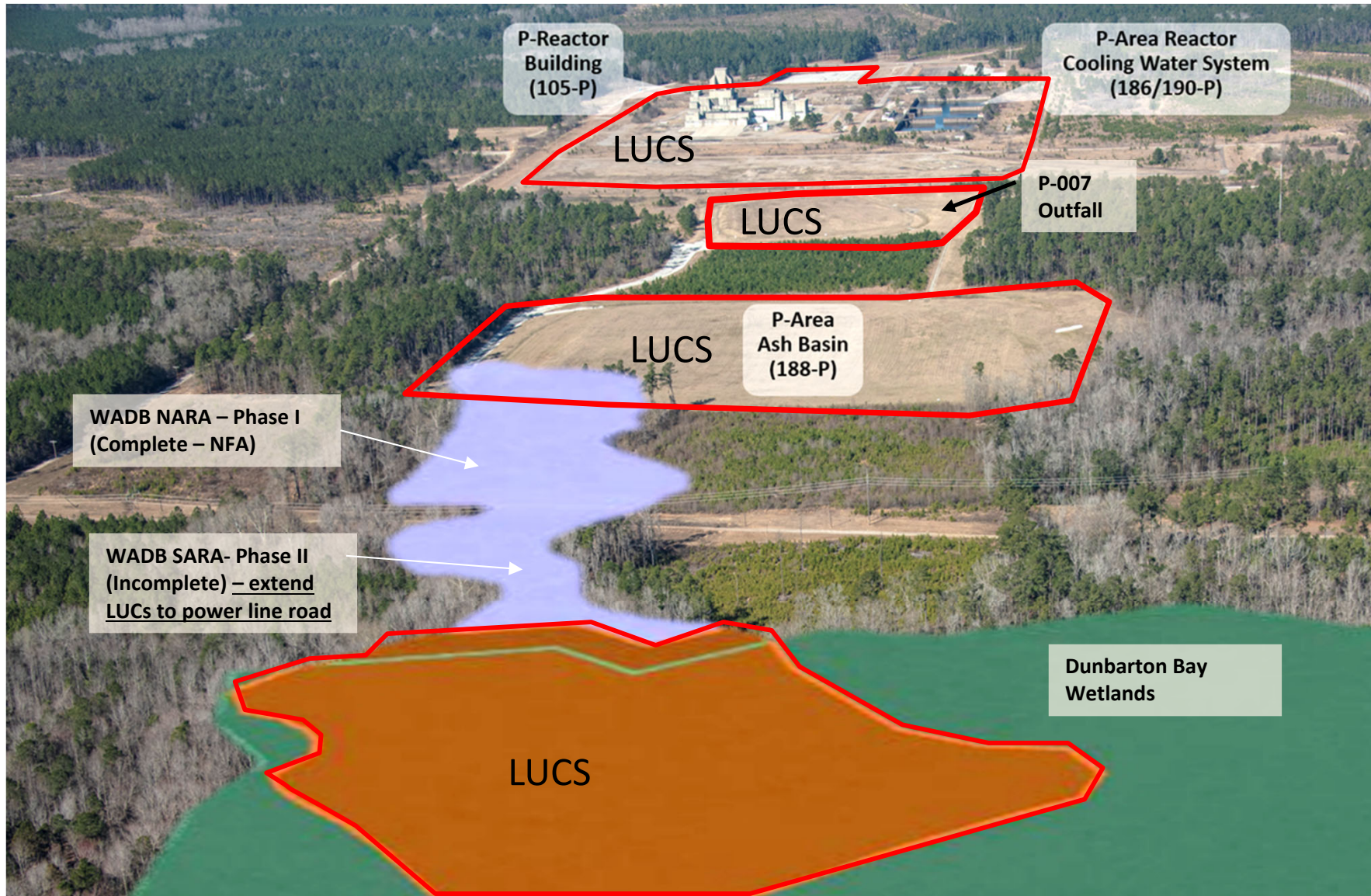


## Recommended Strategy- Wetlands/Overflow Ash Depositional Areas – NFA and LUCs (cont'd).....

### Wetlands Area at Dunbarton Bay (WADB) – Phase II

- Borders on a wetland area and contains areas of saturated subsoils
- Excavation in Zone 1 required specialized equipment and site prep to handle the unstable (with respect to vehicle travel) conditions.
- WADB lies a few hundred yards south of P-Ash Basin (12 acres) and immediately north of Dunbarton Bay (26 acres), both of which leave ash in place and are subject to LUCs.
- Expanding LUCs boundary to include the Phase II area eliminates need to manage excavation problems encountered during excavation of Zone 1 and is within the approved remedy for the unit.

