Savannah River NUCLEAR SOLUTIONS℠

Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis for the D-Area Groundwater Operable Unit Per- and Polyfluoroalkyl Substances Plume (U)

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EXECUTIVE SUMMARY

The United States Department of Energy is proposing to perform a non-time critical removal action for the per- and polyfluoroalkyl substances plume in the Upper Three Runs Aquifer of the D-Area Groundwater Operable Unit. This Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis presents and evaluates non-time critical removal action alternatives developed to address high concentrations of per- and polyfluoroalkyl substances in the D-Area Groundwater Operable Unit and has been developed to combine the reporting requirements of 40 Code of Federal Regulations § 300.410 "Removal Site Evaluation" and 40 Code of Federal Regulations § 300.415 "Removal Action".

Groundwater in the D-Area Groundwater Operable Unit is contaminated with several per- and polyfluoroalkyl substances compounds which exceed United States Environmental Protection Agency promulgated maximum contaminant levels. The per- and polyfluoroalkyl substances plumes are comingled with trichloroethylene, tritium, metals, and low-pH plumes. Per- and polyfluoroalkyl substance plumes originate in the northeast portion of D Area, where known use of aqueous film forming foam containing per- and polyfluoroalkyl substances took place. The per- and polyfluoroalkyl substance plumes are migrating southwest through the Upper Three Runs Aquifer toward the Savannah River wetlands. A non-time critical removal action is warranted in the groundwater to reduce the concentrations of per- and polyfluoroalkyl substances migrating toward the Savannah River wetlands. The elevated levels of per- and polyfluoroalkyl substances in the groundwater meet the criteria in 40 Code of Federal Regulations § 300.415(b) (2) (i): "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants."

The removal action objective for the non-time critical removal action is to reduce regulated per- and polyfluoroalkyl substances (those with maximum contaminant levels) concentrations in monitoring wells within or immediately downgradient of the treatment zone by 90% compared to upgradient monitoring wells. Four alternatives were considered in this Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis to reduce the concentrations of per- and polyfluoroalkyl substances in the Upper Three Runs Aquifer. The alternatives evaluated include the following:

- Alternative 1 – No Action
- Alternative 2a – In-situ Permeable Adsorptive Barrier (Colloidal Activated Carbon Injections)
- Alternative 2b - In-situ Permeable Adsorptive Barrier (Granular Activated Carbon Trench)
- Alternative 3 – Pump and Treat

Guidance on conducting non-time critical removal actions under the Comprehensive Environmental Response, Compensation, and Liability Act recommends each alternative be reviewed against three broad categories: effectiveness, implementability, and cost. Acceptancy of the alternatives is qualitatively scored, based on community acceptance, regulator acceptance, and the ability of the alternative to reduce risk to downgradient receptors.

The table below summarizes the results from the alternative evaluation.

	Effectiveness	Implementability	Cost*	Acceptance
Alternative 1 No Action	Low	High	$0	Low
Alternative 2a In-situ PAB (CAC Injections)	Medium	High	$15.59M	High
Alternative 2b In-situ PAB (GAC Trench)	Medium	Medium	$40.17M	High
Alternative 3 Pump and Treat	High	Medium	$24.27M	High

Note: Range is Low to High, where Low = worst and High = best.
PAB – permeable adsorptive barrier; CAC – colloidal activated carbon; GAC – granular activated carbon
*Million (M)

The preferred action is Alternative 2a, Permeable Adsorptive Barrier (Colloidal Activated Carbon Injections). This alternative proposes injections of colloidal activated carbon into the aquifer which will coat the aquifer matrix in the adsorptive substance forming a subsurface barrier wall. The subsurface barrier wall will passively sequester per- and polyfluoroalkyl substances molecules to

the colloidal activated carbon particles placed in the path of contaminant flow. This will reduce downgradient migration of the highest concentration portion of the per- and polyfluoroalkyl substances plume by capturing it on the adsorptive particles. Eventually the treated water, coming out of the permeable adsorptive barrier, will move downgradient and flush out the downstream aquifer leading to a decrease in groundwater per- and polyfluoroalkyl substances concentrations, achieving applicable or relevant and appropriate requirements.

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LIST OF ACRONYMS AND ABBREVIATIONS

~	approximate, approximately
1Q	first quarter
4Q	fourth quarter
AFFF	aqueous film forming foam
ARAR	applicable or relevant and appropriate requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylene
CAC	colloidal activated carbon
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPRB	Coal Pile Runoff Basin
CPT	cone penetrometer testing
CRMP	Cultural Resource Management Plan
DAG	D-Area Groundwater
DAOU	D-Area Operable Unit
DCSA	D-Area Coal Storage Area
DEXOU	D-Area Expanded Operable Unit
DHWF	D-Area Heavy Water Facility
DHWRF	D-Area Heavy Water Rework Facility
FFTA	Fire Fighting Training Area
ft	feet
GA	Gordon Aquifer
GAC	granulated activated carbon
GCU	Gordon Confining Unit
HFPO-DA	hexafluoropropylene oxide dimer acid
km	kilometer
km^2	square kilometer
m	meter
MCL	maximum contaminant level
mi	mile
mi^2	square mile
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

LIST OF ACRONYMS AND ABBREVIATIONS *(continued/end)*

ng/g	nanogram per gram
ng/L	nanogram per liter
NTC	non-time critical
OU	Operable Unit
PAB	permeable adsorptive barrier
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFOSA	perfluorooctane sulfonamide
RSER/EE/CA	Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis
ROD	Record of Decision
RSL	regional screening level
SCDES	South Carolina Department of Environmental Services
SRFS IOU	Savannah River and Floodplain Swamp Integrator Operable Unit
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
TBC	to be considered
TCE	trichloroethylene
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UTRA	Upper Three Runs Aquifer
VOC	volatile organic compound
WSRC	Westinghouse Savannah River Company

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1.0 INTRODUCTION

The Savannah River Site (SRS) encompasses 803 square kilometers (km^2) (310 square miles [mi^2]) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS is located approximately 40 km (25 mi) southeast of Augusta, Georgia, and 32 km (20 mi) south of Aiken, South Carolina (Figure 1). Constructed in the early 1950s, SRS has hosted a variety of missions, including primarily weapons-grade plutonium manufacturing and processing, radioisotope production for space missions, radioactive materials management and disposal, and supplying tritium to the nation. Industrial areas make up roughly 10 percent of the total area of SRS. D Area is where steam and electricity were produced at the nation's former largest coal-fired power plant and heavy water was produced for use in production reactors. Since closure of the 484-D Powerhouse in 2012, D Area has been the focus of several remedial efforts concerned with tritium, acidity, metals, and chlorinated hydrocarbons from the activities that previously took place there. Groundwater and surface water characterization efforts during the 2020-2024 timeframe have characterized the extent of the per- and polyfluoroalkyl substances (PFAS) groundwater plume in the D-Area Groundwater (DAG) Operable Unit (OU).

Currently, SRS is owned by the United Stated Department of Energy (USDOE) while Savannah River Nuclear Solutions, LLC (SRNS) provides management and operating services. In pursuance of the criteria set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the USDOE has prepared this Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) to promptly manage PFAS contamination in the DAG OU, specifically the highest concentration portion of the PFAS groundwater plume. This RSER/EE/CA identifies the objectives of the treatment for the PFAS plume in the DAG OU, describes treatment alternatives that address the potential threats of the PFAS plume in the environment, and provides a vehicle for public comment in accordance with the NCP, 40 Code of Federal Regulations (CFR) § 300.415.

The public is encouraged to comment on the removal action alternatives presented in this RSER/EE/CA. Following the public comment period, an Action Memorandum will be prepared

by USDOE and added to the SRS Administrative Record, which is accessible by the public. All responses to the public comments will be included in an Action Memorandum.

Copies of this RSER/EE/CA and the Administrative Record for the SRS are available at the following locations:

U.S. Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina-Aiken
471 University Parkway
Aiken, South Carolina 29801
(803) 641–3465

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

The Administrative Record File is available electronically at the following address:

http://www.srs.gov/general/programs/soil/arf/arfirf.html

Hard copies of this RSER/EE/CA are available at the following locations:

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

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

To submit comments or request a public meeting during the public comment period, contact:

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2.0 SITE CHARACTERIZATION

2.1 Site Description and Background

D Area is located on an alluvial terrace in the southwest quadrant of SRS approximately 915 meters (m) (3,000 feet [ft]) east of the Savannah River (Figure 2). Elevation is roughly 37.5 m above mean sea level (amsl) (125 ft amsl), and local topography is relatively flat with a general slope from the northeast to the southwest.

Operable Unit Description

The DAG OU encompasses all the groundwater below D Area, west and southwest toward the Savannah River, and east and south toward Beaver Dam Creek and the D-Area Discharge Canal (Figure 2). The DAG OU consists of groundwater impacted by multiple waste units and facilities associated with the former operation of the 484-D Powerhouse and the production and rework of heavy water moderator for reactor operations. See Figure 3 for the location of the following waste units and facilities in D Area.

- 488-D Ash Basin (488-DAB), D-Area Coal Storage Area (484-17D) (DCSA), D-Area Coal Pile Runoff Basin (489-D) (CPRB), and D-Area Rubble Pit (431-2D) (DRP) (metals plume);
- D-Area Heavy Water Facility (411-D, 411-1D, 412-D, 412-1D, 413-D, and 413-1D) (DHWF) and including the 411-D and 411-3D Fire Fighting Training Area (FFTA) (volatile organic compounds [VOCs] and PFAS plume);
- Area adjacent to the Storage Shed for Steel and Pipe (711-D) (VOC plume);
- D-Area Heavy Water Rework Facility (DHWRF), also known as the 420-D Concentrator Building (tritium plume);
- Moderator Recovery Facility, also known as the 420-2D Rework Handling Facility (tritium plume);
- Moderator Handling and Storage Building (421-2D) (tritium plume);
- Control Laboratory/Supervisor's Office (772-D) (tritium plume); and

- Gasoline Station (715-D) (PFAS plume).

Operable Unit History

The 488-DAB, 489-D CPRB, and the 431-D DRP surface units received waste from operation of the coal-fired 484-D Powerhouse during its operational history. The 488-DAB and the 431-2D DRP are no longer operational, while the 489-D CPRB now only receives stormwater runoff. The 484-D Powerhouse began operation in 1952 and ceased operation in April 2012. Coal for the 484-D Powerhouse was stored in the 484-17D DCSA, which has undergone a removal to raise the pH in vadose zone soils. Exposure of the coal to rainwater resulted in the leaching of metals from both the coal and natural minerals in the underlying soils, leading to a low pH groundwater plume and a metals groundwater plume.

The DHWF and DHWRF were used in the production of heavy water for use in the SRS reactors. The DHWF consisted of six rows of bubble towers, which were used in series to progressively enrich water to 20% to 30% deuterium oxide. Operations of the bubble towers ceased in January 1982. The DHWRF was used to purify contaminated heavy water, and the 420-2D Rework Handling Facility was used to empty and fill contaminated heavy water drums. The Drum Storage Facility stored drums of degraded moderator water until 1988. The 772-D Control Laboratory and Supervisors Office provided sample analysis for heavy water production control and performed moderator chemistry control analyses in support of the reactors at SRS and the D Area moderator purification operations. Incidental releases of solvents and tritium-contaminated water from the operations at the DHWF and DHWRP resulted in a VOC and tritium groundwater plume.

After closure and dismantling of the DHWF, the FFTA (411-D and 411-3D) was established as SRS's main training facility in the late 1980s and was available for periodic use throughout the 1990s and mid-2000s. This area included shallow rimmed concrete fire pits where fuel fires were extinguished with aqueous film forming foam (AFFF) for training purposes. AFFF is a source of PFAS contaminants. The use of the AFFF has subsequently contaminated the vadose zone soil and groundwater with PFAS constituents within and downgradient of the 411-D/411-3D FFTA.

The 715-D Gasoline Station Area, including an underground storage tank (UST) (5,000-gallon capacity), was a former refueling station located just east of the 484-D Powerhouse. The fueling station was closed around 1983. Testimony from former D Area workers indicate that a car fire occurred near the 715-D Gasoline Station Area which may have been extinguished using AFFF.

2.2 Previous Actions

Previous remedial actions have been implemented to address the low pH metals plume (SRNS 2022b), the tritium vadose zone source area (SRNS 2012), and the VOC vadose zone source area (SRNS 2011a). There have been no previous remedial actions to address the DAG OU PFAS groundwater plume.

Remedial actions for the 488-DAB and the 431-2D DRP surface units were completed under the D-Area Expanded Operable Unit (DEXOU) project. The Record of Decision (ROD) Remedial Alternative Selection for the D-Area Expanded Operable Unit (WSRC 2004) documents the selection of a low permeability geosynthetic cover system installed over the 488-DAB, and land use controls and groundwater monitoring for the 488-DAB and the 431-2D DRP.

After the shutdown of the 484-D Powerhouse, the coal pile at the 484-17D DCSA was removed, and the area regraded and partially vegetated. Exposure of coal to rainwater led to the creation of sulfuric acid. As a result, the soils underneath the 484-17D DCSA, the associated storm water runoff to the 489-D CPRB, and groundwater underlying the area have been acidified. In response, a non-time critical (NTC) removal action was completed in 2020 that mixed neutralizing lime/calcium carbonate into the 484-17D DCSA vadose zone soils to a depth of 1.2 m (4 ft) below ground surface (bgs) to reduce acidic soil conditions (SRNS 2022b). The 489-D CPRB is no longer an active facility, and a NTC removal action was completed for the northern 25% section of the basin in 2011. The remaining 75% section was addressed under a NTC removal action in 2018 to remove coal fines and contaminated sediments from the basin. The southern 75% section remains open as a storm water retention structure. To address the low pH conditions in the groundwater beneath the 484-17 DCSA and 489-D CPRB and the discharge to surface water in the D-Area Discharge Canal, a treatability study was initiated which consisted of two elements: 1) Injection of potable water into the aquifer upgradient of the low-pH plume to flush the aquifer; and 2)

Construction of calcium carbonate reactive structures to adjust the pH in the D-Area Discharge Canal. Since March 2022, approximately 469,391 m^3 (124 million gallons) have been injected into the Upper Three Runs Aquifer (UTRA) as a part of the treatability study.

The DHWF, the DHWRF, 420-2D Rework Handling Facility, the 421-D Moderator Handling and Storage Building, and the 772-D Control Laboratory and Supervisors Office were previously sources of either VOC or tritium contamination to groundwater. These units have been decommissioned and/or decontaminated and are no longer a source of VOC or tritium contamination to groundwater.

Previous characterization for the DAOU First Early Action ROD (SRNS 2011b) investigated fuel/benzene, toluene, ethylbenzene, xylene (BTEX) products throughout the Bubble Tower Subunit soils, and groundwater samples have previously been monitored downgradient from the FFTA. These evaluations did not identify any soil contaminant migration threat that would impact groundwater and BTEX constituents were not detected in groundwater at the FFTA.

The UST at the 715-D Gas Station was removed in 1983 along with about 94.6 L (25 gallons) of pooled product beneath the tank. This UST was a source of fuel contamination to groundwater. The UST release was previously managed under the South Carolina Department of Environmental Service (SCDES) UST program (Permit #18936) and was closed in November 2012. With the removal of the UST and the pooled product beneath the tank, the 715-D Gas Station Area is no longer considered a source of fuel contamination to groundwater. Adjacent to the 715-D Gasoline Station Area was the Storage Shed for Steel and Pipe (711-D). Soil vapor extraction wells were employed at the area adjacent to the Storage Shed for Steel and Pipe (711-D) to address vadose zone VOC contamination.

2.3 Land Use

The area encompassed by the DAG OU includes zones currently designated for industrial use. Although the DAG OU and PFAS plume extends beyond the industrial use footprint of D Area, the NTC removal action proposed in this RSER/EE/CA would be implemented within the industrial use footprint. The UTRA, the target of this investigation, is not currently used regionally

as a drinking water source. Land use of the entire DAG OU area will be controlled as part of a future remedial decision in accordance with the *Early Action Land Use Control Implementation Plan for the D-Area Operable Unit* (SRNS 2011c) and the *SRS Land Use Control Assurance Plan* (WSRC 1999) to prevent the use of groundwater that exceeds maximum contaminant levels (MCLs).

2.4 Environmental Setting

The groundwater in the DAG OU discharges to a wetland area west of D Area or to surface water. The wetland area is part of the Savannah River and Floodplain Swamp Integrator Operable Unit (SRFS IOU). The SRFS IOU is primarily a mixed bottomland hardwood forest floodplain and contains cypress/tupelo swamp habitat. For more information about the environmental setting of DAG OU, see the *RCRA Facility Investigation/Remedial Investigation Work Plan for the D-Area Groundwater Operable Unit (D-Area Upgradient Sources) (U)* (SRNS 2022a).

2.5 Geology and Hydrogeology

A generalized lithostratigraphic - hydrostratigraphic column for the central SRS is shown in Figure 4. The column illustrates the current stratigraphic nomenclature used at SRS and the geological ages of the lithostratigraphic formations. The stratigraphy beneath the DAOU is typical of the central third of the SRS. The pertinent stratigraphy beneath D Area, in ascending order, is the Snapp, Fourmile Branch, Congaree, Warley Hill, and Tinker/Santee Formations. Over most of SRS, these units are overlain by the sands, clayey sands, and lesser clay lenses of the Dry Branch Formation, Tobacco Road San, and Altamaha Formation (“Upland” Unit). However, in D Area, west of the ash basins, these three shallowest lithostratigraphic units have been eroded by the ancestral Savannah River and locally replaced with a veneer of Quaternary stream terrace deposits.

D Area lies on sediments of the Santee Formation, which is lithologically heterogenous, where clay beds, sandy clay to clayey sand beds, and sand beds interfinger and are truncated over short distances. The Santee Formation primarily comprises the UTRA in D Area. The underlying Warley Hill Formation generally consists of very clayey sands and sandy clays to clays. The unit becomes increasingly clayey towards the base of the formation. The laterally continuous clayey sands to

clays in the Warley Hill and in the uppermost part of the underlying Congaree Formation constitute the Gordon Confining Unit (GCU) (Figure 4).

The Congaree often consists of clayey sands and clays, and the upper portion of the formation is often included in the GCU. The underlying Fourmile Branch Formation generally consists of moderately-sorted sands that constitute the main portion of the Gordon Aquifer (GA). The Snapp Formation constitutes the top of the Crouch Branch Confining Unit in the area.

The two aquifers of primary concern in D Area are the deeper GA and the shallow UTRA. The semi-confined GA is a 15.2 m (50 ft) thick sequence of fine to medium-grained sand that is overlain by the GCU; the GCU can be up to a 3.0 m (10 ft) thick clay layer or consist of silty/sandy clays to silty sands. The GCU is overlain by the UTRA, which is an unconfined series of interbedded and laterally discontinuous sand, silt, and clay beds ranging in thickness from 12.2 m (40 ft) to 18 m (60 ft) beneath D Area. West of 488-DAB, the UTRA and GCU are incised by 13.7 m (45 ft) thick sequence of Quaternary deposits consisting of fluvial clay, silt, and sand. The water table is encountered at a depth of approximately 4.6 m (15 ft) below ground surface, and shallower in many parts of D Area. Groundwater in the UTRA generally flows to the west-southwest near D Area and discharges to the floodplain and wetlands as well as the Savannah River (Figure 5). Groundwater flowrate in the UTRA has been calculated to be about 75 – 85 ft/yr based on data from the last few groundwater monitoring reports.

2.6 Nature and Extent of Contamination

This section will focus on the nature and extent of PFAS contamination within the DAG OU, specifically perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and perfluorobutanesulfonic acid (PFBS), as each have United States Environmental Protection Agency (USEPA) promulgated MCLs and are present in the DAG OU. Hexafluoropropylene oxide dimer acid (HFPO-DA), also known as GenX, is not detected in the DAG OU PFAS plume and is not discussed as part of the NTC removal action. Current PFAS MCLs are shown in Table 1, although it should be noted that USEPA announced in May 2025 its intention to rescind the MCLs for all PFAS excepting PFOS and PFOA. PFAS contamination in DAG OU has been extensively

characterized in pursuance of annual reporting requirements under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and during efforts to further characterize PFAS contamination. The findings of the fourth quarter (4Q)2024 sampling event to support the DAG OU annual report and the first quarter (1Q)2025 investigative sampling event are described below, with maximum PFAS groundwater concentrations (1/1/2024 – 6/30/2025) contained in Table 1.

Toxicity and Mobility Characteristics

PFAS, commonly known as "forever chemicals," do not degrade readily under normal environmental conditions due to their thermal and chemical stability. Their stability and tendency to bioaccumulate in living organisms can pose a risk even at very low concentrations, as reflected in their low MCLs and USEPA Regional Screening Levels (RSLs) (Table 1).

The mobility of PFAS in the environment varies based on their specific chemical structures and the characteristics of the soil or aquifer matrix, along with co-constituents. One subset of PFAS, perfluoroalkyl acids (PFAAs), have hydrophobic fluorinated carbon chain tails and hydrophilic functional group heads, commonly carboxylic acids or sulfonic acids. The protonation state of the functional group head influences contaminant transport, as it affects the molecule's charge and therefore interactions with the surrounding soil or aquifer matrix. At environmentally relevant pHs most PFAAs are deprotonated due to their low acid dissociation constants, resulting in a negative charge (ITRC 2023). This negative charge can lead to repulsion by negatively charged soil particles, enhancing mobility in groundwater. Additionally, the length of the fluorinated carbon chain impacts PFAS transport. Studies have shown that shorter fluorinated carbon chains lead to higher mobility of PFAS compounds in the environment (Anderson et al. 2016). Soil density and fraction of organic carbon significantly affect contaminant sorption coefficients, as demonstrated in a study on the partitioning of PFOA, PFOS, and perfluorooctane sulfonamide (PFOSA). Despite having the same carbon chain length, these compounds exhibited differing partitioning and mobility characteristics (Ahrens et al. 2011), indicating that the type of functional group head also plays a crucial role in the complex migration behavior of PFAS.

The PFAS targeted by this RSER/EE/CA are all defined as PFAAs and have either a carboxylic acid or sulfonic acid functional group head. They also vary in chain length from 4 carbons to 9 carbons (Table 2). Transport of these compounds in vadose and saturated zones is not yet fully understood; however, previous characterization efforts have proven adequate to understand the extent of PFAS groundwater contamination in the DAG OU and that they are quite mobile in DAG.