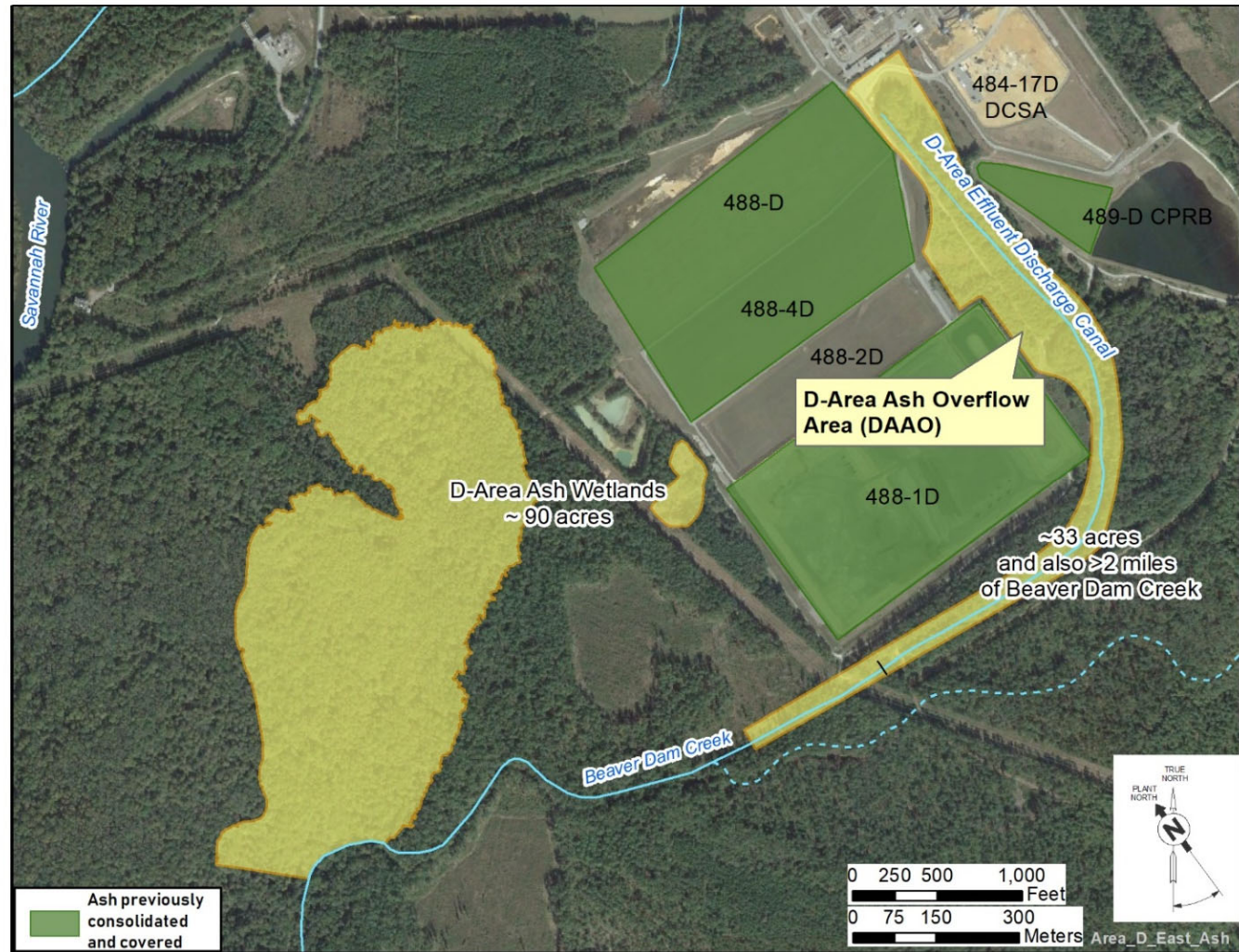
# Recommended Strategy - Wetlands/Overflow Ash Depositional Areas - LUCs (cont'd)



## Recommended Strategy- Wetlands/Overflow Ash Depositional Areas – NFA or LUCs (cont'd)

- The D-Area Overflow (DAO) should be addressed with the Savannah River Floodplain Swamp IOU for final action:

- The DAO is primarily within wetland/saturated areas
- The lateral extent of ash has not been defined. Will be characterized and delineated during SRFS IOU RI process.
- Potential impacts of ash along Beaver Dam Creek are being assessed.