Characterization Efforts

Groundwater characterization efforts during the 2020-2024 timeframe have characterized the DAG OU PFAS groundwater plume. The 4Q2024 sampling event was completed in support of annual reporting requirements under CERCLA. The event consisted of 96 sample locations (75 groundwater wells and 21 surface water monitoring points) (Figure 6 and Figure 11). Widespread PFAS contamination above MCLs in the UTRA was seen during this sampling event. PFAS concentrations exceeded MCLs in 49 groundwater monitoring wells, all of which are screened in the UTRA. The 2024 individual PFAS constituents' groundwater plume sizes are as follows: PFOA ~ 234 hectares (577 acres); PFOS ~ 210 hectares (518 acres); PFNA ~ 197 hectares (487 acres); PFHxS ~ 51 hectares (125 acres); and PFBS - 0 hectares (results below RSL). In 2024, the maximum concentrations for PFOA (150 ng/L), PFOS (310 ng/L), PFNA (2,600 ng/L), PFHxS (120 ng/L), and PFBS (600 ng/L) were observed for these groundwater plumes. Plume maps showing the distribution and concentrations in the UTRA are depicted in Figure 7 through Figure 10. It is apparent that these PFAS species are very mobile in groundwater, as the first use of AFFF was in the 1980s, and the PFAS plumes have traveled over 2,249.4 m (7,380 ft) downgradient and now encompass over 247 hectares (610 acres) (Figure 12). The general distribution of the PFAS plumes tends to be from just northeast of the FFTA to the floodplains close to the Savannah River. The PFAS plumes overlap several other DAG OU plumes such as the trichloroethylene (TCE), tritium, and pH and metals plumes (Figure 13 through Figure 15), which will need to be considered in the selection and design of a treatment.

Twenty surface water sampling points exceeded at least one MCL for PFAS in 4Q2024 (Figure 7 through Figure 11). Surface water samples collected in the wetland during 4Q2024 (DSWM-Wet-01, DSWM-Wet-02, and DSWM-Wet-03) show that contaminated groundwater is potentially

discharging into the wetland. Concentrations exceeded MCLs for both PFOA and PFOS at each of these three locations. Savannah River surface water samples indicate that there is currently no significant contribution to PFAS concentrations in the river from D Area as samples upgradient and downgradient of D Area were similar (Figure 11). For more detail on contamination in the DAG OU, refer to the annual data summary report for 2023 data (SRNS 2024).

In 1Q2025, groundwater sampling and geologic characterization was conducted using ISOFlow and cone penetrometer testing (CPT) southwest of the FFTA and on the border of the hotspot area (PFNA => 1,000 ng/L) of the PFAS plume (Figure 16). Seven CPT borings were installed (numbered DCPT-01 through DCPT-07) generally from northwest to southeast. CPTs were used to provide a detailed geologic description of the subsurface before conducting the ISOFlow groundwater sampling. At each of the DISO ISOFlow locations, five sampling intervals were estimated using the CPT logs, and the final selected sample intervals were determined by the lithology seen during drilling. The data collected from the 1Q2025 investigative sampling event show that concentrations are highest at DISO-1 and tend to decrease moving toward DISO-7. Maximum concentrations for PFOA (80.2 ng/L), PFOS (440 ng/L), PFNA (1,670 ng/L), PFHxS (150 ng/L), and PFBS (15.9 ng/L) were observed at DISO-1. The highest PFAS concentration varied in depth from roughly 6.1-15.2 m (20-50 ft) bgs at northwestern locations, to 12.2-19.8 m (40-65 ft) bgs at locations further southwest. The concentrations of PFOA, PFOS, PFNA, PFHxS, and PFBS at each sampling location are shown in Table 3. Lithographic cross sections and PFAS plume maps generated from the ISOFlow samples are shown in Figure 17 through Figure 21. The groundwater data is also presented in Appendix C.

Characterization efforts within the DAG OU show that widespread PFAS concentrations, consistently exceeding USEPA MCLs, are present in the DAG OU. Contamination has migrated from the source area, through the UTRA, and directly southwest toward the Savannah River Floodplain and Swamp where groundwater discharges. This is generally shown in the conceptual site model illustrated in Figure 22. Along the high concentration portion of the plume where the investigative sampling was conducted, the highest PFAS concentrations were detected at the northwesternmost locations. The PFAS plume deepens and lowers in concentrations toward the southwest.

3.0 REMOVAL ACTION SCOPE AND OBJECTIVES

The NTC removal action proposed at the DAG OU is associated with PFAS contamination in the UTRA 10 to 100 times greater than MCLs. PFAS contamination in the UTRA is generally between 3.0-18.3 m bgs (10-60 ft bgs). Although the entire plume width is between ~ 1066.8-1219.2 m (3500-4000 ft), the higher concentration portion of the plume (~ 304.8 m [1000 ft]) is the focus of this action. The full vertical extent of PFAS contamination and an optimal transect of the plume, roughly perpendicular to groundwater flow, will be targeted. Treatment along this transect of the PFAS plume, approximated by the location of the 1Q2025 investigative sampling event, to significantly reduce downgradient PFAS migration will be evaluated in this NTC removal action. Final action for the DAG OU PFAS Plume will be managed as part of the final DAG OU remedial decision.

An effectiveness monitoring plan, specific to this removal action, will be developed to evaluate the short- and long-term impacts of this NTC removal action on the groundwater.

3.1 Justification for a Removal Action

USDOE, the lead agency, is mandated to take action to reduce the adverse effects of man-made contamination on human health and the environment. The NCP states that if the lead agency determines a release or potential release poses a threat to public health or welfare or the environment, the lead agency may take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release. This determination should be based on the factors identified in 40 CFR § 300.415(b) (2).

Several PFAS constituents exceed their respective MCLs in the DAG OU. PFAS contamination is migrating from the high concentration area of the PFAS plume though the UTRA towards the wetlands and the Savannah River. Downgradient concentrations will likely continue to increase until action is taken. Due to the proximity of the PFAS plume to the Savannah River, the DAG OU PFAS contamination meets the criteria in 40 CFR § 300.415(b) (2) (i): “Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.”

3.2 Removal Action Objectives

The removal action objective (RAO) for the PFAS contamination present in the DAG OU to protect human health and the environment includes the following:

- Reduce regulated PFAS (those with MCLs) concentrations in monitoring wells within or immediately downgradient of the treatment zone by 90% compared to upgradient monitoring wells.

The RAO, specifically the 90% reduction in PFAS concentrations, is based on SRS experience with remedial technologies (i.e., pump and treat, in-situ remediation, etc.) and industry studies for treatment of PFAS-contaminated groundwater using similar technologies (Singh et al. 2023; Pourabadehei, et al. 2025).

4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

In accordance with CERCLA, four alternatives for the DAG OU NTC Removal Action targeting PFAS contamination were examined. Although Alternative 2a and Alternative 2b are functionally very similar, these two alternatives are evaluated separately to provide more detail on two emplacement methods for the same type of treatment technology.

4.1 Alternative 1, No Action

The No Action alternative is required to be evaluated by the NCP to serve as a baseline for comparison to other alternatives. Under the No Action alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume. This alternative would leave the PFAS contamination within the DAG OU in its current condition with no additional controls.

4.2 Alternative 2a, In-situ Permeable Adsorptive Barrier (Colloidal Activated Carbon Injections)

An in-situ permeable adsorptive barrier (PAB) wall of colloidal activated carbon (CAC) (an adsorptive carbon material that can be suspended in an aqueous solution) will be constructed using

appropriate injection technology. The specific injection strategy and amount of adsorbent media will be determined in the design phase, after a vendor has been selected, to optimize immobilization of PFAS constituents and minimize CAC migration. Injection wells and/or direct push technologies may be used; furthermore, it may prove beneficial to utilize the funnel and gate approach to reduce the treatment zone length (i.e., impermeable barrier walls [funnel] to direct groundwater flow to the permeable zone or zones containing adsorbent material [gate]). Orientation of the PAB wall may vary depending on the design of the barrier and field interferences but will be roughly perpendicular to groundwater flow and generally align with the 1Q2025 investigative sampling event location. The PAB wall is estimated to be 304.8 m (1000 ft) in length and extend to a depth between 18.3-24.4 m (60-80 ft) bgs. The elevation of the treatment media should at least extend to the maximum observed groundwater elevation to prevent bypass of the barrier. Once injected, the CAC will coat the saturated soil and remain in place forming an adsorptive zone in the path of contaminant flow without significantly altering groundwater flow. The PAB wall will behave as a passive subsurface filter for groundwater. PFAS molecules will readily adsorb to the CAC and will be immobilized within the aquifer preventing the higher concentration portion of the PFAS plume from migrating downgradient and potentially impacting wetlands or surface water. Treated water flowing out of the PAB wall will move downgradient and flush out the contaminated aquifer leading to a reduction in PFAS concentrations. A monitoring network will be established which will include installation of additional wells. Over time, as the CAC adsorption sites become saturated, it may be necessary to add or replace adsorptive material. A generic graphical representation of Alternative 2a is shown in Figure 23.

4.3 Alternative 2b, In-situ Permeable Adsorptive Barrier (Granular Activated Carbon Trench)

An in-situ PAB wall of granular activated carbon (GAC) (a granular adsorptive carbon material commonly used for drinking water treatment) will be constructed. The adsorptive GAC will be supplemented with a substrate such as sand and/or gravel to create the barrier material. Orientation of the PAB wall may vary depending on the design of the barrier and field interferences but will be roughly perpendicular to groundwater flow and generally align with the 1Q2025 investigative

sampling event location. The PAB wall is estimated to be 304.8 m (1000 ft) in length and extend to a depth between 18.3-24.4 m (60-80 ft) bgs. The elevation of the treatment media should at least extend to the maximum observed groundwater elevation to prevent bypass of the barrier. The specific placement strategy and amount of adsorbent media will be determined in the design phase, after a vendor has been selected, to optimize immobilization of PFAS constituents. Long-arm excavators could be used to construct the trench but other technologies will be considered; furthermore, it may prove beneficial to utilize the funnel and gate approach to reduce the treatment zone length. PFAS contaminated soil removed during trench construction will need to be properly disposed of during barrier construction. A relatively homogeneous permeable barrier resulting from trenching and backfilling the trench will alter groundwater flow potentially creating preferential pathways through the GAC barrier. The PAB wall will behave as a passive subsurface filter for groundwater. PFAS molecules will readily adsorb to the adsorptive GAC and will be immobilized within the aquifer preventing the higher concentration portion of the PFAS plume from migrating downgradient and potentially impacting wetlands or surface water. Treated water flowing out of the PAB wall will move downgradient and flush out the contaminated aquifer leading to a reduction in PFAS concentrations. A monitoring network will be established which will include installation of additional wells. Over time, as the GAC adsorption sites become saturated, it may be necessary to add or replace adsorptive material. A generic graphical representation of Alternative 2b is shown in Figure 23.

4.4 Alternative 3, Pump and Treat

Extraction wells will be placed at the appropriate intervals along the PFAS plume to capture contaminated water migrating through the aquifer. An estimated five extraction wells will be used spaced roughly 61.0 (200 ft) apart. The screen zone of each extraction well should extend from the upper saturated zone to the maximum depth of observed PFAS contamination in the UTRA. The layout of extraction wells may vary depending on the design but will be roughly perpendicular to groundwater flow and generally align with the 1Q2025 investigative sampling event location. Capture zone modeling may be required to optimize the design of the pump and treat system. Extracted water will be pumped to a facility to be treated. An onsite treatment facility would need

to be constructed near the extraction wells to serve that purpose. Electrical and phone lines would be constructed for this facility. If needed, the water will be pretreated by technologies appropriate for the properties of the treatment water (e.g., organic matter, particulates, pH, etc.) to enhance and prolong treatment via GAC filters. Waste from the pretreatment process will be managed appropriately. The GAC filter vessels could be arranged in several different ways (e.g., in series or in parallel) and would partially determine how often the filter media will be removed/rearranged. Once the filter media is considered spent, it will be sent to a permitted reactivation facility where the GAC will be thermally reactivated at temperatures up to 982 degrees Celsius (roughly 1800 degrees Fahrenheit) (DiStefano et al., 2022). The reactivation process will revert the GAC to a renewed state while simultaneously destroying PFAS molecules. The reactivated GAC can then be recycled back into the treatment system, if desired. Treated water will be discharged to the D-006 ditch. A monitoring network will be established which will include installation of additional monitoring wells. A generic graphical representation of Alternative 3 is shown in Figure 24.

5.0 ANALYSIS AND COMPARISON OF REMOVAL ACTION ALTERNATIVES

Four removal action alternatives are evaluated in this RSER/EE/CA. According to the NCP, the No Action Alternative, Alternative 1, must be evaluated as a baseline. Alternative 2a and Alternative 2b both involve construction of a PAB wall in the subsurface to produce an in-situ filter that intercepts and immobilizes PFAS contaminants; however, Alternative 2a and 2b differ by the adsorptive material used and implementation methods. Alternative 3 utilizes pump and treat technology to extract PFAS contaminated groundwater from the subsurface and remove PFAS contaminants via GAC filter vessels. With Alternative 3, spent GAC filter media will be thermally reactivated to simultaneously renew the adsorptive properties of the GAC and destroy adsorbed PFAS contaminants. Alternatives 2a, 2b, and 3 will assume the same treatment length and depth: 304.8 m (1000 ft) and 16.8 m (55 ft) respectively.

Guidance on conducting NTC removal actions under CERCLA recommends each alternative be reviewed against three broad categories: effectiveness, implementability, and cost.

5.1 Effectiveness

Alternative 1, No Action, does not meet the effectiveness criteria. Leaving the PFAS plumes associated with the DAG OU in place does not reduce the migration of PFAS contaminated groundwater. This alternative does not contribute to a reduction in toxicity, mobility, or volume, and thus is not effective in meeting the RAO.

Alternative 2a, In-situ PAB (CAC Injections), meets the effectiveness criteria by reducing PFAS mobility in the subsurface. Addition of an adsorptive barrier in the path of contaminant flow will sequester PFAS and bind them in place where they will remain indefinitely. Treated water flowing from the PAB will dilute and flush out the contaminated aquifer leading to a reduction in PFAS concentrations in groundwater downgradient. Capture and accumulation of PFAS molecules on adsorptive media will decrease the volume of contaminated media by removing PFAS from groundwater and concentrating it. Activated carbon adsorption is proven to be effective at capturing PFAS molecules due to the high surface area of activated carbon paired with hydrophobic interactions with contaminants. In-situ application of CAC has been extensively studied and deployed in the field. In many cases, PFAS concentrations downgradient of CAC injections have been observed to decrease to below detection limits (Carey et al., 2022), indicating how effective carbon adsorption can be at reducing contaminant mobility. The amount of adsorbent media will be determined in the design phase after a vendor has been selected, optimizing immobilization of PFAS constituents specific to the DAG OU.

Alternative 2a will be effective in the short- and long-term. In the case of a well-implemented CAC barrier (without partial groundwater bypass), PFAS concentrations have been observed to decrease to non-detect levels within months of application and are proven to be generally successful between 0.3-6 years. Long-term modeling estimates that the injections of CAC will be effective for much longer depending on the design of the barrier and aquifer conditions (Carey et al. 2022; McGregor 2018). Reapplication of adsorptive material can extend the barrier lifetime for ongoing effectiveness; likewise, source elimination will extend the barrier lifetime. Limited remobilization of PFAS molecules has been observed after adsorption to CAC in natural environments which contributes to the long-term effectiveness of Alternative 2a. This alternative is estimated to take

about 6 months to install. This alternative will provide overall protection of human health and the environment by sequestering PFAS contamination in-situ.

Alternative 2b, In-situ PAB (GAC Trench), meets the effectiveness criteria by reducing PFAS mobility in the subsurface. Addition of an adsorptive barrier in the path of contaminant flow will sequester PFAS molecules and bind them in place where they will remain indefinitely. Treated water flowing from the PAB will dilute and flush out the contaminated aquifer leading to a reduction in PFAS concentrations in groundwater downgradient. Capture and accumulation of PFAS molecules on adsorptive media will decrease the volume of contaminated media by removing PFAS from groundwater and concentrating it. Activated carbon adsorption is proven to be effective at capturing PFAS molecules due to the high surface area of activated carbon paired with hydrophobic interactions with contaminants. GAC is commonly used for drinking water treatment, including treatment of PFAS contaminated water. GAC applications for in-situ PFAS treatment have been limited. However, GAC has been successfully utilized in several in-situ barrier walls aimed at treating other contaminants in groundwater (e.g., polycyclic aromatic hydrocarbons and VOCs) (Singh et al. 2023) and in combination with another adsorbent to treat PFAS-contaminated groundwater in a pilot-scale in-situ treatment train (Pourabadehei, et al. 2025). PFAS plumes can partially bypass PABs in the presence of high conductivity zones; however, since the subsurface is homogenized during trench construction, this will likely limit contaminant bypass of the barrier if the barrier substrate is more permeable than surrounding sediment. The amount of adsorbent media will be determined in the design phase after a vendor has been selected, optimizing immobilization of PFAS constituents specific to the DAG OU.

Alternative 2b will be effective in the short- and long-term. Reapplication of adsorptive material can extend the barrier lifetime for ongoing effectiveness; likewise, source elimination will extend the barrier lifetime. Limited remobilization of PFAS molecules has been observed after adsorption to GAC in drinking water treatment applications which contributes to the long-term effectiveness of Alternative 2b. Short-term effectiveness has been shown in previous studies of similar technologies: During the pilot-scale in-situ treatment train mentioned previously, "… lead and lag cells reached 100% PFAS removal approximately 6 months …" after the in-situ treatment train began operation (Pourabadehei, et al. 2025). It is expected that this alternative would take about 6

months to install. This alternative will provide overall protection of human health and the environment by sequestering PFAS contamination in-situ.

Alternative 3, Pump and Treat, meets the effectiveness criteria by reducing migration of PFAS contaminated groundwater. Recovering contaminated groundwater from the aquifer limits downgradient migration and removes PFAS contamination from the subsurface. Alternative 3 reduces the contaminant volume/mass through treatment of the contaminated groundwater and spent GAC. PFAS are removed from the aqueous phase and concentrated on adsorptive GAC media. GAC utilized to treat PFAS in groundwater has been capable of achieving non-detect levels in treated water at a treatment system at Brookhaven National Laboratory (BNL 2023). Removal efficiency of the GAC media is proportional to the frequency GAC is changed out, meaning PFAS removal efficiency can remain very high throughout the lifetime of Alternative 3, but it may necessitate frequent GAC change outs. Spent GAC media will be thermally reactivated simultaneously reopening adsorption sites on the GAC and destroying PFAS molecules. Reactivation of spent GAC has been shown to need lower temperatures than generally required for PFAS destruction and can achieve high destruction efficiencies (>99.99% for PFOA, PFOS, GenX, and PFBS) (DiStefano et al., 2022). Alternative 3 will achieve long-term effectiveness by constant replenishment of GAC media which removes PFAS from the extracted groundwater and then by destroying the PFAS contaminants during the reactivation process. This alternative is expected to be effective in the short term, although it is estimated that it will take 1 to 2 years to complete the permitting and infrastructure and treatment plant construction. This alternative will provide overall protection of human health and the environment by limiting downgradient expansion of the PFAS plume and ultimately destroying the captured PFAS.

Identification of Applicable or Relevant and Appropriate Standards

In accordance with 40 CFR § 300.415(j) of the NCP, on-site removal actions conducted under CERCLA of 1980, as amended, are required to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the exigencies of the situation. In determining whether compliance with ARARs is practicable, the lead agency may consider appropriate factors, including 1) the urgency of the situation; and 2) the scope of the removal

action. ARARs include only federal and state environmental or facility siting laws/regulations; they do not include occupational safety or worker protection requirements. Compliance with OSHA standards is required by 40 CFR § 300.150. For purposes of ease of identification, the USEPA has created three categories of ARARs: Chemical-, Location- and Action-Specific. Additionally, per 40 CFR § 300.405(g)(3), other advisories, criteria, or guidance may be considered in determining remedies (to-be-considered [TBC]) category]. USDOE, the lead agency at the SRS, is expected to comply with ARARs and TBC guidance as set forth in the RSER/EE/CA when conducting this NTC removal action.

Applicable requirements, as defined in 40 CFR § 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements, as defined in 40 CFR § 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Under Section 121 of CERCLA, any material remaining on site must reach a level or standard of control equal to that of any other applicable or relevant and appropriate standard or requirement promulgated under any federal or more stringent state environmental statute. The term "promulgated" means that the requirement generally is applicable and legally enforceable. The ARAR concept is pertinent only to onsite actions; offsite actions must comply with all applicable federal and state requirements. A requirement under other environmental laws may be either "applicable" or "relevant and appropriate," but not both. The first step in identifying ARARs is to determine if a requirement is applicable.

ARARs are identified for the DAG OU NTC removal action in Appendix A for Alternatives 2a, 2b, and 3. This RSER/EE/CA does not propose to waive any ARARs. The final condition of the site after the NTC removal action will leave some contaminants in the groundwater that are not being addressed by this NTC removal action. The final disposition of all DAG OU groundwater plumes will be addressed under a separate remedial action(s) as defined in the ROD for the DAG OU, which will likely include land use controls until MCLs in groundwater are met. Existing administrative controls will remain in place until the final disposition of the DAG OU. Completion activities are identified in the FFA, a legally binding and enforceable tri-party agreement between USDOE and the two regulatory agencies, USEPA and SCDES.

5.2 Implementability

Implementability of each alternative was assessed against the criteria below:

- Technical feasibility with regard to available techniques and demonstrated methods for accomplishing the proposed alternative
- Administrative feasibility with regard to operations personnel and other resources to complete the alternative's implementation; also, the availability of specific equipment and technical specialists
- Regulatory acceptance of the preferred alternative
- Community acceptance of the preferred alternative. USDOE–Savannah River will provide for a public comment period, and comments concerning the proposed action will be incorporated into the comment responses and included with the Action Memorandum.

Alternative 1, No Action, is the current condition and would not require any additional resources to implement. PFAS concentrations in the DAG OU will remain above MCLs and be free to travel within the UTRA. Although Alternative 1 requires no technical or administrative effort, it is unlikely to be implemented based on regulatory requirements set for PFAS compounds and the potential risk to human health and ecological receptors.

Alternative 2a, In-situ PAB (CAC Injections), could be implemented without major technical or administrative concern. Permeable reactive barriers (PRBs), functionally similar to PABs, have been implemented at SRS, and site personnel are knowledgeable about the technology. Implementation of the PAB will likely be subcontracted to readily available vendors experienced with CAC injections. The required materials and equipment for construction of an adsorptive barrier are also readily available; Furthermore, a DPT drill rig and/or injection wells will likely be used and are technologies SRS personnel are very familiar with. Alternative 2a could be implemented with one-time material placement. Technical challenges could arise because of the subsurface interferences likely to be encountered due to the large number of injection points, and complexity of the aquifer present (e.g., preferential pathways and low permeability zones) around the potential implementation location. The aquifer characteristics in the proposed zone of injection are well understood based on previous characterization. In addition, although an injection permit will be required to inject CAC, SRS has successfully obtained SCDES injection permits for numerous groundwater remedies.

Alternative 2b, In-situ PAB (GAC Trench), could be implemented without major technical or administrative concern. PRBs, functionally similar to PABs, have been implemented at SRS, and site personnel are knowledgeable about the technology. Implementation of the PAB will likely be subcontracted to experienced vendors, which are readily available. The required materials and equipment for construction of an adsorptive barrier are also readily available. Furthermore, trenching is also a technology familiar with SRS personnel. Contaminated soil will need to be disposed of if removed from the subsurface to be replaced with barrier material. Disposal of PFAS containing waste can be both difficult and expensive, likely requiring further treatment and/or disposal in a Subtitle C landfill. Alternative 2b could be implemented with one-time material placement. Technical challenges could arise because of the subsurface interferences (e.g. utilities) likely to be encountered due to the continuous trench. In addition, although an injection permit will be required to place GAC in the subsurface, SRS has worked with SCDES to obtain injection permits for numerous groundwater remedies.

Alternative 3, Pump and Treat, could be implemented without major technical or administrative concern as demonstrated at several pump and treat remediations implemented and operated at SRS

over the years. Site personnel have the knowledge and experience to ensure successful implementation and operation of a pump and treat system. The optimal location and number of extraction wells would be determined by groundwater modeling using fairly well understood aquifer properties in the vicinity of the targeted plume. Design and construction of the ex-situ GAC filter vessels will likely be subcontracted to experienced vendors, which are readily available. SRS currently operates GAC filter vessels at the effluent treatment facility for industrial water treatment applications, and other types of treatment vessels have been utilized for F Area groundwater treatment; therefore, this technology is not new to SRS. However, the geochemistry of the water will have to be assessed to determine if pre-treatment will be required to prevent biofouling or solids precipitation that would reduce the efficiency/longevity of the GAC. Disposal of pre-treatment media may be required. Alternative 3 will require significantly more permitting than Alternative 2a or 2b because contamination is continuously removed from the subsurface and being treated. Several initial permitting/reporting requirements will need to be met to implement Alternative 3. Reactivation of spent GAC will be managed through offsite vendors as SRS does not have the capability to reactivate GAC nor is SRS likely to construct a reactivation facility for this purpose. Reactivation facilities are readily available in the United States. Transportation of the spent GAC to the carbon reactivation facility will likely pose the highest difficulty as this waste will likely need to be shipped long distances. Shipping permits and qualified drivers will be needed to transport the spent GAC to the reactivation facility.

5.3 Cost

The cost categories considered for the removal action alternatives were capital and operation and maintenance (O&M). Direct capital costs were summarized as infrastructure, site preparation, storm water management, treatment implementation, site restoration, and monitoring network. Alternative 1 has no associated costs, so all fields are blank. Alternative 2a, 2b, and Alternative 3 have costs associated with each of these categories apart from site restoration for Alternative 3 as it is included as a percentage of the total. Indirect capital costs were calculated using a percentage of the direct capital costs (excluding monitoring well network implementation as this cost had more certainty associated with it). Note that pretreatment and capture zone modeling for

Alternative 3 was not accounted for in the cost estimate but should be included in the final design. O&M activities associated with Alternative 2a, 2b, and Alternate 3 were estimated for one-year, three-year, and 15-year activities. Present values were calculated assuming 30-year O&M for both alternatives. Indirect O&M costs were calculated using a percentage of the direct O&M costs.

The cost estimates were developed based on the current understanding of the DAG OU PFAS plume, described in Section 2.6, and the basic descriptions of each alternative presented in Section 4.0. Where possible, elements of cost estimates previously prepared for similar alternatives were used and were scaled to be representative of 2025 dollars. The cost estimates provided in this document were developed for comparative evaluation only with an expected level of accuracy of -30% to +50%. Once the removal alternative is selected, a more detailed cost analysis will be performed based on preliminary design information.

The estimated cost, including direct and indirect capital costs, as well as the present worth of direct and indirect O&M costs for 30 years are summarized below for each alternative:

- Alternative 1. No Action ~$0
- Alternative 2a. In-situ PAB (CAC Injection) ~$15.59M
- Alternative 2b. In-situ PAB (GAC Trench) ~$40.17M
- Alternative 3. Pump and Treat ~$24.27M

*Million (M)

Detailed costs for each alternative are presented in Appendix B.

5.4 Comparison of Removal Action Alternatives

A comparative analysis of the removal action alternatives is summarized in the table below. The criteria of effectiveness, implementability, and cost were ranked as low, medium, or high for each alternative. A ranking of “low” indicates the least favorable score in comparison with the other alternatives, and a ranking of “high” indicates the most favorable score. Effective PFAS plume capture is assumed for both alternatives.

Alternative 1 was given an effectiveness score of low, with no action not addressing elevated PFAS contaminant levels. Both Alternative 2a and Alternative 2b were qualitatively given an effectiveness score of medium because, while the PAB wall technology has been proven effective in the field as discussed in the previous sections, in general in-situ technologies have greater uncertainty in getting contact between the contaminants and the treatment media. It also may require addition or replacement of adsorbent material as the effectiveness of the barrier decreases over time. Alternative 3 was qualitatively given an effectiveness ranking of high. GAC treatment is well documented to be effective in ex-situ applications for PFAS contaminated water treatment, and plume capture and treatment will be achieved through continuous pumping and frequent changeouts of adsorbent material at the treatment facility. It is important to note that Alternative 3 can create exposure pathways along the lengthy treatment process associated with treatment of the contaminated groundwater (Hall et al., 2024), while Alternatives 2a and 2b sequester PFAS contamination in the aquifer preventing ex-situ treatment-related exposure of human or ecological receptors to PFAS; although, Alternative 3 does destroy PFAS constituents, which eliminates the potential for future exposure of those destroyed constituents.

Alternative 1 was given an implementability score of high because no resources or actions are required to implement. Alternative 2a and Alternative 2b can be implemented with one-time material placement. SRS has experience with potential emplacement techniques for both Alternative 2a and 2b; additionally, neither of these alternatives require a disposition pathway being established for routine disposal of waste, as PFAS contaminants are sequestered in the aquifer. For these reasons, the implementability of Alternative 2a was qualitatively scored as high. Alternative 2b however will require more construction work (associated with digging the trench), generate PFAS contaminated soils that will need disposal, and is the lesser used technique for treating PFAS contaminated groundwater in-situ when compared to Alternative 2a. For these reasons Alterative 2b was qualitatively scored as medium for implementability. Implementability of Alternative 3 was qualitatively scored as medium due to the required construction and establishment of a PFAS deposition pathway. This would include construction of several extraction wells and an onsite GAC treatment facility (likely including pretreatment with its own waste management), spent GAC shipping to a reactivation facility, and permitting. There is also

the possibility that water captured by the extraction wells may contain unacceptable levels of tritium. Alternative 3 will be more difficult to implement than Alternative 2a because of the multi-step treatment approach and the regulatory requirements centered around facility operation and waste management.

Acceptance of Alternative 1 was qualitatively scored as low because this alternative does not result in any reduction in contaminant mobility, toxicity, or volume and does not decrease the risk to downgradient receptors. Alternative 2a and Alternative 2b were qualitatively scored as high because PRBs, which are similar functionally to a PAB, have been implemented at SRS. In addition, regarding Alternative 2a, CAC barriers have been implemented at several locations in the United States which have been successful at decreasing downgradient concentrations (Regenesis 2022; Regenesis 2023; Regenesis 2025). Alternative 2a will also not remove PFAS constituents from the subsurface (which could introduce other exposure pathways). Alternative 3 is highly likely to be accepted due to the history of pump and treat systems at SRS and previous success through use of these systems; in addition, this alternative destroys PFAS.

	Effectiveness	Implementability	Cost*	Acceptance
Alternative 1 No Action	Low	High	$0	Low
Alternative 2a In-situ PAB (CAC Injections)	Medium	High	$15.59M	High
Alternative 2b In-situ PAB (GAC Trench)	Medium	Medium	$40.17M	High
Alternative 3 Pump and Treat	High	Medium	$24.27M	High

Note: Range is Low to High, where Low = worst and High = best.
PAB – permeable adsorptive barrier; CAC – colloidal activated carbon; GAC – granular activated carbon
*Million (M)

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Based on the evaluation of removal action alternatives in this RSER/EE/CA, the lead agency recommends Alternative 2a, In-situ PAB (CAC Injections), is the best solution based on ability to meet RAOs and the tradeoffs among evaluation criteria. Alternative 2a meets the RAO by sequestering PFAS contaminants on CAC material injected within the subsurface. This alternative will provide overall protection of human health and the environment by preventing ex-situ treatment-related exposure of human and ecological receptors to PFAS. In-situ adsorptive barriers of CAC can achieve high percent reductions in PFAS concentrations in groundwater, and are effective in the short- and long-term, as discussed in Section 5.1. Alternative 2a will also require much less management over the lifetime of the barrier system, likely limited to monitoring and reporting for O&M, because it is a passive system which does not create any waste, unlike Alternative 3. Compared to Alternative 2b, Alterative 2a will generate minimal waste during construction and CAC injections are much more widely utilized. Alternative 2a will be easier to implement than both Alterative 2b and Alternative 3 because of easier construction and very limited waste disposal. The minimally invasive one-time application, absence of a waste disposal pathway, and minimal O&M costs all contribute to Alternative 2a having the lowest cost, other than the No Action alternative.

Use of a NTC removal action is an effective strategy for cost-effectively reducing obvious risks and supporting area closure by initiating early actions while meeting necessary ARARs. This alternative will not preclude any additional remediation of the DAG OU and is consistent with the current and future land use.

7.0 NATIONAL ENVIRONMENTAL POLICY CONSIDERATIONS

This RSER/EE/CA conforms to USDOE policy (i.e., DOE Order 451.1B, “National Environmental Policy Act Compliance Program”) to incorporate National Environmental Policy Act (NEPA) values in USDOE CERCLA documents. NEPA values include consideration of socioeconomic, demographic, environmental justice, archaeological, historical, cultural, natural resources, protected species, floodplains, wetlands, and cumulative impacts of the proposed action.

The area impacted by the recommended NTC removal action represents no cultural or historical significance. It has not been identified that this area hosts structures which qualify as historically significant as documented in the SRS's Cold War Built Environmental Cultural Resource Management Plan (CRMP) (USDOE 2005). The site of the proposed NTC removal action is located within an established industrial landscape. Any previously existing archaeological, cultural, or historical resource(s) in the project area would have been destroyed by extensive land alterations and modern construction-related activities associated with development of the DAOU. Implementation of the proposed removal action would have a negligible impact on SRS archaeological, cultural, or historical resources.

8.0 PROJECT SCHEDULE

This RSER/EE/CA will be submitted to USEPA and SCDES for review and comment. The RSER/EE/CA will be available for public comment following this review. The removal action schedule is presented below:

Submit Rev 0 RSER/EE/CA for Regulatory Comment	January 2026
Submit Rev 1 RSER/EE/CA for Regulatory Comment	May 2026
Issue RSER/EE/CA for Public Comment	July 2026
Publish Action Memorandum	September 2026
Procure contractor	FY27
Submit Removal Action Design Plan	FY27
Removal Action Start	FY28
Anticipated Completion of Removal Action	FY28
Removal Action Post Construction Report	FY29

9.0 REFERENCES

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40 CFR 300.500. “General”. Protection of Environment. Environmental Protection Agency. Code of Federal Regulations.

40 CFR 300.405. “Discovery or notification”. Protection of Environment. Environmental Protection Agency. Code of Federal Regulations.

40 CFR 300.410. “Removal Site Evaluation”. Protection of Environment. Environmental Protection Agency. Code of Federal Regulations.

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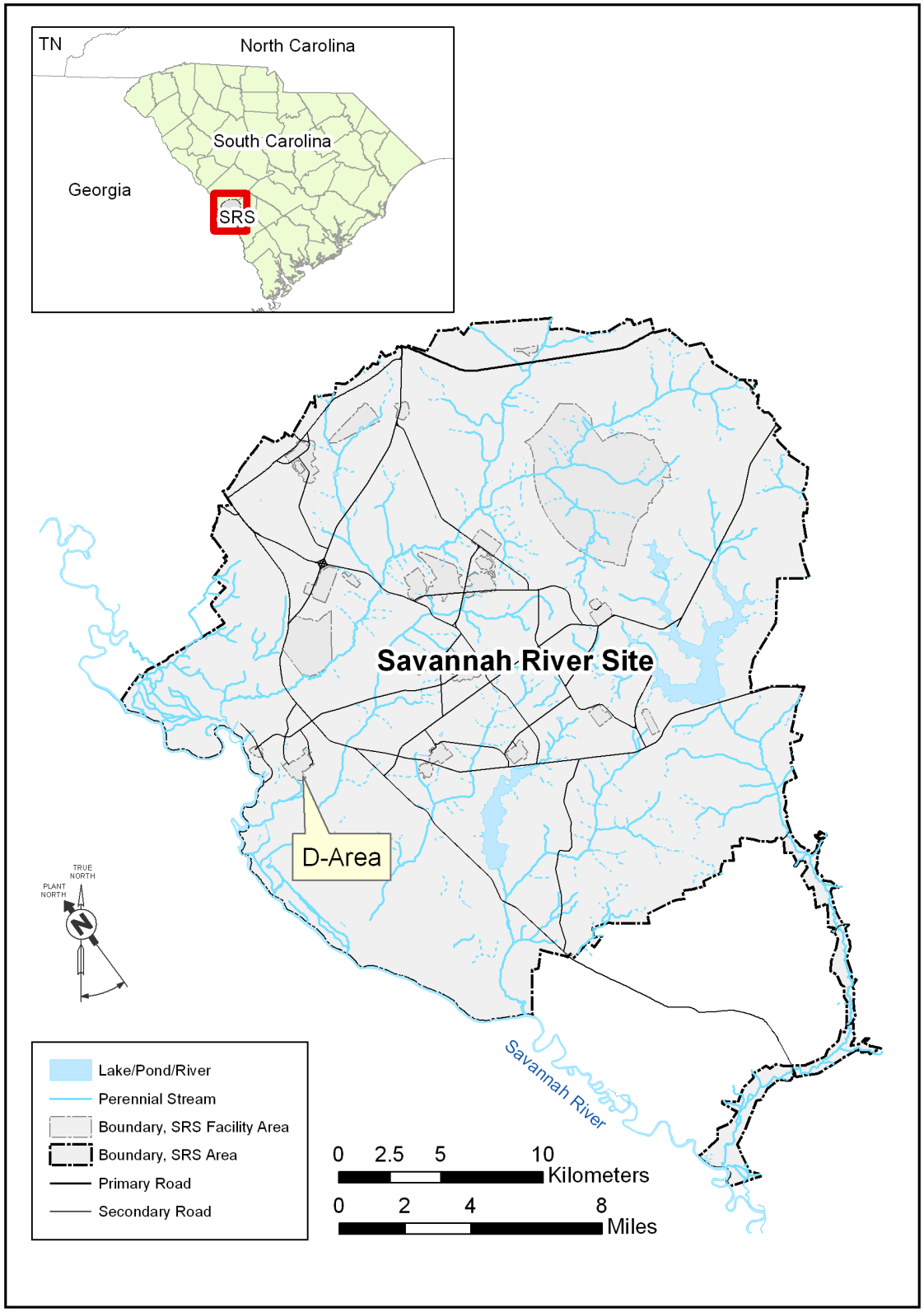


Figure 1. Geologic Proximity of Savannah River Site

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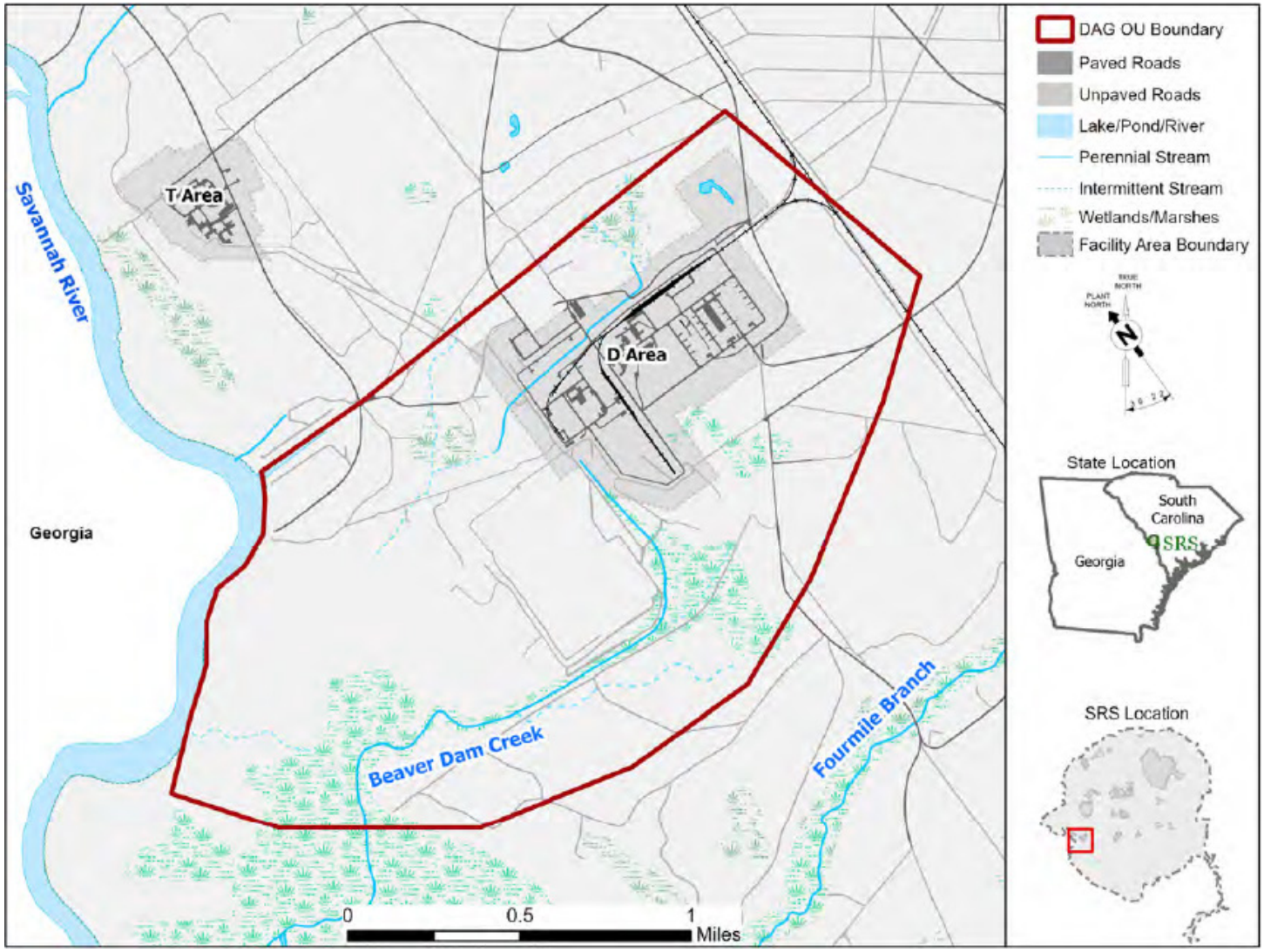