# Justification for NFA or LUCs as a Final Action- Wetland Areas

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## *Protective of Human Health and the Environment*

- Projected risk to the IOU worker is expected to be within acceptable thresholds allowing for NFA
- LUCs are well established at SRS and are not destructive to sensitive ecological environments when compared to excavation/disposal alternatives
- Studies by SREL of chronic exposure to coal combustion wastes has shown ecological affects associated with the highest level of contaminants only within aquatic basins
- SREL research at depositional areas indicate that the bioavailability of metals is reduced in aged/weathered depositional ash deposits (attenuated)
  - Depositional areas at WADB and DABW have not been shown to be a threat to wildlife receptors.
- Long-term empirical groundwater monitoring data and source term modeling at SRS ash units show no current or future groundwater degradation

## **Program Efficiencies**

- More cost effective than excavation and disposal or cover system alternatives
- Schedule efficiencies with streamlined regulatory documentation
- 5 Year ROD review process will ensure LUCs are maintained and remain protective

# LUCs as a Final Action for Wetland Areas – Uncertainties/Considerations

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- **DABW**

- Uncertainty in risk to IOU worker

- Uncertainty to be managed by calculating risk based on current soil data.

- Ecological impacts of ash deposition have not been determined – SREL activities continue

- Uncertainty is managed by using proxy and future data to support NFA or LUCs if necessary

- **WADB – Phase II**

- Regulator/community acceptance of LUCs for completion of Phase II

- Existing ROD states that ash would be excavated and transported to “an approved ex situ containment facility located off-SRS property” and applies LUCs in Dunbarton Bay and buffer area just south of Phase II site.

- **Lessons learned from WADB Phase I:**

- Uncertain what volume, criteria, and schedule will be imposed on SRS by local landfill.
    - Excavation in Zone 1 demonstrated the need for specialized equipment and site prep to handle the unstable (with respect to vehicle travel) conditions.
    - Saturated conditions require drying via windrows to meet disposal facility criteria
    - Excavation would be significantly hampered during high rainfall events

## Alternatives to LUCs as a Final Action for Wetland Areas (Plan B)

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- **What are the Alternatives to LUCs as a Final Action if the Uncertainties are Deemed Unmanageable?**
  
- **DABW**
  - Leave DABW in the SRFS IOU with a ROD date of 2064
  
- **WADB – Phase II**
  - Implement excavation and disposal alternative from approved WADB ROD

## Recommended Strategy – Active Coal Pile Runoff Basin

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- **Manage H-Area Coal Pile Runoff Basin (HCPRB) as a separate unit as listed in the FFA:**
  - Currently has an active industrial stormwater permit needed for stormwater runoff – drainage from former H-Area coal yard;
  - This coal fines waste unit is not administratively tied to an ash unit like ACPRB with AAP

# Recommended Administrative Strategies

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## Plan A

- **Final [EA\*] ROD (Beneficial Reuse Units)**
  - HAB, LAB, KAB, AAP, ACPRB, FAL (after permit modification as needed)
- **ESD – if needed (LUCs for Phase II)**
  - WADB
- **Final ROD (SRFS IOU)**
  - DABW
- **Defer remedial decision**
  - HCPRB
  - DAO (SRFS IOU)

\* EAROD for AAP and ACPRB

# Summary of Recommended Strategy Path Forward

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## • Primary Considerations

- Combining units for maximum efficiency in regulatory document preparation, engineering design, project planning, construction execution and cost
- Decision document(s) (i.e., [EA]ROD and ESD) will be used to prioritize/revise FFA milestones for cost effective remedy implementation
- Addressing FAL under CERCLA provides for comprehensive strategy that will allow for use of existing SRS resources for future SRS closure projects including beneficial reuse (consolidation) as practical
- Beneficial reuse as a long-term decision strategy
- LUCs only for WADB and NFA or LUCs for DABW (under IOU program) is most rational path with benefits to schedule, natural resources, habitat protection, and cost efficiency.
- Recommended path maximizes the reduction of the footprint of the ash/coal fines units site-wide
- Stability of ash units will be verified (and ensured, if necessary) until excavated for beneficial reuse.