Figure 2. Location of DAG OU at the Savannah River Site

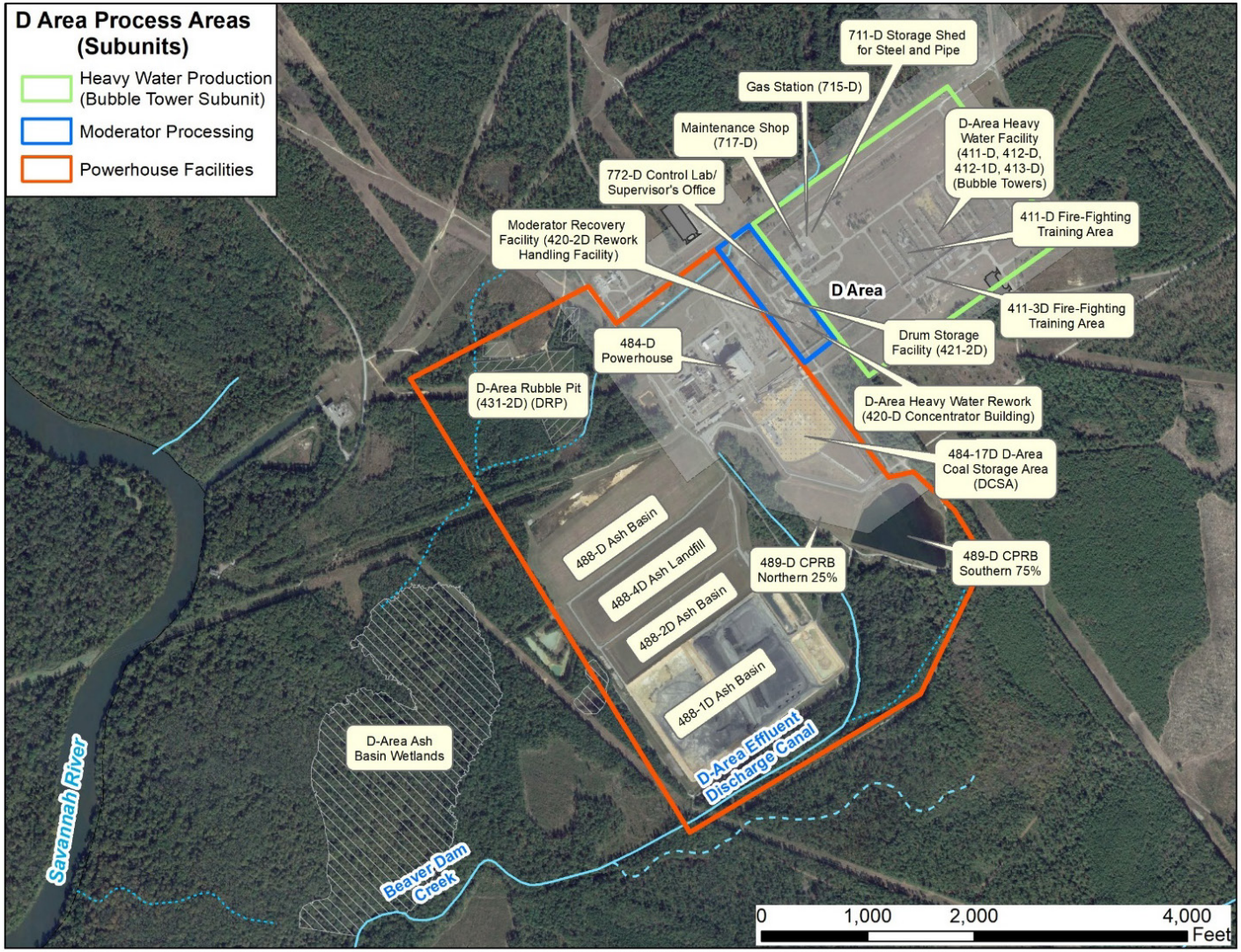


Figure 3. D Area Waste Units and Facilities

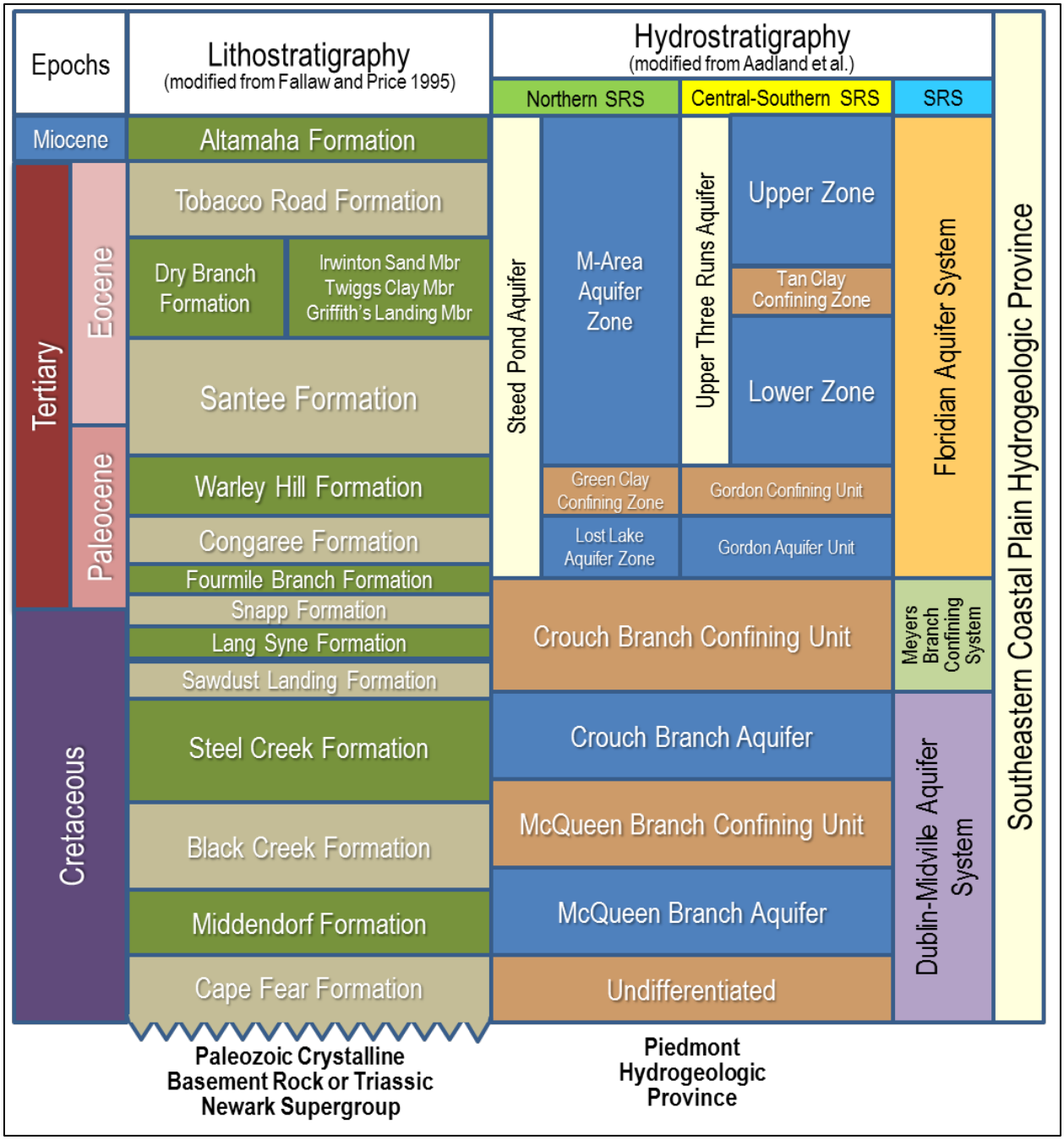


Figure 4. Lithostratigraphic and Hydrostratigraphic Units at SRS

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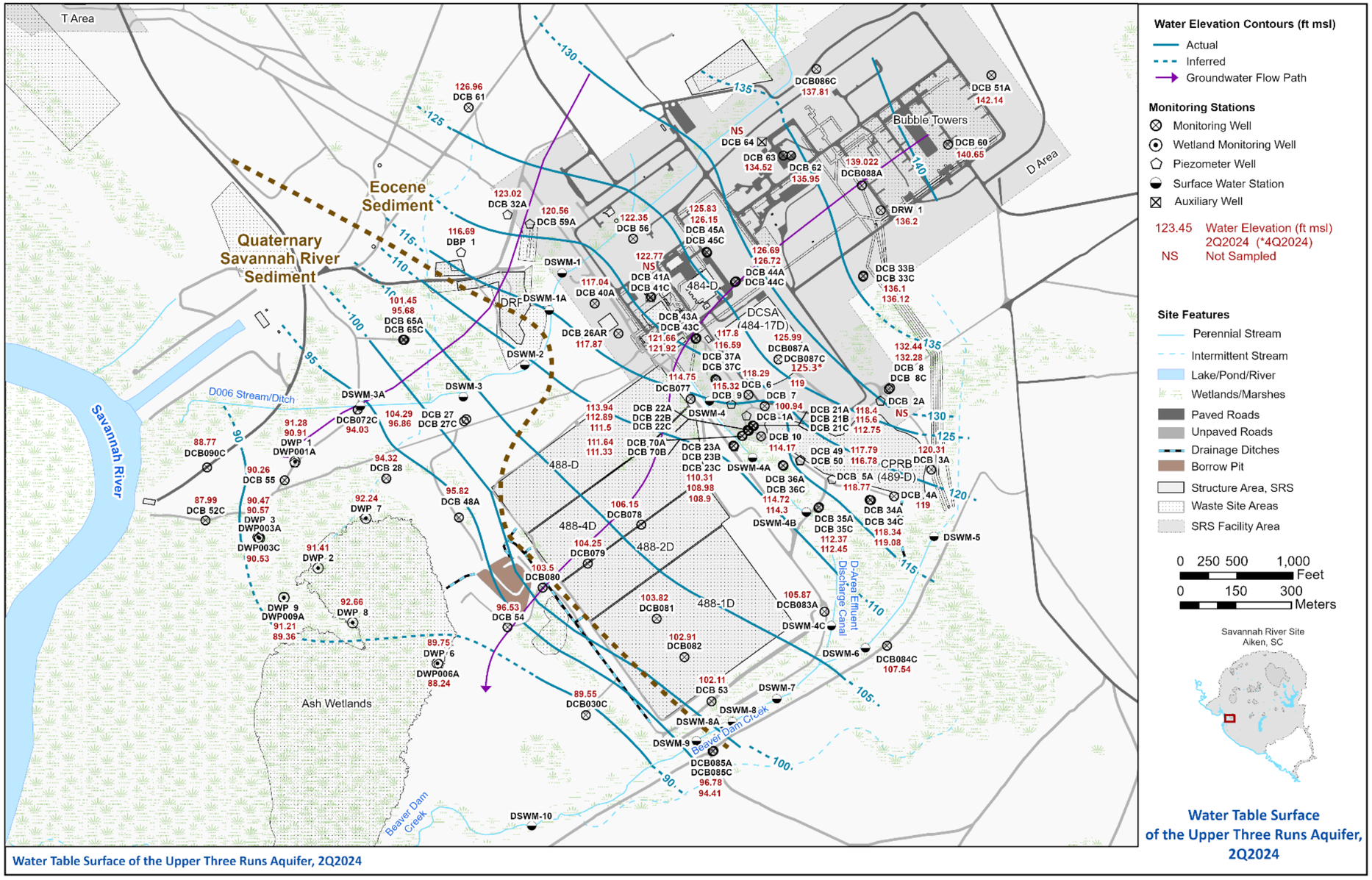


Figure 5. Water Level and Flow Direction of the UTRA

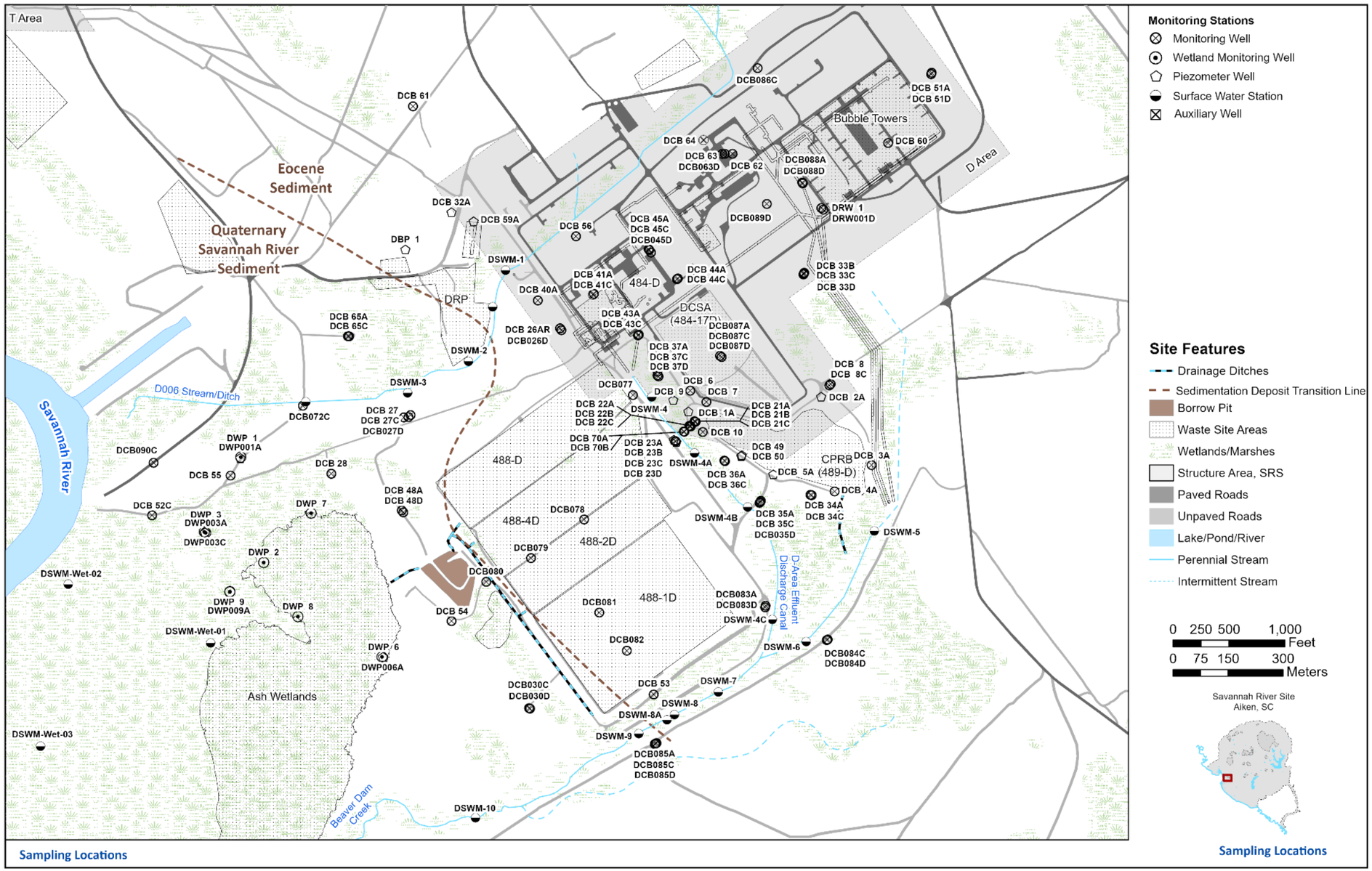


Figure 6. Sampling Locations

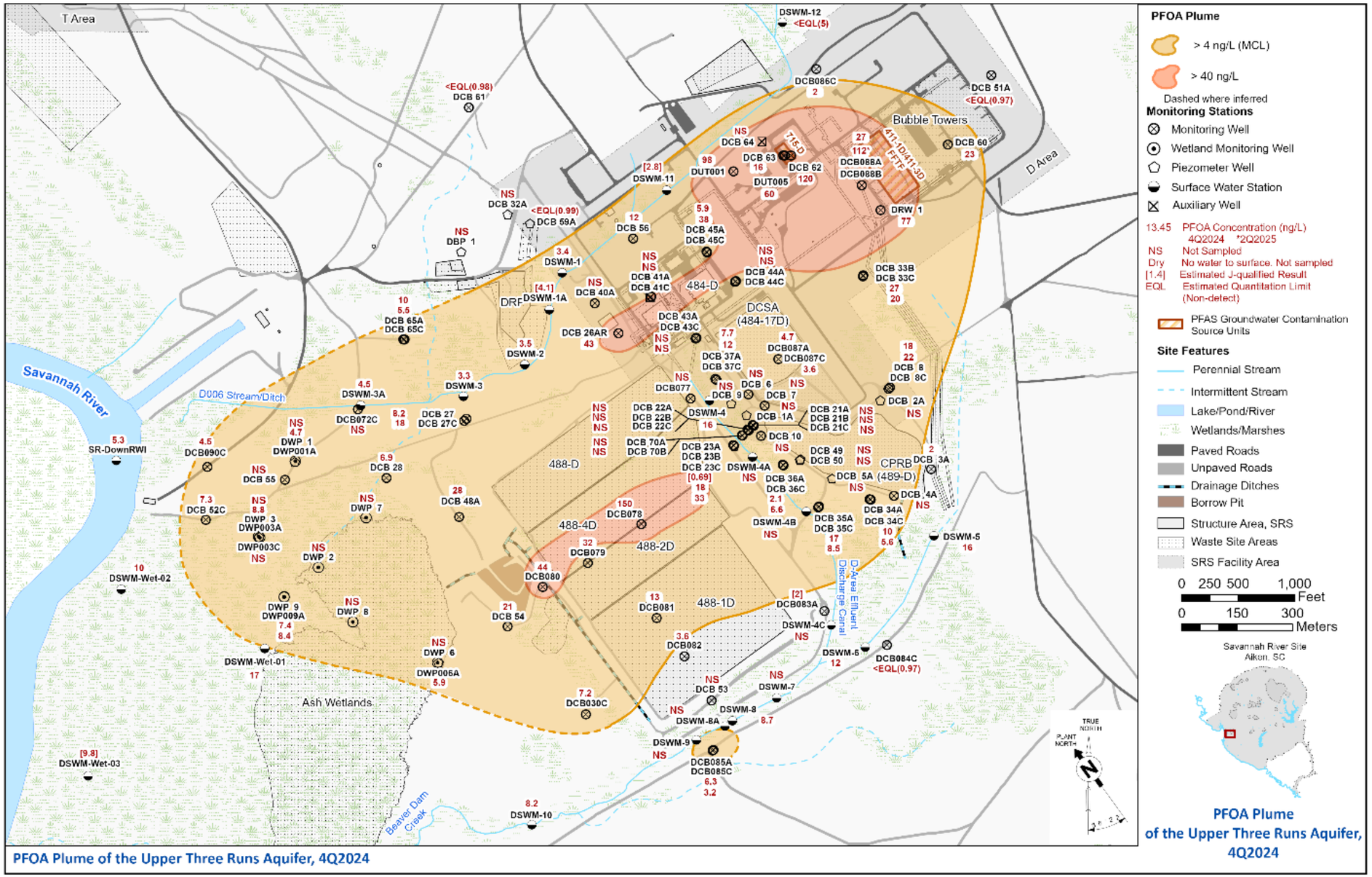
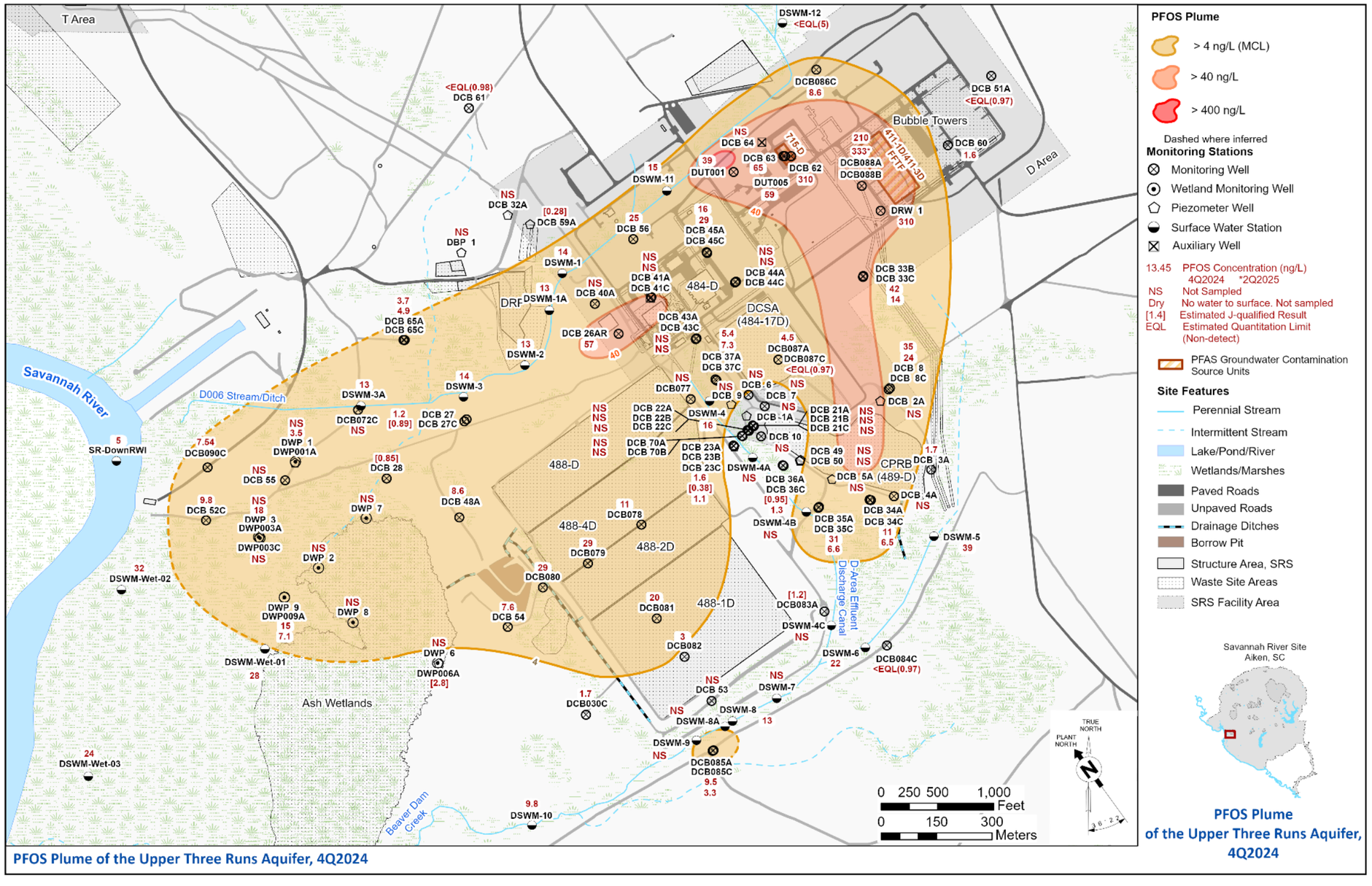


Figure 7. 4Q2024 DAG OU PFOA Plume Map



PFOS Plume of the Upper Three Runs Aquifer, 4Q2024

Figure 8. 4Q2024 DAG OU PFOS Plume Map

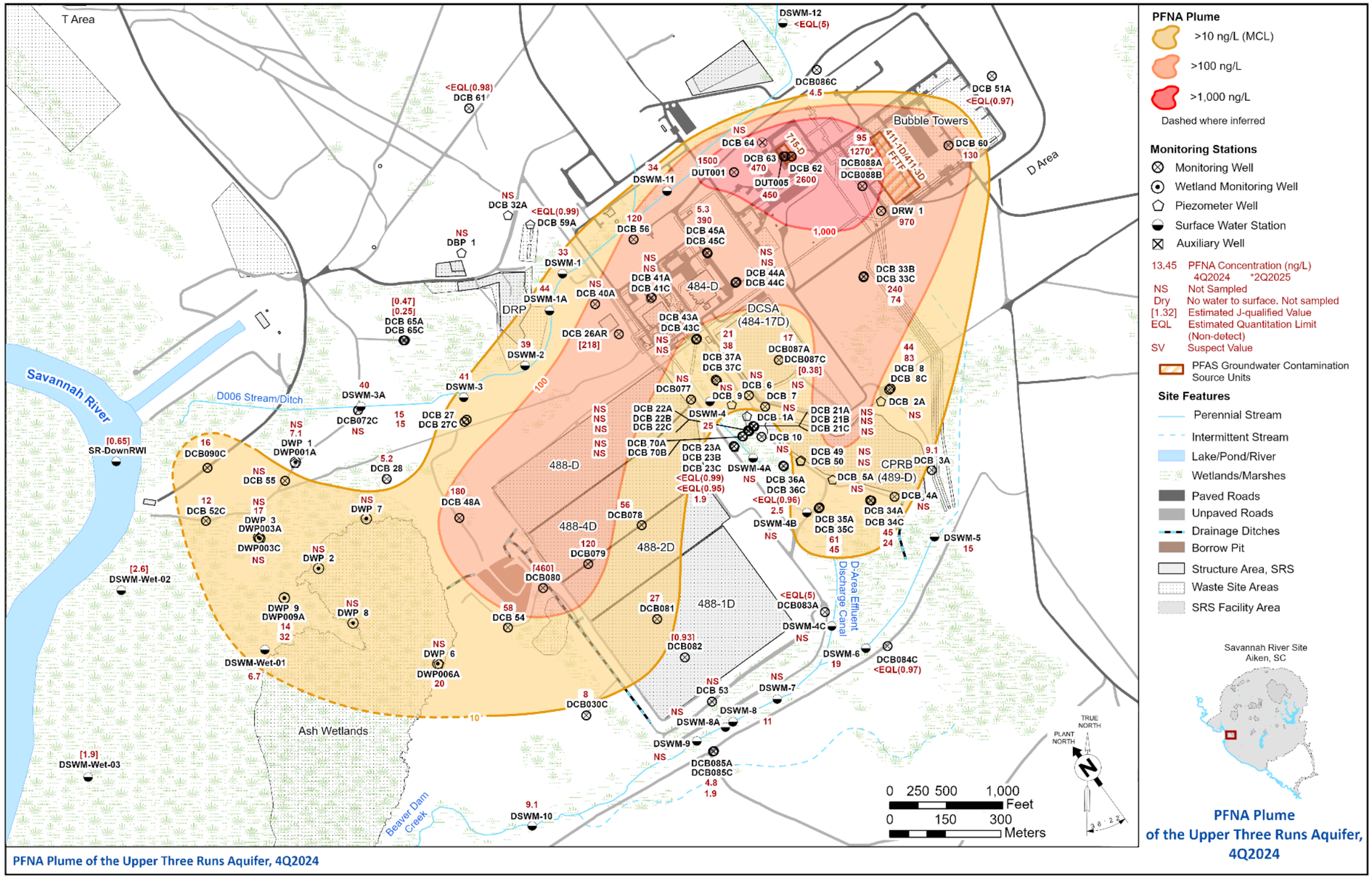


Figure 9. 4Q2024 DAG OU PFNA Plume Map

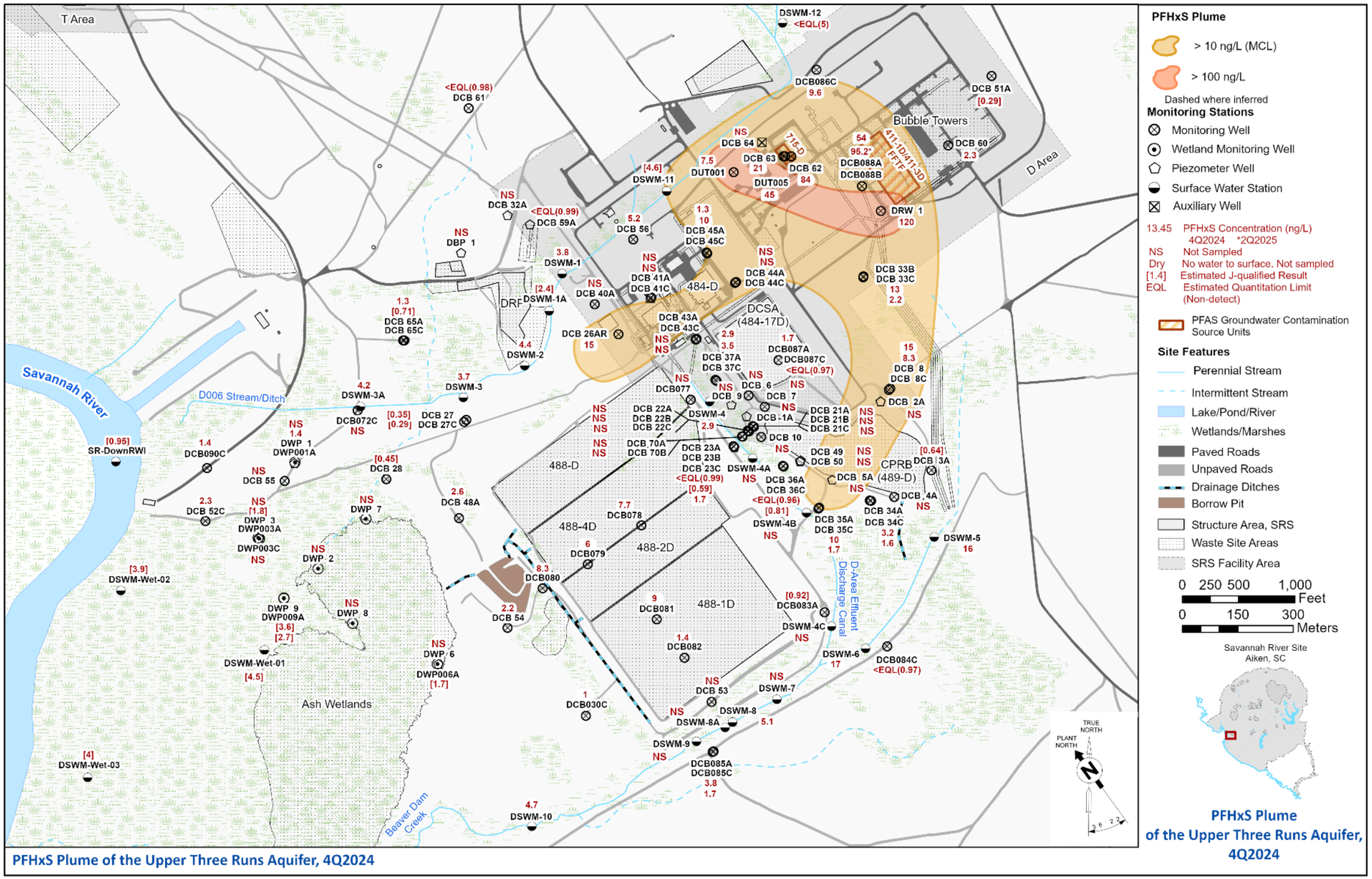


Figure 10. 4Q2024 DAG OU PFHxS Plume Map

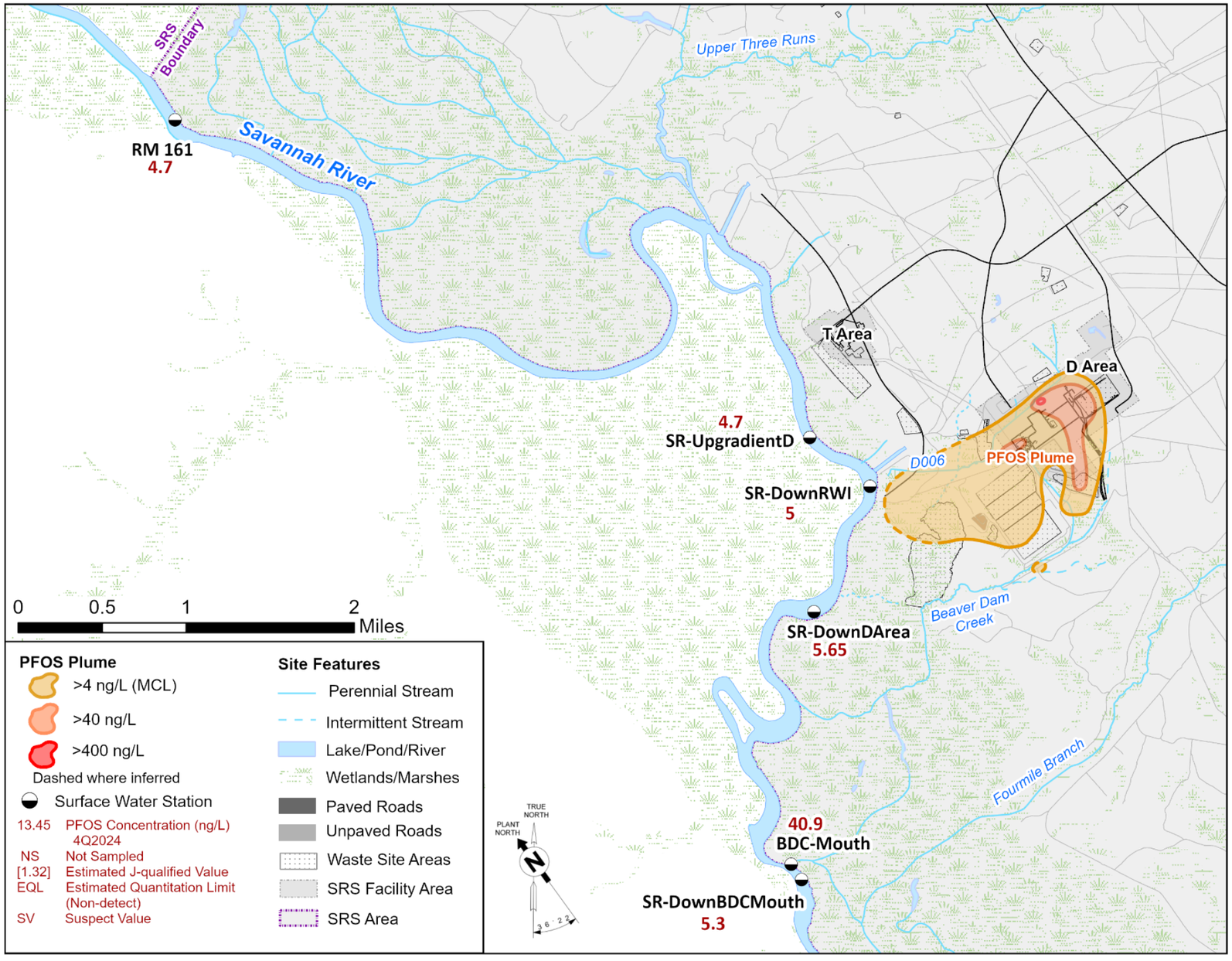


Figure 11. Savannah River Sample Locations and PFOS Concentrations

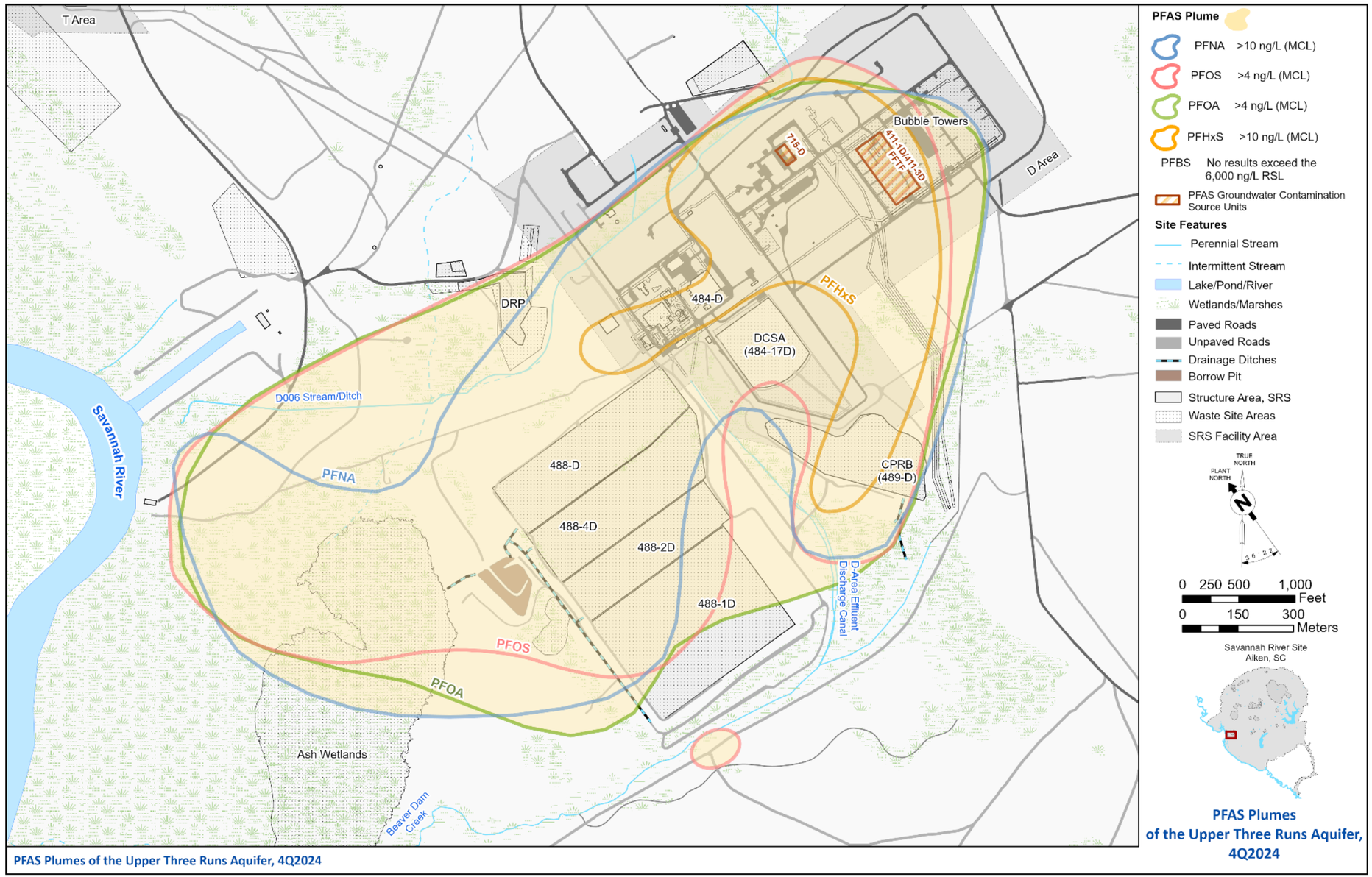
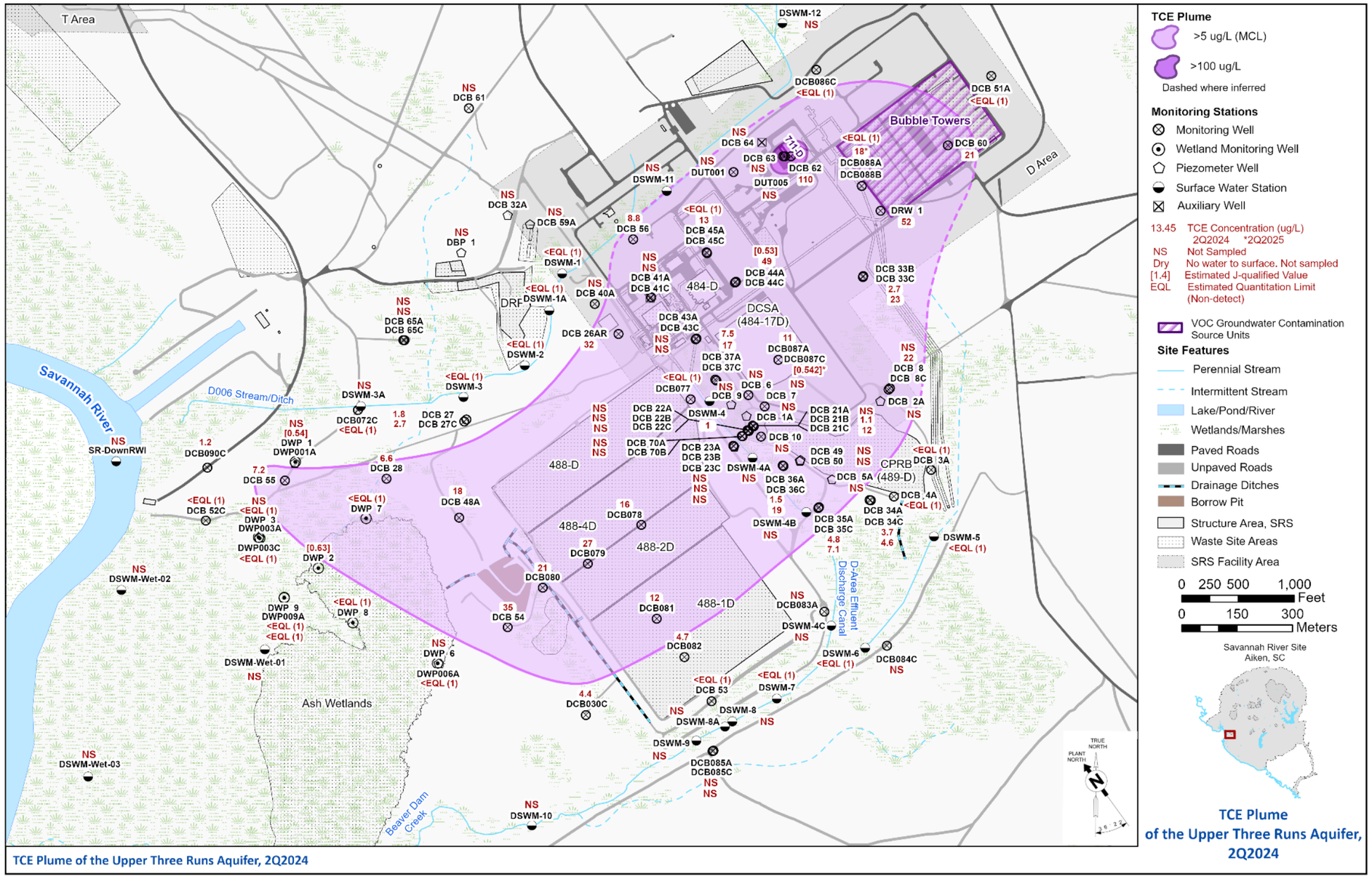
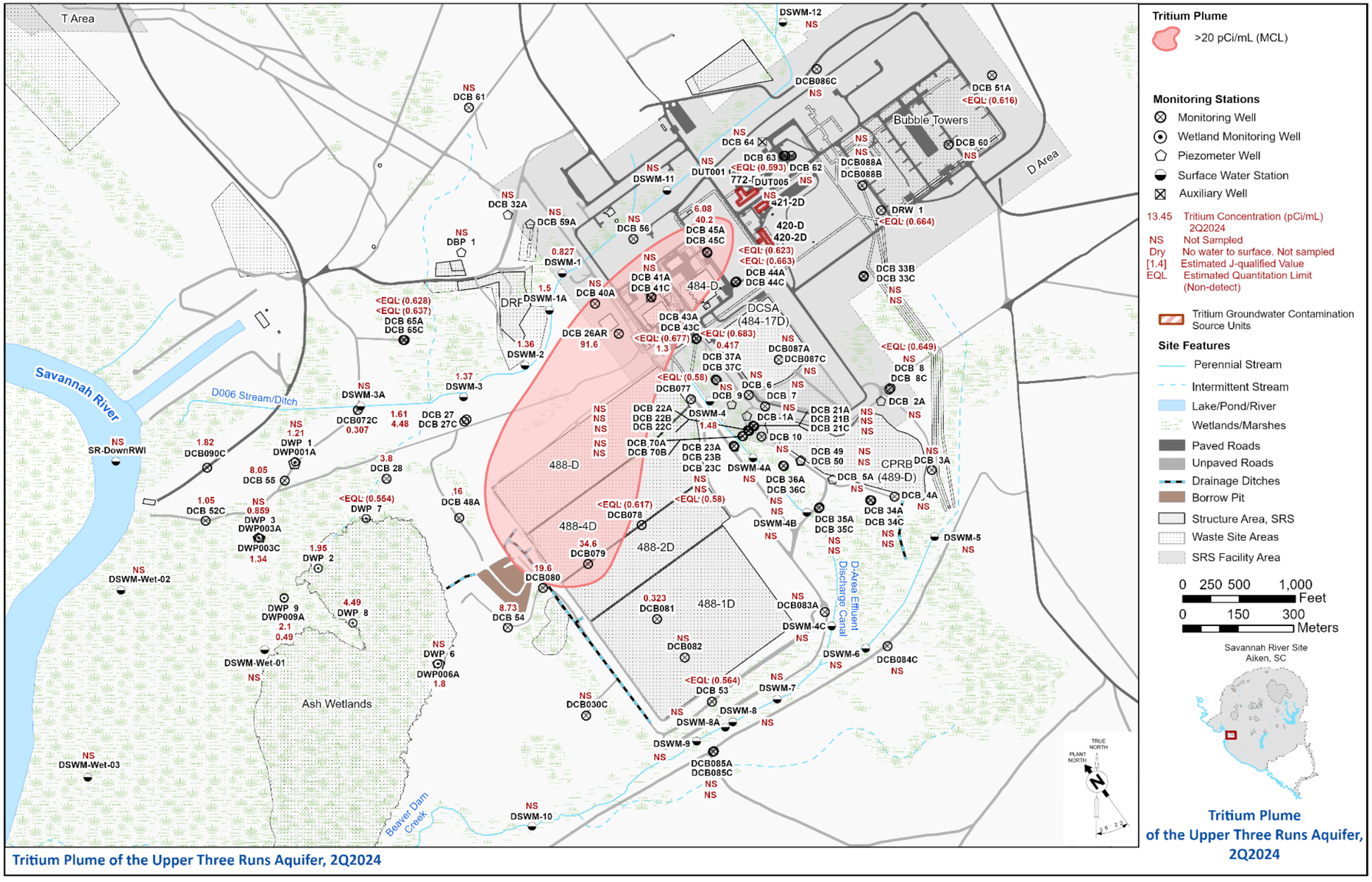


Figure 12. 4Q2024 Combined DAG OU PFAS Plume



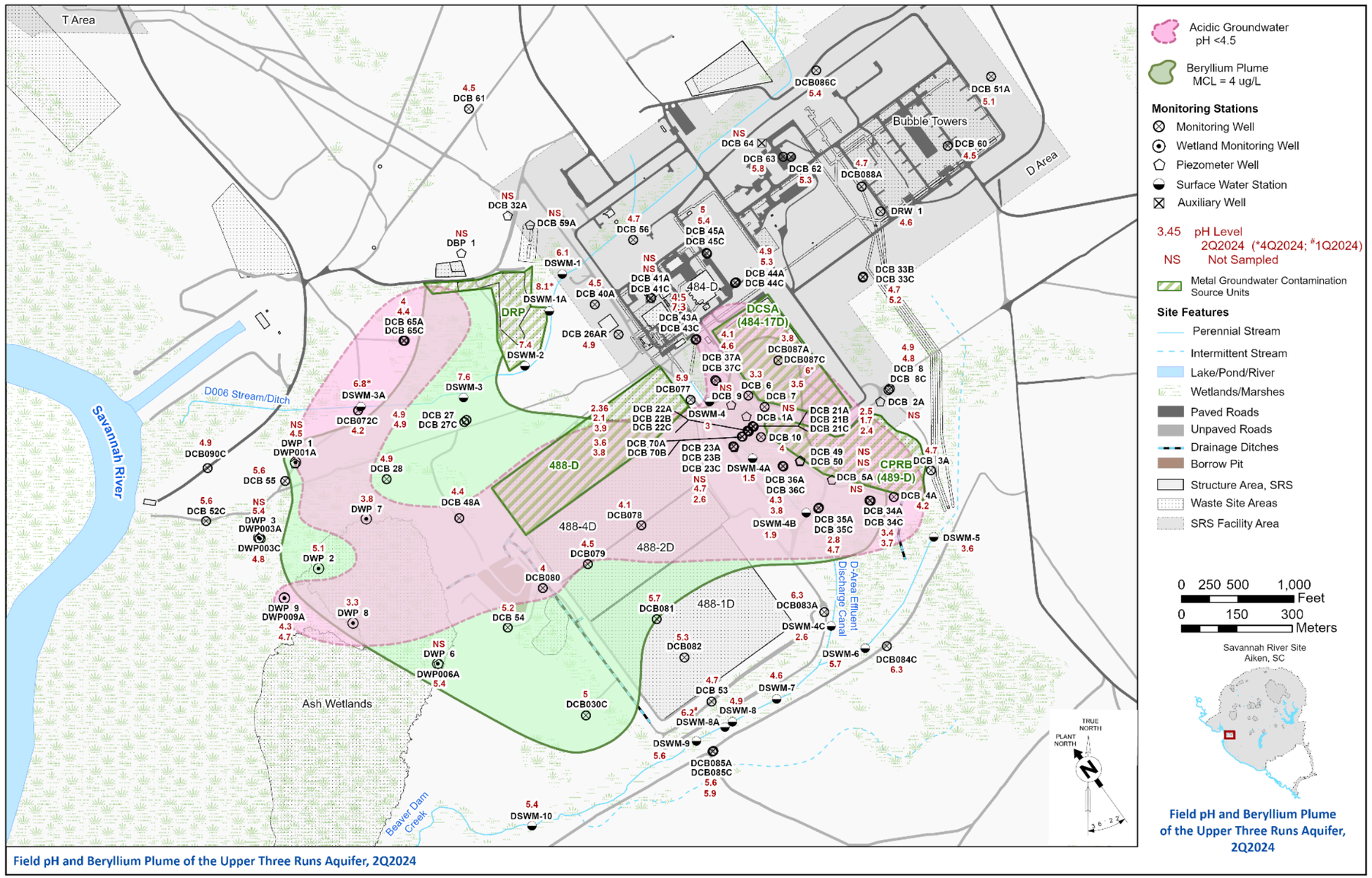
TCE Plume of the Upper Three Runs Aquifer, 2Q2024