# Summary of Preferred and Alternative Paths by Waste Unit

Unit	Preferred	Alternative	Description
AAP, ACPRB	LUCs until beneficial reuse (e.g., lower backfill at SDUs)	Consolidate at ACPRB with Class III Cover System	A-Area Ash Pile (788-0A) and A-Area Coal Pile Runoff Basin (788-3A) are currently planned to be addressed through one set of FFA documentation (FFA). ROD issuance Oct 2024, RA Start Jan 2026. <b>Proposed Documentation:</b> <u>Focused RI/FS, SB/PP, Final EA ROD for beneficial reuse units</u>
FAL	Move unit into FFA. LUCs until beneficial reuse (e.g., lower backfill at SDUs)	Modify permit to allow additional ash and close FAL per the approved closure plan in the permit.	Currently, FAL permit allows acceptance of only ash from around the FAL (associated with FAL). Ash has been accepted previously from other units (AAP). <b>Proposed Documentation:</b> FFA Mod/Permit mod, <u>Focused RI/FS, SB/PP, Final ROD for beneficial reuse units</u>
HAB, KAB, LAB	LUCs until beneficial reuse (e.g., lower backfill at SDUs)	Consolidate ash at KAB close with a Class III cover (or keep separate in FFA - revisit after 5 yrs)	Fill material will be needed to support future SRS Closures. Fill material needed far exceeds volume of SRS ash unit ash. Intent to use SRS ash as fill material. <b>Proposed Documentation:</b> <u>Focused RI/FS, SB/PP, Final ROD for beneficial reuse units.</u>
DABW, WADB	<u>NFA or LUCs (DABW) and LUCs (WADB) as Final Actions.</u>	Pursue final action for DABW as part of SRFS IOU; WADB <u>excavation/disposal</u>	Units addressed in IOUs. DABW part of SRFS IOU. WADB part of Steel Creek IOU. WADB Phase I (North Ash Remediation Area & South Ash Remediation Area [SARA] Zone 1) complete. Phase 2 (SARA Zones 2, 3, 3a, and 4) addressed under the SC IOU (RA Dec 2064). <b>Documentation:</b> <u>ESD if required for WADB; Focused RI/FS, SB/PP, Final ROD for DABW</u>

Note: HCPRB is not included. This is an active unit (Industrial Stormwater Permit, operating); FFA RA Start April 2043  
 DAO is not included. Final decision will be based on SRFP IOU remedy.

## Recommended Schedule for 2022

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- Core Team Meeting – April 19, 2022 (complete)
- Follow Up Core Team Meeting to be scheduled as Teams meeting in mid-May
- Submit Program Strategy Agreement Letter to Core Team – July 11, 2022
- EPA/SCDHEC Review and Approval – August 12, 2022

## Identified Action Items (Short and Long-Term) from April 19<sup>th</sup> Meeting

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- Teams meeting in mid-May to identify path forward for FAL SW permit and follow-up with Core Team on Rev. 1 Redline and any new concerns/issues
- Resolve permit considerations for the FAL SW permit to allow for beneficial re-use
- Coordinate with SCDHEC SW permit conditions for allowing ash/coal fines waste to be used for beneficial re-use as base fill in the identified closures (i.e., SDUs).
- Perform testing of ash prior to beneficial re-use as a lower backfill in closure projects which includes both chemical (specifically SPLT testing) and geotechnical analysis.
- Within EAROD for beneficial reuse units provide dates for when beneficial re-use would begin for each unit.
- Provide a risk calculation for the IOU worker given existing data within the DABW to determine if NFA or LUCs is appropriate final response.
- For beneficial reuse units discuss with Core Team the appropriateness of a single Focused RI/FS prior to a combined ROD
- Define a specific nature of beneficial re-use within the RODs (i.e., backfill for SRS liquid waste closure projects, etc.)