Figure 13. 4Q2024 DAG OU TCE Plume Map



Tritium Plume of the Upper Three Runs Aquifer, 2Q2024

Figure 14. 4Q2024 DAG OU Tritium Plume Map



Field pH and Beryllium Plume of the Upper Three Runs Aquifer, 2Q2024

Figure 15. 4Q2024 DAG OU pH and Beryllium Plume Map

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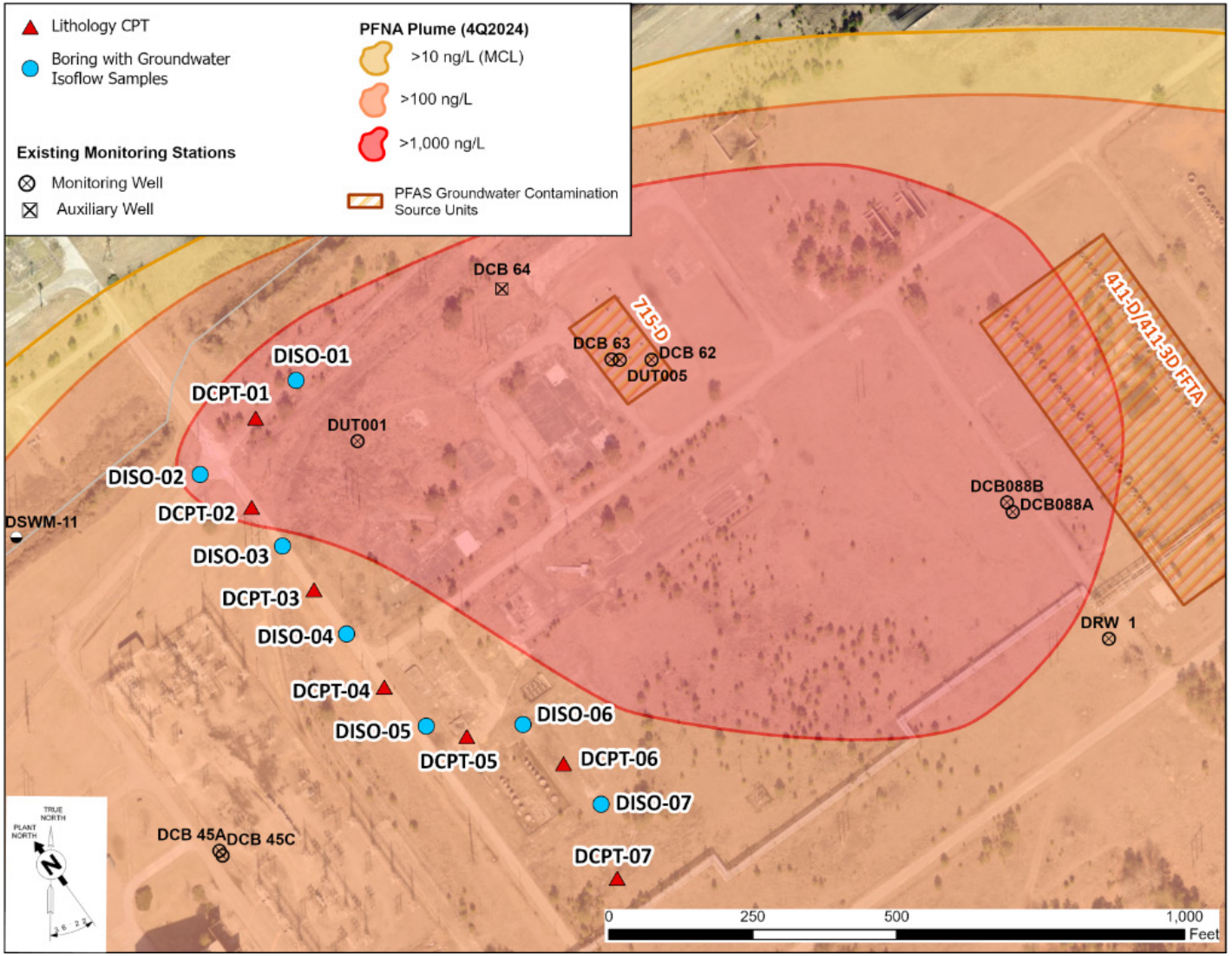


Figure 16. Investigative Sampling Locations

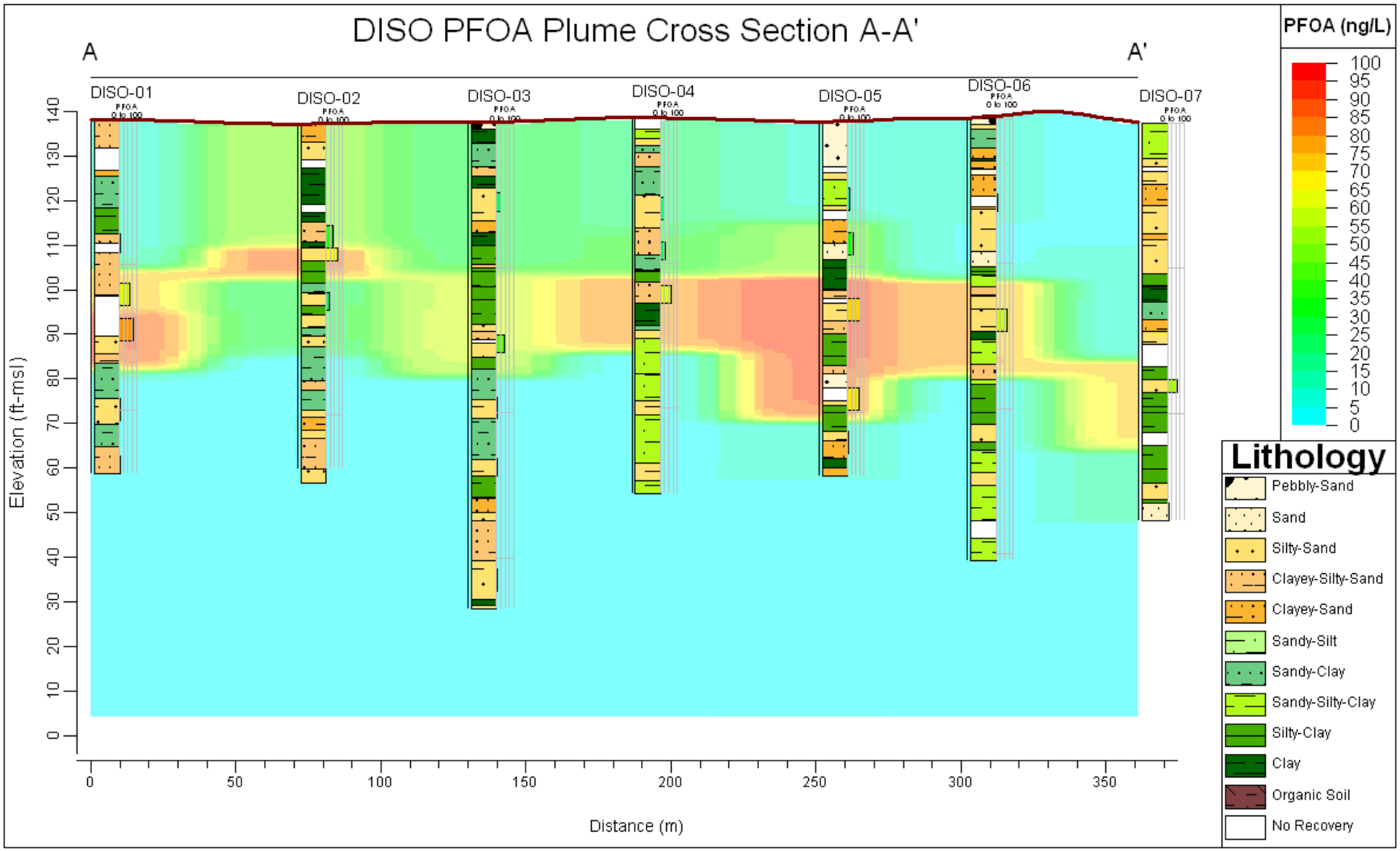


Figure 17. Investigative Sampling PFOA Plume and Lithology Cross Section

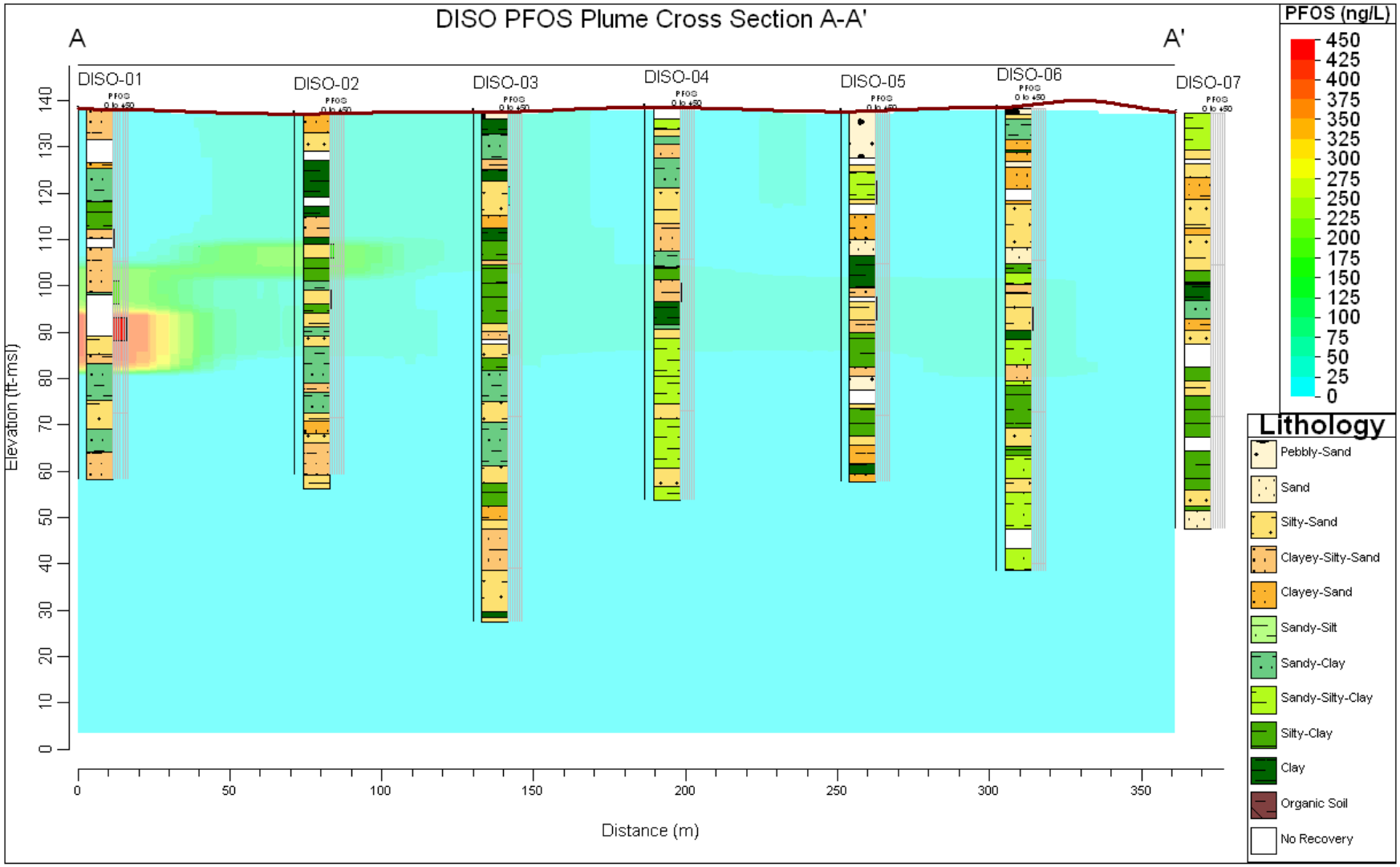


Figure 18. Investigative Sampling PFOS Plume and Lithology Cross Section

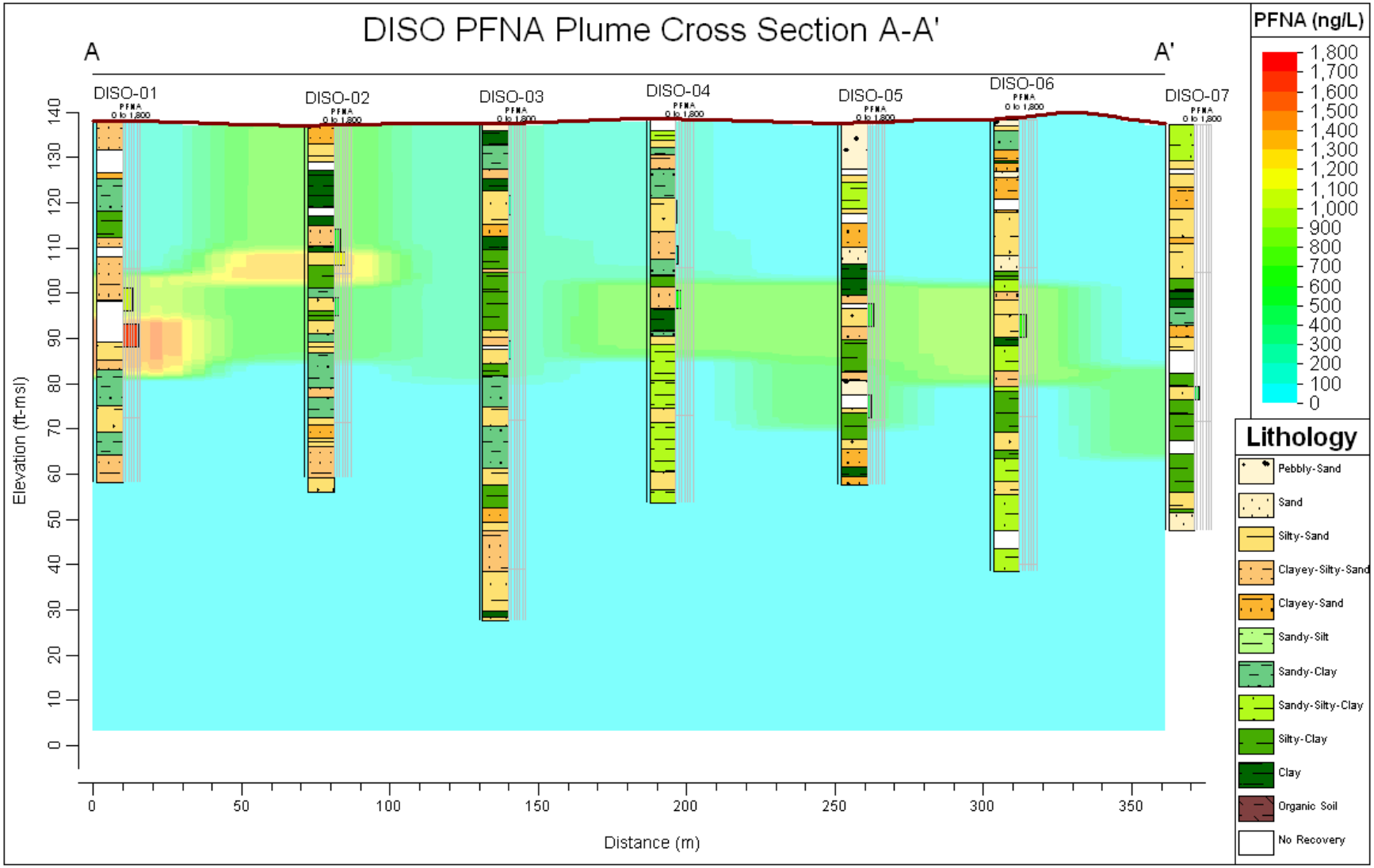


Figure 19. Investigative Sampling PFNA Plume and Lithology Cross Section

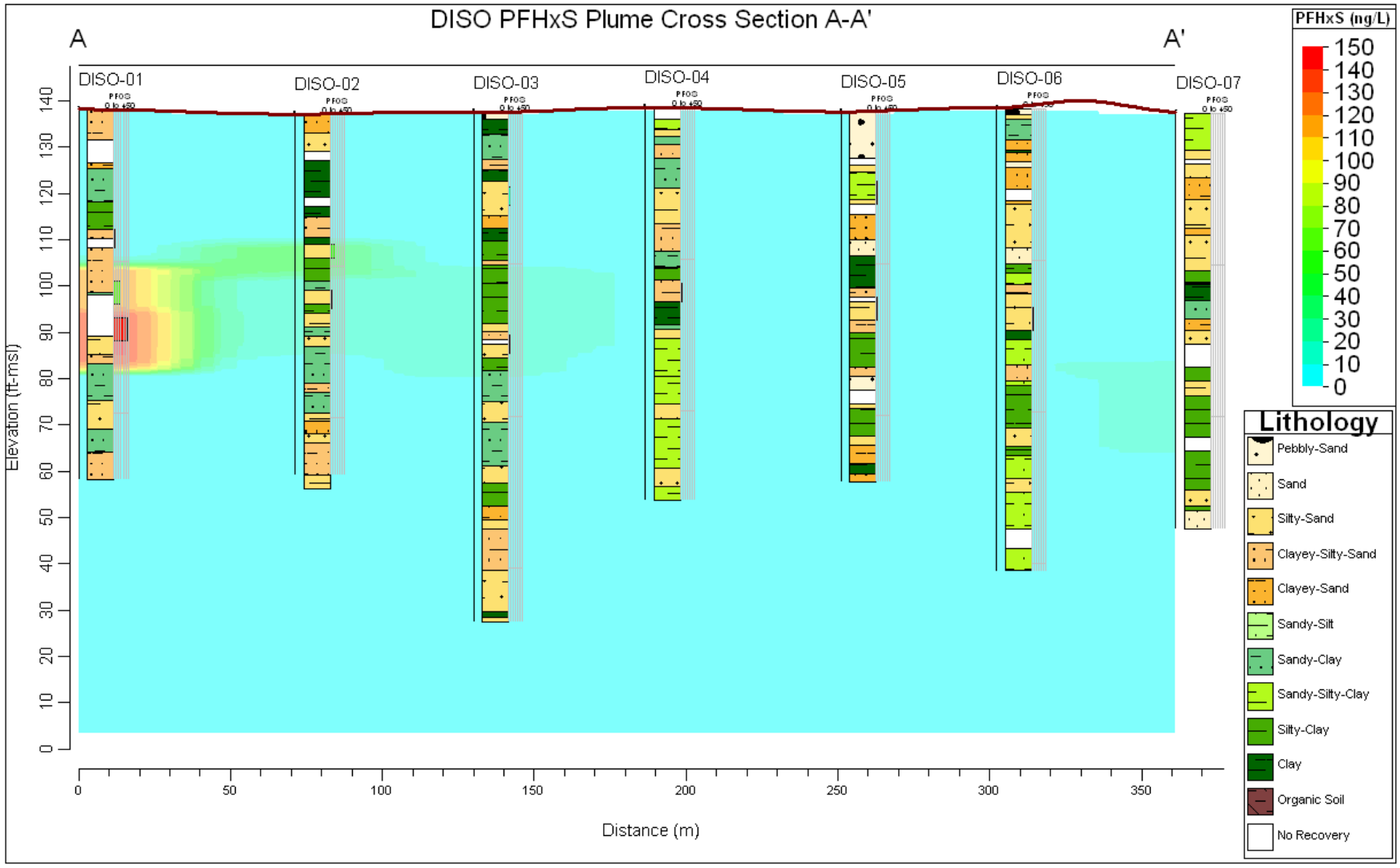


Figure 20. Investigative Sampling PFHxS Plume and Lithology Cross Section

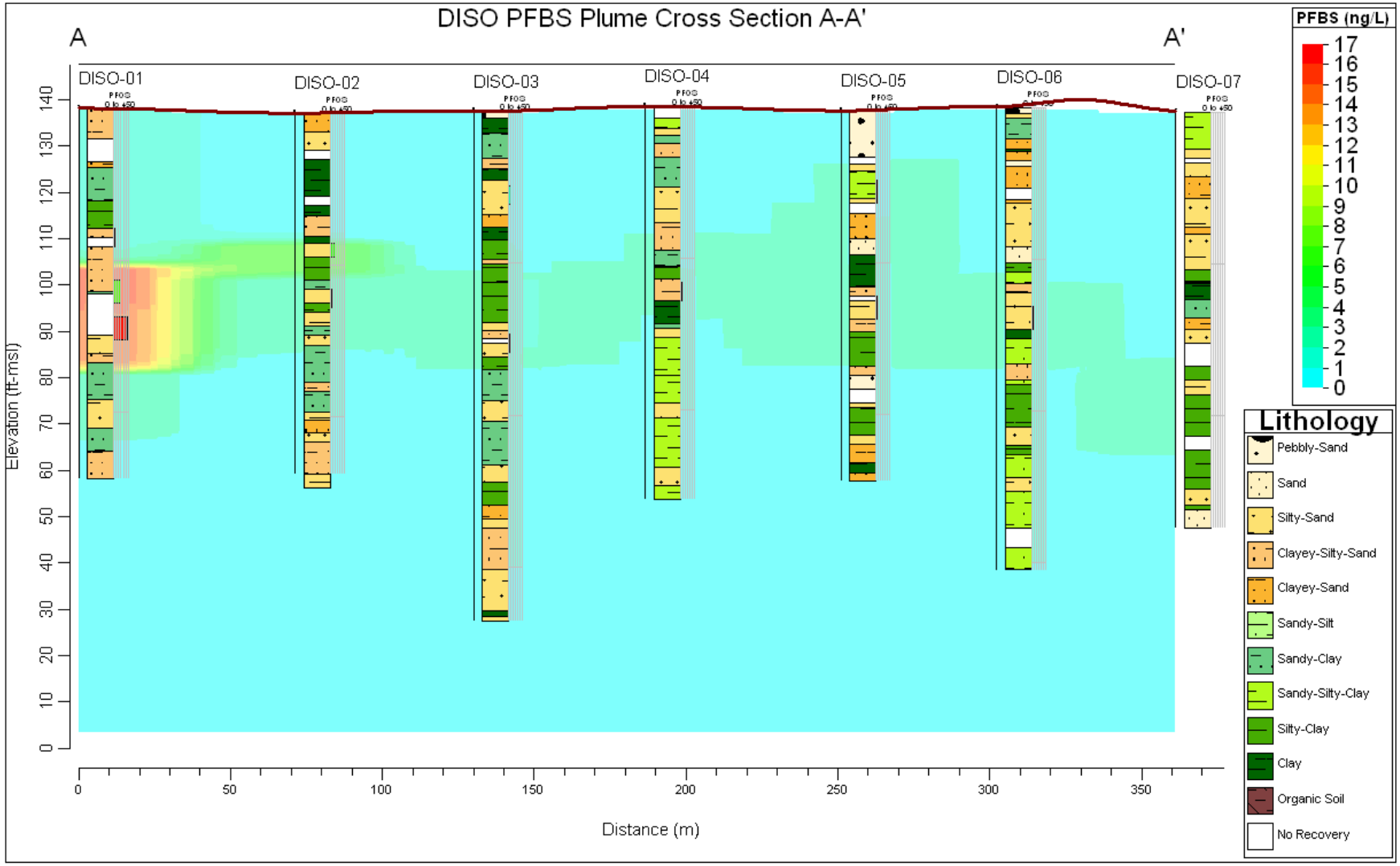


Figure 21. Investigative Sampling PFBS Plume and Lithology Cross Section

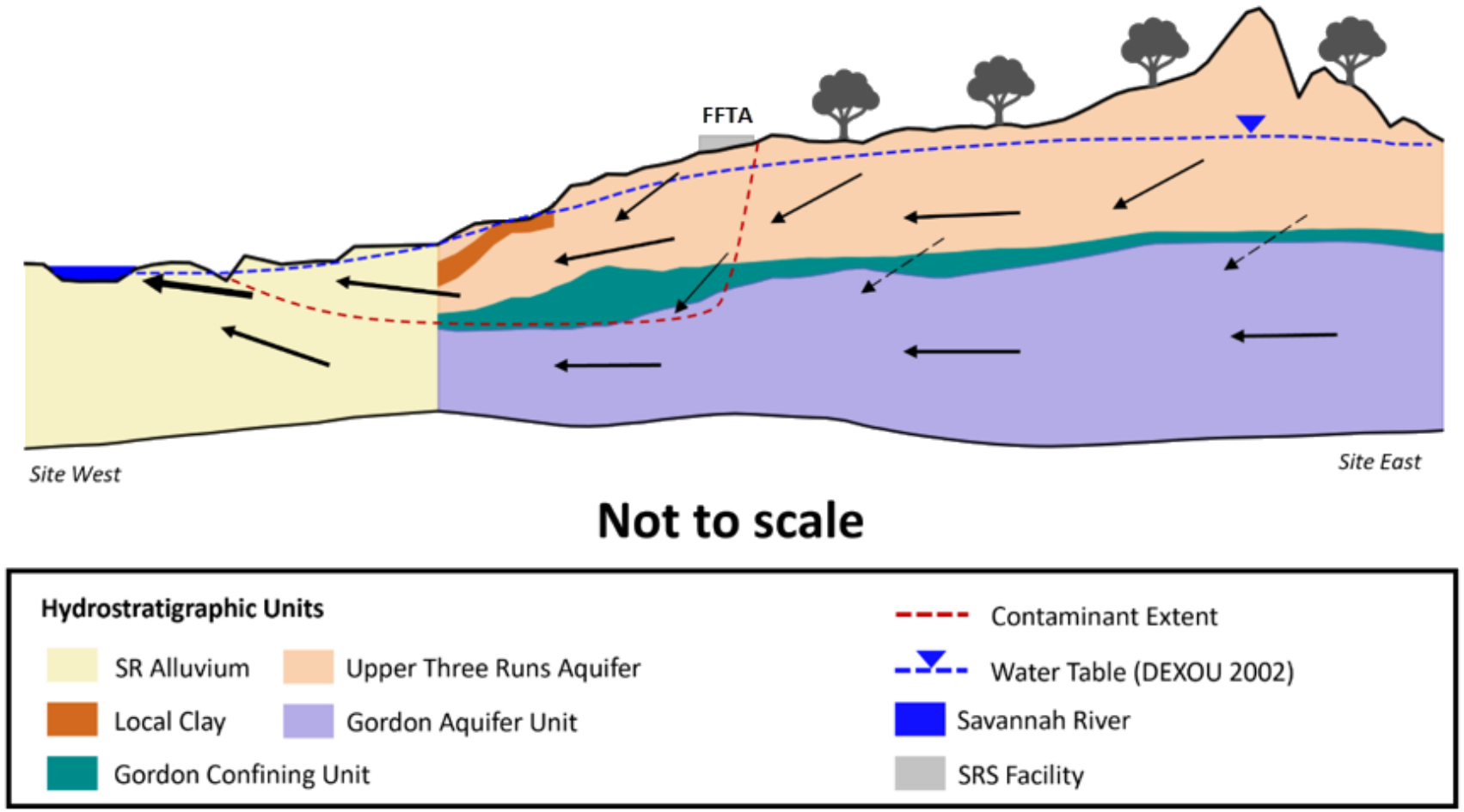


Figure 22. Conceptual Site Model for the DAG OU

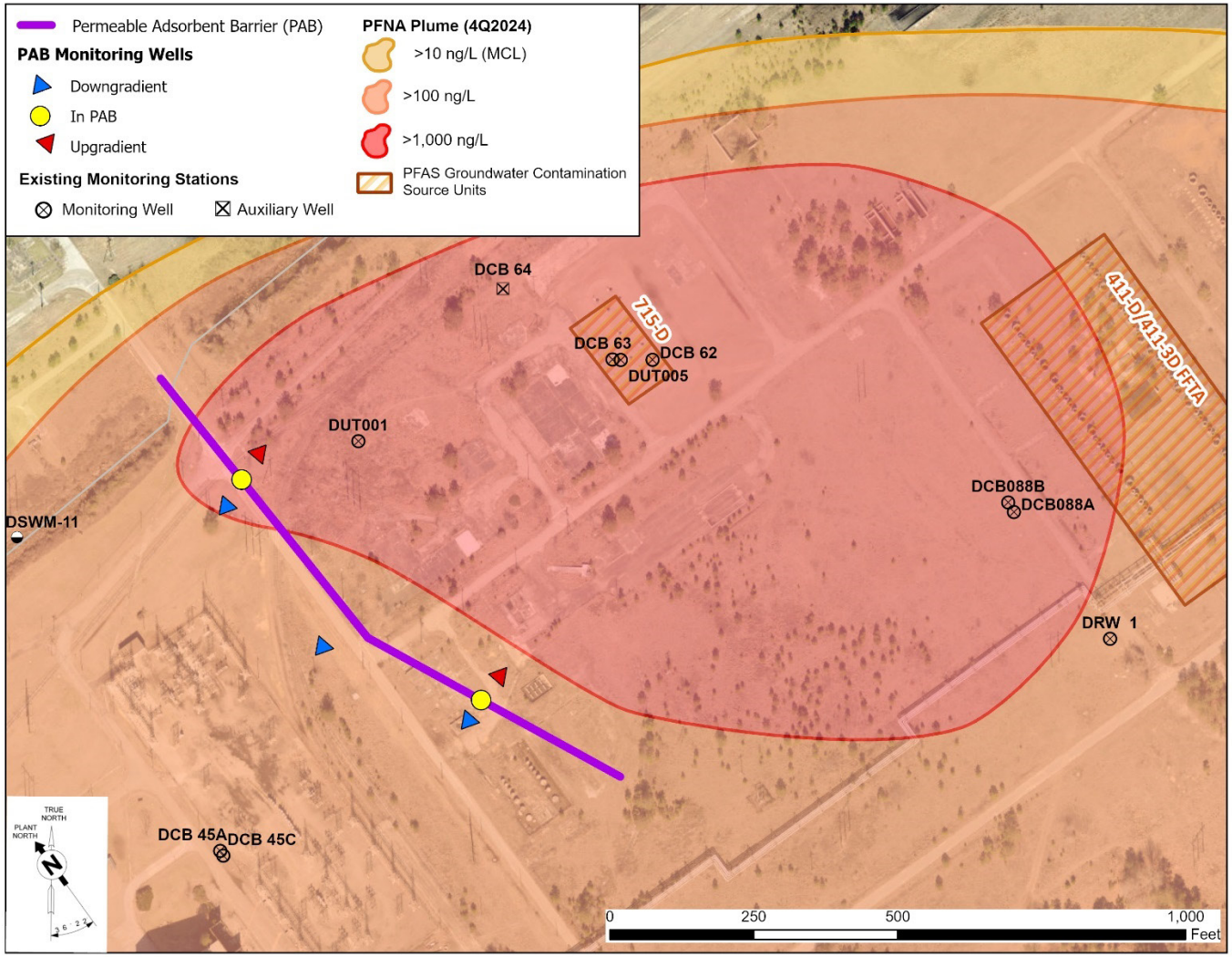


Figure 23. Potential PAB Arrangement Alternatives 2a & 2b

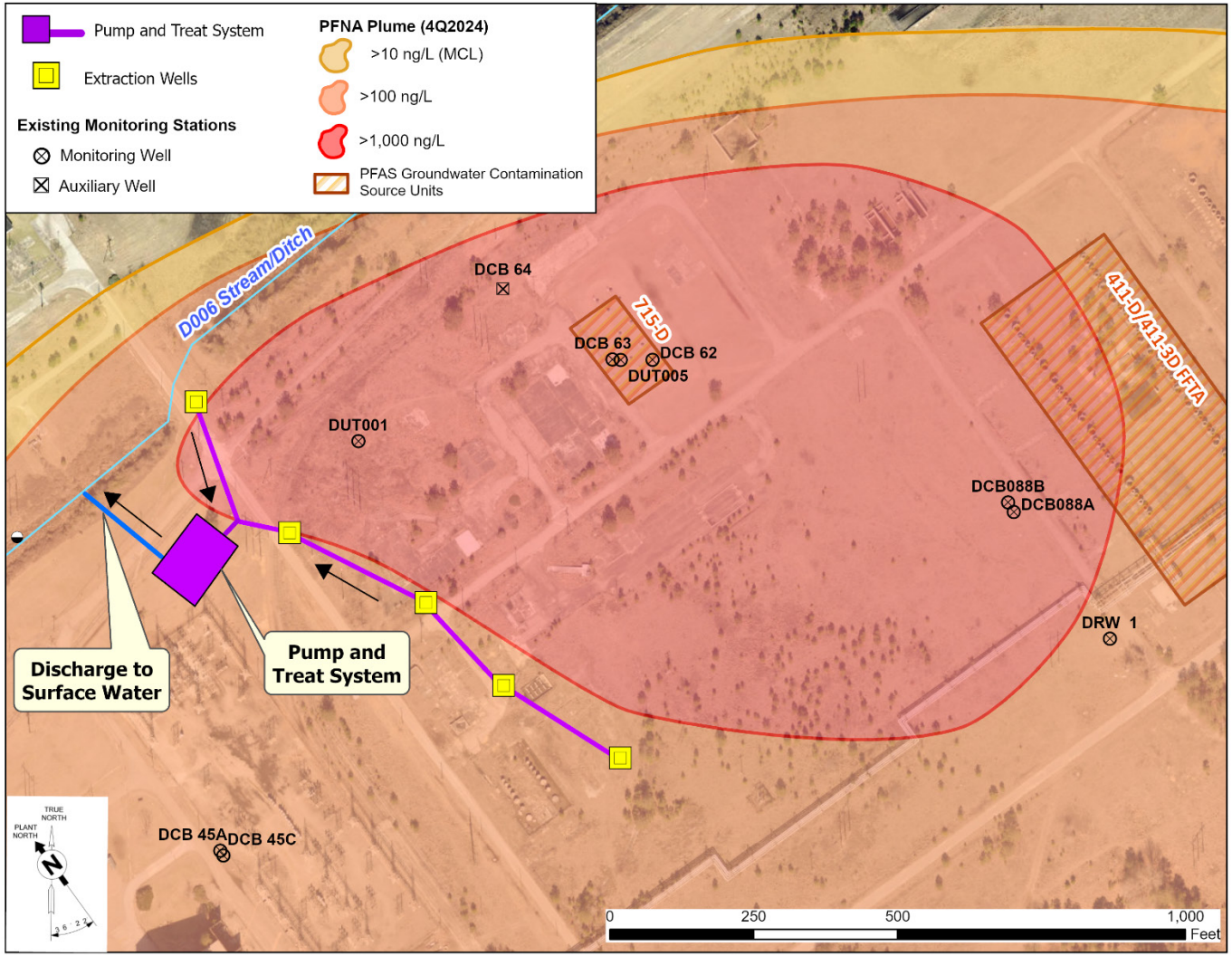


Figure 24. Potential Pump and Treat System Arrangement

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Table 1. USEPA Standards for Six PFAS and Removal Action Cleanup Levels

CAS. No.	Contaminant (1/1/24-6/30/25 Max)	MCL (ng/L) (unless otherwise noted)	Tap Water RSL (ng/L)	MCL-based SSL (ng/g)
45285-51-6	PFOA (max = 150 ng/L)	4	0.0027	0.061
45298-90-6	PFOS (max = 440 ng/L)	4	2	0.03
122499-17-6	HFPO-DA (All Below DLs)	10	15	0.001
108427-53-8	PFHxS (max = 150 ng/L)	10	390	0.0042
72007-68-2	PFNA (max = 2,600 ng/L)	10	59	0.042
45187-15-3	PFBS (max = 600 ng/L)	No individual MCL	6000	--
N/A	Hazard Index PFAS (HFPO-DA, PFBS, PFHxS, and PFNA) (max = 268)	1 (unitless)	N/A	N/A

MCL - maximum contaminant level
RSL - regional screening level
SSL - soil screening level
ng/L - nanogram per liter
DL – detection limit
PFOA - perfluorooctanoic acid
PFOS - perfluorooctanesulfonic acid
HFPO-DA - hexafluoropropylene oxide dimer acid
PFHxS - perfluorohexanesulfonic acid
PFNA - perfluorononanoic acid
PFBS - perfluorobutanesulfonic acid

Table 2. Chemical Descriptions of the Regulated PFAS in the DAG OU

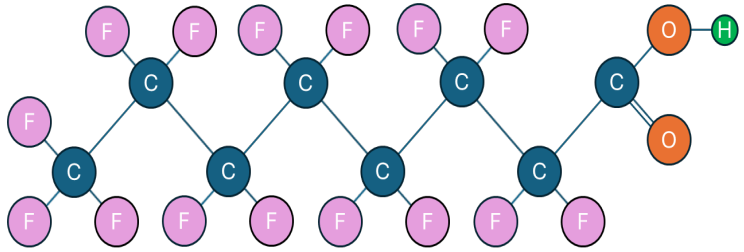
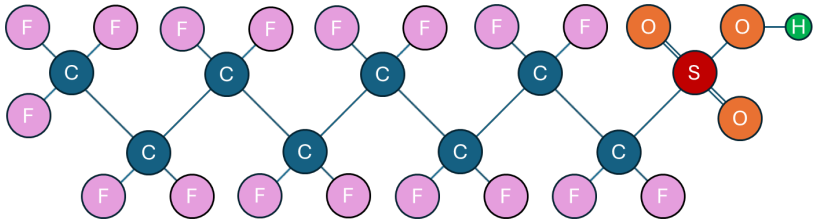
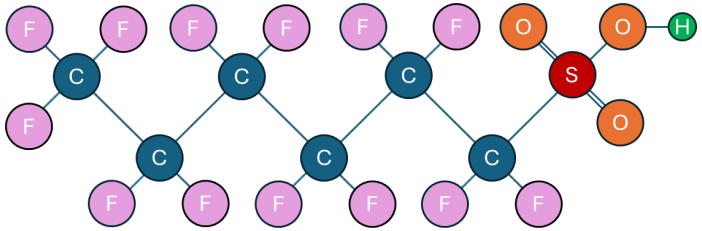
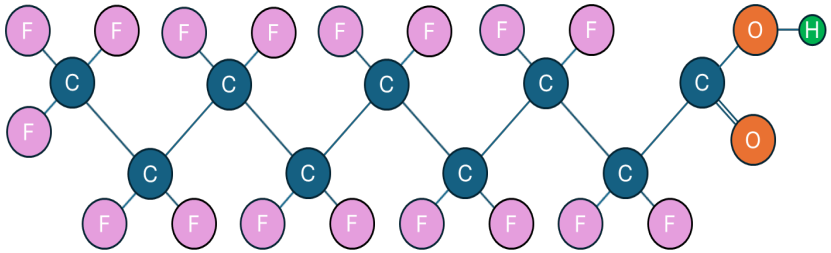
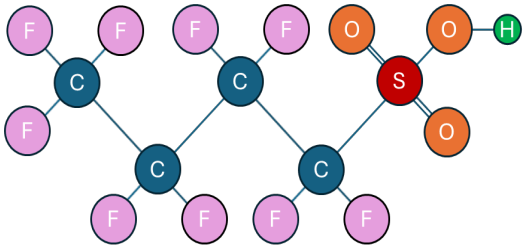
Contaminant ID		Characteristics		
CAS. No.	Short Name	Functional Group Head	Number of Carbons	Structures
45285-51-6	PFOA	Carboxylic Acid	8	
45298-90-6	PFOS	Sulfonic Acid	8	
108427-53-8	PFHxS	Sulfonic Acid	6	

Table 2. Chemical Descriptions of the Regulated PFAS in the DAG OU *(continued/end)*

Contaminant ID		Characteristics		
CAS. No.	**Short Name**	**Functional Group Head**	**Number of Carbons**	**Structures**
72007-68-2	PFNA	Carboxylic Acid	9	
45187-15-3	PFBS	Sulfonic Acid	4	

PFOA - Perfluorooctanoic acid
PFOS - Perfluorooctanesulfonic acid
PFHxS - Perfluorohexanesulfonic acid
PFNA - Perfluorononanoic acid
PFBS - Perfluorobutanesulfonic acid
Elements in structures: C = carbon; F = fluorine; O = oxygen; H = hydrogen; S = sulfur

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Table 3. Sample Depths and Concentrations from 1Q2025 Investigative Sampling

Location	Start Depth (ft bgs)	End Depth (ft bgs)	PFOA	PFOS	PFNA	PFHxS	PFBS
DISO-01	26	30	1.98	7.02	27.1	3.27	0
DISO-01	37	42	62.5	205	1090	122	16.5
DISO-01	45	50	80.2	440	1670	150	15.9
DISO-01	63	68	5.25	1.15	4.47	4.02	2.74
DISO-01	76	80	0	0	0	0	0
DISO-02	23	28	39.6	28	632	3.86	0.687
DISO-02	28	31	67.7	180	1200	43.1	6.76
DISO-02	38	42	20.7	46.4	524	13.1	2.15
DISO-03	16	20	23.4	48.4	226	6.6	0.993
DISO-03	48	52	45.7	16.6	224	14.9	1.65
DISO-03	62	67	1.03	0	1.28	0	0
DISO-03	76	80	2.18	0	0	0	1.11
DISO-03	101	106	0	0	0	0	0
DISO-04	18	23	19.4	18.1	111	4.39	0.768
DISO-04	28	32	25.4	22.7	195	5.24	0.692
DISO-04	38	42	63.7	35.2	632	8.4	1.1
DISO-04	64	68	3.04	0	4.91	0	0
DISO-05	15	20	9.7	27.7	2.44	1.53	0.704
DISO-05	25	30	35.5	8.51	15.5	9.16	1.07
DISO-05	40	45	72.7	26.7	622	9	1.39
DISO-05	60	65	70.9	6.94	474	8.18	1.23
DISO-05	70	75	8.69	0	18.3	0.751	0
DISO-06	17	21	7.82	3.4	3.86	4.65	1.39
DISO-06	25	30	4.4	1.39	5.22	2.42	0
DISO-06	43	48	60.9	36.2	734	9.5	1.48
DISO-06	69	73	0	0	4.06	0	0
DISO-06	90	95	2.03	0	2.9	0	0
DISO-07	19	24	0.747	0	1.07	0	0
DISO-07	29	34	6.59	4.45	46.8	1.69	0
DISO-07	45	50	5.14	8.43	44.4	2.4	0
DISO-07	58	61	56.4	18.2	478	14.2	2.61
DISO-07	86	90	13.2	0	3.2	0.765	0

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Appendix A

Potential ARARs and TBC Criteria

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Location-Specific ARARs						
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
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.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable.**	40 CFR §230.10(a) 40 CFR §230.10(d)	✓	✓	✓
Location encompassing *aquatic ecosystem* as defined in 40 CFR 230.3 (c)	No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 *et seq.* have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable**	40 CFR §230.10(a) 40 CFR §230.10(d)	✓	✓	✓
	Must comply with the substantive requirements of the NWP 38, General Conditions, as appropriate, any regional or case-specific conditions recommended by the Corps District Engineer, after consultation. *Note:* Despite that consultation may be considered an administrative requirement, it should be performed to ensure activities are in compliance with substantive provisions of the permit.	On-site CERCLA action conducted by Federal agency that involves discharge of dredged or fill material into *waters of the United States*, including jurisdictional wetlands – **relevant and appropriate**	Nationwide Permit (38) – Cleanup of Hazardous and Toxic Waste 33 *CFR* 323.3(b)	✓	✓	✓
Presence of wetlands	Requires Federal agencies to evaluate action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Actions that involve potential impacts to, or take place within, wetlands – **applicable**	Executive Order 11990 – *Protection of Wetlands* - Section 1.(a)	✓	✓	✓
Presence of migratory birds and their habitats	No person may take, possess, import, export, transport, sell, purchaser, barter or offer for sale, purchase or barter, any migratory bird, or the parts, nests, or eggs of such bird except as may be permitted under the terms of a valid permit.	If action is likely to impact migratory birds – **applicable**	16 USC 703-704 – Migratory Bird Treaty Act	✓	✓	✓

Chemical-Specific ARARs						
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
Organic contaminants in the groundwater	MCLs established the highest level of a contaminant that is allowed in drinking water. • Tetrachloroethylene (PCE) = 0.005 mg/L (5 µg/L) • Trichloroethylene (TCE) = 0.005 mg/L (5 µg/L) • Cis-1,2-dichlroethylene = 70 µg/L • Perfluorononanoic acid (PFNA) = 0.00001 mg/L (10 ng/L) • Perfluorooctanesulfonic acid (PFOS) = 0.0000040 mg/L(4 ng/L) • Perfluorooctanoic acid (PFOA) = 0.0000040 mg/L(4 ng/L) • Perfluorohexanesulfonic acid (PFHxS) = 0.00001 mg/L (10 ng/L)	The state of South Carolina classifies all groundwater as potential sources of drinking water and mandates that groundwater meet MCLs established by the SDWA.– **relevant and appropriate**	40 CFR §141.61 MCLs for organic contaminants SC R.61.58, Section 5 (N) MCLs for Volatile Synthetic Organics	✓	✓	✓
	Per- and Polyfluoroalkyl Substances (PFAS) mixtures containing at least two or more of PFHxS, PFNA, HFPO-DA (GenX Chemicals), and PFBS using a Hazard Index MCL to account for the combined and co-occurring levels of these PFAS in drinking water. • Perfluorobutanesulfonic acid (PFBS) = 2000 ng/L • PFNA = 10 ng/L • PFHxS = 10 ng/L • GenX Chemicals = 10 ng/L	The PFAS Mixture Hazard Index (HI) is the sum of component hazard quotients (HQs), which are calculated by dividing the measured component PFAS concentration in water by the relevant health-based water concentration when expressed in the same units. – **relevant and appropriate**	40 CFR §141.61 (c)(2) MCLs and HBWCs for PFAS. s	✓	✓	✓
Radionuclide contaminants in the groundwater	National Primary Drinking Water Regulations: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels Radioactive Contaminants (SC R. 61-58.5) • Beta emitters = 4 mrem/yr • Tritium = 20,000 pCi/L	Certain elements are radioactive and may emit a form of radiation known as beta radiation. Some people who drink water containing beta emitters in excess of the MCL over many years may have an increased risk of getting cancer. – **relevant and appropriate**	40 CFR §141.66 (Subpart O)(8) SC R. 61-58.5 Radioactive Contaminants 61-68	✓	✓	✓
Groundwater seep into Waters of the State	Establishes South Carolina official classified water uses for all waters of the State, general rules and specific numeric and narrative criteria for protecting classified and existing water uses • Tetrachloroethylene (PCE) = 0.005 mg/L (5 µg/L) • Trichloroethylene (TCE) = 0.005 mg/L (5 µg/L) • Cis-1,2-dichlroethylene = 70 µg/L	This regulation classifies all surface water and groundwater in the state for protecting classified water uses. – **applicable**	SC R. 61-68 Water Classification and Standards SC R. 61-68 Section G.10.c Appendix	✓	✓	✓

Action Specific ARARs						
Action	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
General Construction Standards — All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)						
Managing Storm Water Run-Off from Land-Disturbing Activities	Must comply with the substantive requirements for stormwater management and sediment control of *NPDES General Permit No. SCR100000.*	Large and small construction activities (as defined in R.61-9) of more than 1 acre of land – **applicable**	SC R.61-9.122.26(c) NPDES General Permit No. SCR100000	✓	✓	✓
	The requirements of R.72-305 and R.72-307 will apply.	For land disturbing activities disturbing more than five (5) acres – **applicable**	SC R.72-305.B.(3)	✓	✓	✓
	The stormwater management and sediment control plan shall contain at a minimum the information provided in the following subsections:	Activities involving more than two (2) acres and less than five (5) acres of actual land disturbance which are not part of a larger common plan of development or sale – **applicable**	SC R.72-307 I. – *South Carolina Storm Water Management and Sediment Reduction Regulations*	✓	✓	✓
	A plan for temporary and permanent vegetative and structural erosion and sediment control measures which specify the erosion and sediment control measures to be used during all phases of the land disturbing activity and a description of their proposed operation.		SC R.72-307 I.(3)(d)	✓	✓	✓
	Provisions for stormwater runoff control during the land disturbing activity and during the life of the facility meeting the following requirements: 1. Post-development peak discharge rates shall not exceed pre-development discharge rates for the 2- and 10-year frequency 24-hour duration storm event. Implementing agencies may utilize a less frequent storm event (e.g. 25-year, 24-hour) to address existing or future stormwater quantity or quality problems. Discharge velocities shall be reduced to provide a non-erosive velocity flow from a structure, channel, or other control measure or the velocity of the 10-year, 24- hour storm runoff in the receiving waterway prior to the land disturbing activity, whichever is greater.		SC R.72-307 I.(3)(e)	✓	✓	✓
Managing Fugitive Dust Emissions from Land-Disturbing Activities	Regulates concentration of particulate matter in ambient air not to exceed 150 µg/m3 (24-hour average concentration) for $PM_{10.}$ Regulates concentration of particulate matter in ambient air not to exceed 15.0 $\mu g/m^3$ (annual arithmetic mean concentration) and 65 $\mu g/m^3$ (24-hour average concentration) for $PM_{2.5.}$		40 CFR §50.6 & 50.7 National Primary and Secondary Ambient Air Quality Standards	✓	✓	✓
	Emissions of fugitive particulate matter shall be controlled in such a manner and to the degree that it does not create an undesirable level of air pollution. Volatile organic compounds shall not be used for dust control purposes. Oil treatment is also prohibited.	Activities that will generate fugitive particulate matter (Statewide) – **applicable**	SC R.61-62.6 Section III(a)- Control of Fugitive Particulate Matter Statewide SC R.61-62.6 Section III(d)	✓	✓	✓

Action Specific ARARs *(cont'd)*						
Action	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
Waste Characterization and Storage — (e.g., wastewaters, excavated ash, coal fines, contaminated soils/sediments, vegetation, debris)						
Characterization of *solid* waste	Must determine if solid waste is a hazardous waste using the following method: Should first determine if waste is excluded from regulation under 40 CFR 261.4; and	Generation of solid waste as defined in 40 CFR 261.2 – **applicable**	40 CFR §262.11(a) SC R.61-79 262.11*(a)*	✓	✓	✓
	Must determine if waste is listed as hazardous waste under 40 CFR Part 261.	Generation of solid waste which is not excluded under 40 CFR 261.4(a) – **applicable**	40 CFR §262.11(b) SC R.61-79 262.11*(b)*	✓	✓	✓
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR Part 261 by either: 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 the materials or the processes used.	Generation of solid waste which is not excluded under 40 CFR 261.4(a) – **applicable**	40 CFR §262.11(c) SC R.61-79 262.11*(c)*	✓	✓	✓
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be *hazardous* waste – **applicable**	40 CFR§ 262.11(d) SC R.61-79 262.11*(d)*	✓	✓	✓
Determinations For Management of *Hazardous* Waste [1]	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 CFR 268 *et seq.* *Note:* This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 CFR §268.9(a) SC R.61-79 268.9*(a)*	✓	✓	✓
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment, or disposal – **applicable**	40 CFR §268.9(a) SC R.61-79 268.9*(a)*	✓	✓	✓
	Must determine if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. *Note:* This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 CFR §268.7(a) SC R.61-79 268.7 (a) (1)	✓	✓	✓
Temporary Storage of Solid Waste	Shall be conducted in a manner to: a. Inhibit the harborage of flies, rodents, and other vectors; b. Prevent conditions for transmission of diseases to man or animals; c. Prevent blowing debris and particulates so as not to be injurious to human health and the environment; d. Prevent water pollution and prevent the escape of solid waste or leachate to waters of the State; and Minimize objectionable odors, dust, unsightliness, and aesthetically objectionable conditions, and prevent the accumulation of materials in an untidy and unsafe manner so as to become a fire and safety hazard.	Generation of solid waste for temporary storage prior to processing, disposal of that waste – **relevant and appropriate**	SC R.61- 107.5(C)(1)	✓	✓	✓

Action Specific ARARs *(cont'd)*						
Action	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
Disposal of Wastes Off-Site (e.g., development water, contaminated soils/sediments, vegetation)						
Off-Site Disposal of Solid Waste	Shall ultimately dispose of solid waste at facilities and/or sites permitted or registered by the Department for processing or disposal of that waste stream.	Generation of solid waste intended for off-site disposal – **relevant and appropriate**	SC R.61-107.5(D)(3)		✓	✓
Off-site Disposal of RCRA-*Hazardous* Waste in a 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) SC R.61-79 268.40*(a)*		✓	✓
	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards (UTSs), found in 40 CFR 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001-D043) not managed in a wastewater treatment system regulated under the Clean Water Act (CWA), that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **applicable**	40 CFR §268.40(e) SC 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) SC R.61-79 268.49*(b)*		✓	✓
	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 underlying hazardous constituents [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) SC R.61-79 268.34*(f)*		✓	✓
Transportation of Wastes						
Transportation of Samples (i.e. Solid Waste, Soils and Wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: · • the sample is being transported to a laboratory for the purpose of testing; or · • the sample is being transported back to the sample collector after testing · • the sample is being stored by sample collector before transport to a lab for testing.	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition – **applicable**	40 CFR §261.4(d)(1)(i)-(iii) SC R.61-79 261.4(d) (1)		✓	✓

Action Specific ARARs *(cont'd/end)*						
Action	**Requirements**	**Prerequisite**	**Citation**	**Alt-2a**	**Alt-2b**	**Alt-3**
Discharge of Treated Groundwater (If Necessary)						
Discharge to Surface Water	Any discharge into waters of the State must be permitted by the Department and receive a degree of treatment and/or control which shall produce an effluent which is consistent with the Act, the Clean Water Act (P.L. 92-500, 95-217, 97-117, 100-4), this regulation, and related regulations. *Note:* Under CERCLA Section 121(e) permits are not required for on-site response actions. Instead, SRS must meet any applicable effluent limits in its existing NPDES discharge permit or other substantive requirements, including the numeric water quality criteria for the protection and maintenance of the appropriate class of surface waters as adopted in SC R.61-68 and listed in Sections E, G, and the appendix therein.	Discharge of pollutants (including toxic substances) into waters of the State of South Carolina – **applicable**	SC R.61- 68E.4.a SC R.61-68 E.14			✓
	Site-specific permit effluent limitations and alternate criteria less stringent than those derived in accordance with the requirements in SC R.61-68 E.14.c. may be derived where it is demonstrated that such limits and criteria shall maintain the existing and classified uses.		SC R.61-68 E.14.c.(7)			✓
	Discharge of garbage, cinders, ashes, oils, sludges, or other refuse is not allowed.	Quality Standards for Waters of the State of South Carolina (classified as FW as provided in SC R.61-68G.10) – **applicable**	SC R.61- 68G.10.a			✓
	Treated wastes, toxic wastes, deleterious substances in sufficient amounts to make the waters unsafe or unsuitable for primary contact recreation or to impair the waters for any other best usage are not allowed.		SC R.61- 68G.10.b			✓
	Discharge of toxic pollutants is not allowed except as prescribed in Section E of SC R.61-68.		SC R.61- 68G.10.c			✓
	Stormwater, and other nonpoint source runoff is allowed if water quality necessary for existing and classified uses shall be maintained and protected consistent with anti-degradation rules.		SC R.61- 68G.10.d			✓
	Dissolved oxygen – daily average not less than 5.0 mg/L with a low of 4.0 mg/L		SC R.61-68G.10.e			✓
	pH between 6.0 and 8.5		SC R.61-68G.10.g			✓
Underground Injection Well Installation, Operation, and Abandonment						
Monitoring of Class V underground injection wells	Monitoring requirements shall, at a minimum, specify: Monitoring of the nature of injected fluids with metering and daily recording of injected and produced fluid volumes as appropriate; Monitoring of injection pressure and either flow rate or volume semimonthly, or metering and daily recording of injected and produce fluid, volumes as appropriate; Demonstration of mechanical integrity at least once every five years during the life of the well; Monitoring of the fluid level in the injection zone semimonthly, where appropriate and monitoring of the parameters chosen to measure water quality in the monitoring wells semimonthly	Monitoring into the injection zone of ground waters of the State of South Carolina - **applicable**	SC R.61-87.14(G)(3)	✓		
Operation and maintenance of Class V underground injection wells	Shall at all times properly operate and maintain all facilities and systems of treatment and controls which are installed or used.	Operation of well for underground injection of any fluids into the subsurface or ground waters of the State of South Carolina – **applicable**	SC R.61-87.13(X)	✓		
	Shall report malfunction of injection system which may cause fluid migration into or between underground sources of drinking water; shall immediately stop injection upon determination that the injection system has malfunctioned and could cause fluid migration into or between underground sources of drinking water; shall not restart the injection system until the malfunction has been corrected		SC R.61-87.13(EE)	✓		

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

Appendix B

Cost Estimates

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DAG OU PFAS
Alternative 1
No Action

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
Institutional Controls				
Posting of Warning Signs		0 ea	$ 500	$ -
Land Use Control Implementation Plan		0 ea	$ 5,000	$ -
Deed Restrictions		0 ea	$ 5,000	$ -
Subtotal - Direct Capital Cost				$ -
Mobilization/Demobilization		9% of subtotal direct capital		$ -
Site Preparation/Site Restoration		9% of subtotal direct capital		$ -
Total Direct Capital Cost				$ -
Indirect Capital Costs				
Engineering & Design		14% of direct capital		$ -
Project/Construction Management		25% of direct capital		$ -
Health & Safety		6% of direct capital		$ -
Overhead		30% of direct capital + indirect capita		$ -
Contingency		26% of direct capital + indirect capita		$ -
Total Indirect Capital Cost				$ -
Total Estimated Capital Cost				$ -
Direct O&M Costs				
Annual Costs (Existing System during Post-ROD Design & Const)		1.5% 3 Year Discount Rate[1]		*Years 2027-2029*
Access Controls		0 ea	$ 500	$ -
Maintenance		0 ea	$ 1,900	$ -
Subtotal - Annual Costs				$ -
Present Value Cost				$ -
Annual Costs		1.9% 30 Year Discount Rate[1]		*Years 2029-2057*
Access Controls		0 ea	$ 500	$ -
Annual Inspection/Maintenance		0 ea	$ 1,900	$ -
Subtotal - 10 Year Annual Costs				$ -
Present Value Cost				$ -
Five Year Costs		1.9% 30 Year Discount Rate[1]		*Years 2029-2057*
Remedy Review		0 ea	$ 15,000	$ -
Present Value Cost				$ -
Total Present Value Direct O&M Cost				$ -
Indirect O&M Costs				
Project/Admin Management		14% of direct O&M		$ -
Health & Safety		19% of direct O&M		$ -
Overhead		30% of direct O&M + indirect O&M		$ -
Contingency		20% of direct O&M + indirect O&M		$ -
Total Present Worth Indirect O&M Cost				$ -
Total Estimated Present Worth O&M Cost				$ -
TOTAL ESTIMATED COST				$ -

[1] Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.
Real Interest Rates for OMB Circular No. A-94
Treasury Notes and Bonds of Specified Maturitie:

DAG OU PFAS
Alternative 2a
PAB – CAC Injections

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
Infrastructure				
Construct Access Road	1,500	lf	$ 12	$ 18,000
Site Preparation				
Clear and Grubbing				
Clear Vegetation and Debris, Stockpile at Site Perimeter	0.46	ac	$ 2,600	$ 1,194
Clear Trees and Grub Stumps, Stockpile at Site Perimeter	0.46	ac	$ 4,500	$ 2,066
Contour Site After Clearing and Grubbing	0.46	ac	$ 1,700	$ 781
Stormwater Management				
Stormwater Management/Pollution Prevention Plan (SWPPP)	1	ea	$ 40,000	$ 40,000
Stormwater Management (Best Management Practices [BMPs])	1,000	lf	$ 25	$ 25,000
Treatment Implementation				
Initial Reporting	1	ea	$ 41,806	$ 41,806
Vendor Design and Implementation of CAC Barrier	400	ea	$ 8,986	$ 3,594,204
Injection Permit	1	ea	$ 20,000	$ 20,000
Site Restoration	1	ea	$ 100,000	$ 100,000
Subtotal - Direct Capital Cost				$ 3,843,050
Mobilization/Demobilization		3% of subtotal direct capital		$ 115,291
Monitoring Network				
One Time Costs (Mobilization, meetings, documents, etc.)	1	ea	$ 9,110	$ 9,110
Monitoring Well Installation (screened 25-35 ft bgs)	7	well	$ 10,170	$ 71,189
Monitoring Well Installation (screened 50-60 ft bgs)	7	well	$ 12,675	$ 88,724
Total Direct Capital Cost (CAC Injection)				$ 4,127,364
Indirect Capital Costs				
SRS Engineering & Design Support		8% of direct capital		$ 316,667
Project/Construction Management		15% of direct capital		$ 593,751
Health & Safety		3% of direct capital		$ 118,750
Overhead		30% of direct capital + indirect capital		$ 1,496,253
Contingency		26% of direct capital + indirect capital		$ 1,296,753
Total Indirect Capital Cost (CAC Injection)				$ 3,822,174
Total Estimated Capital Cost (CAC Injection)				$ 7,949,538

DAG OU PFAS
Alternative 2a
PAB – CAC Injections

Direct O&M Costs						
Annual Costs (Existing System during Post-ROD Design & Const)		1.5%	3 Year Discount Rate[1]			*Years 2027-2029*
Access Controls	1	ea		$ 500	$	500
Maintenance	1	ea		$ 1,900	$	1,900
Subtotal - Annual Costs					$	2,400
Present Value Cost						$4,625
Three Year Costs		1.5%	3 Year Discount Rate[1]			*Year 2030*
Post Construction Report	1	ea		$ 100,000	$	100,000
Present Value Cost						$91,454
Annual Costs (Post Construction)		1.9%	30 Year Discount Rate[1]			*Years 2029-2057*
Annual Monitoring	1	ea		$ 30,000	$	30,000
Reporting	1	ea		$ 40,000	$	40,000
Subtotal - 30 Year Annual Costs					$	70,000
Present Value Cost					$	1,426,271
Fifteen Year Cost		1.9%	30 Year Discount Rate[1]			*Year 2041*
Barrier Maintenance - Reinjection of CAC		50%	of total capital cost		$	3,890,258
Present Value Cost					$	2,933,362
Total Present Value Direct O&M Cost					$	**4,455,711**
Indirect O&M Costs						
Project/Admin Management		14%	of direct O&M		$	623,800
Health & Safety		1%	of direct O&M		$	44,557
Overhead		30%	of direct O&M + indirect O&M		$	1,523,853
Contingency		20%	of direct O&M + indirect O&M		$	990,505
Total Present Worth Indirect O&M Cost					$	**3,182,715**
Total Estimated Present Worth O&M Cost					$	**7,638,426**

TOTAL ESTIMATED COST

CAC Injections	$ **15,587,964**

[1] Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.
Real Interest Rates for OMB Circular No. A-94
Treasury Notes and Bonds of Specified Maturities

DAG OU PFAS
Alternative 2b
PAB – GAC Trench

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
Infrastructure				
Construct Access Road	1,500	lf	$ 12	$ 18,000
Site Preparation				
Clear and Grubbing				
Clear Vegetation and Debris, Stockpile at Site Perimeter	0.46	ac	$ 2,600	$ 1,194
Clear Trees and Grub Stumps, Stockpile at Site Perimeter	0.46	ac	$ 4,500	$ 2,066
Contour Site After Clearing and Grubbing	0.46	ac	$ 1,700	$ 781
Stormwater Management				
Stormwater Management/Pollution Prevention Plan (SWPPP)	1	ea	$ 40,000	$ 40,000
Stormwater Management (Best Management Practices [BMPs])	1,000	lf	$ 25	$ 25,000
Treatment Implementation				
Initial Reporting	1	ea	$ 41,806	$ 41,806
Design	1	ea	$ 509,191	$ 509,191
Granular Activated Carbon (10% of trench volume)	1,017,500	lb-GAC	$ 2.50	$ 2,543,750
Sand (90% of trench volume)	13,750	ton	$ 100	$ 1,375,000
Trench Construction (1000 ft long x 10 ft wide x 50 ft deep)	10,185	yd^3	$ 537.04	$ 5,469,829
Contaminated Soil Transport and Disposal in Subtitle C Landfill	18,512	ton	$ 489	$ 9,052,570
Site Restoration	1	ea	$ 100,000	$ 100,000
Subtotal - Direct Capital Cost				$ 19,179,186
Mobilization/Demobilization		3% of subtotal direct capital		$ 575,376
Monitoring Network				
One Time Costs (Mobilization, meetings, documents, etc.)	1	ea	$ 9,110	$ 9,110
Monitoring Well Installation (screened 25-35 ft bgs)	7	well	$ 10,170	$ 71,189
Monitoring Well Installation (screened 50-60 ft bgs)	7	well	$ 12,675	$ 88,724
Total Direct Capital Cost (GAC Trench)				**$ 19,923,584**
Indirect Capital Costs				
SRS Engineering & Design Support		1.5% of direct capital		$ 296,318
Project/Construction Management		3% of direct capital		$ 592,637
Health & Safety		0.5% of direct capital		$ 98,773
Overhead		30% of direct capital + indirect capital		$ 6,222,687
Contingency		26% of direct capital + indirect capital		$ 5,392,995
Total Indirect Capital Cost (GAC Trench)				**$ 12,603,410**
Total Estimated Capital Cost (GAC Trench)				**$ 32,526,995**

DAG OU PFAS
Alternative 2b
PAB – GAC Trench

Direct O&M Costs						
Annual Costs (Existing System during Post-ROD Design & Const)		1.5%	3 Year Discount Rate[1]			*Years 2027-2029*
Access Controls	1		ea	$ 500	$	500
Maintenance	1		ea	$ 1,900	$	1,900
Subtotal - Annual Costs					$	2,400
Present Value Cost						$4,625
Three Year Costs		1.5%	3 Year Discount Rate[1]			*Year 2030*
Post Construction Report	1		ea	$ 100,000	$	100,000
Present Value Cost						$91,454
Annual Costs (Post Construction)		1.9%	30 Year Discount Rate[1]			*Years 2029-2057*
Annual Monitoring	1		ea	$ 30,000	$	30,000
Reporting	1		ea	$ 40,000	$	40,000
Subtotal - 30 Year Annual Costs					$	70,000
Present Value Cost					$	1,426,271
Fifteen Year Cost		1.9%	30 Year Discount Rate[1]			*Year 2041*
Barrier Maintenance - Reinjection of CAC		50%	of total capital cost of CAC barrier		$	3,890,258
Present Value Cost					$	2,933,362
Total Present Value Direct O&M Cost					**$**	**4,455,711**
Indirect O&M Costs						
Project/Admin Management		14%	of direct O&M		$	623,800
Health & Safety		1%	of direct O&M		$	44,557
Overhead		30%	of direct O&M + indirect O&M		$	1,523,853
Contingency		20%	of direct O&M + indirect O&M		$	990,505
Total Present Worth Indirect O&M Cost					**$**	**3,182,715**
Total Estimated Present Worth O&M Cost					**$**	**7,638,426**

TOTAL ESTIMATED COST

GAC Trench	**$ 40,165,421**

[1] Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.
Real Interest Rates for OMB Circular No. A-94
Treasury Notes and Bonds of Specified Maturities

DAG OU PFAS
Alternative 3
Pump and Treat

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
Infrastructure				
Construct Access Road	1,500	lf	$ 12	$ 18,000
Install Powerline	3,000	lf	$ 25	$ 75,000
Install Phonelines	3,000	lf	$ 5	$ 15,000
Site Preparation				
Clear and Grubbing				
Clear Vegetation and Debris, Stockpile at Site Perimeter	0.49	ac	$ 2,600	$ 1,286
Clear Trees and Grub Stumps, Stockpile at Site Perimeter	0.49	ac	$ 4,500	$ 2,226
Contour Site After Clearing and Grubbing	0.49	ac	$ 1,700	$ 841
Excavate to create basin (15 ft x 50 ft x 10 ft deep)	278	yd^3	$ 13	$ 3,611
Stormwater Management				
Stormwater Management/Pollution Prevention Plan (SWPPP)	1	ea	$ 40,000	$ 40,000
Stormwater Management (Best Management Practices [BMPs])	1,000	lf	$ 25	$ 25,000
Treatment Implementation				
Installation of Extraction Well Network and Piping to Treatment Building				
Extraction Well Installation - One Time Costs (Mobilization, meetings, documents, etc.)	1	ea	$ 9,110	$ 9,110
Extraction Well Installation - Construction	5	well	$ 43,249	$ 216,247
Pump and Aquifer Test	1	ea	$ 103,000	$ 103,000
Piping to Treatment Building	2,000	lf	$ 15	$ 30,000
GAC Filter Vessels and Associated Infrastructure (70 gmp)				
General Conditions	1	ea	$ 184,000	$ 184,000
Separations Equipment (6000 lb capacity vessels, 5100 lb GAC per vessel)	1	ea	$ 320,000	$ 320,000
Piping and Appurtenances	1	ea	$ 160,000	$ 160,000
Electrical and Instrumentation/Controls	1	ea	$ 64,000	$ 64,000
Treatment building	800	ft^2	$ 500	$ 400,000
Site Work	1	ea	$ 40,000	$ 40,000
Installation (Equipment and Piping)	1	ea	$ 240,000	$ 240,000
Initial Permitting and Reporting				
Title 5	1	ea	$ 12,162	$ 12,162
Rad NESHAP	1	ea	$ 12,162	$ 12,162
NESHAP 5G	1	ea	$ 12,162	$ 12,162
IWT	1	ea	$ 6,781	$ 6,781
Subtotal - Direct Capital Cost				$ 1,990,587
Mobilization/Demobilization		9% of subtotal direct capital		$ 179,153
Site Preparation/Site Restoration		9% of subtotal direct capital		$ 179,153
Monitoring Network				
One Time Costs (Mobilization, meetings, documents, etc.)	1	ea	$ 9,110	$ 9,110
Monitoring Well Installation (Screened 25-35 ft bgs)	5	well	$ 10,170	$ 50,849
Monitoring Well Installation (Screened 50-60 ft bgs)	5	well	$ 12,675	$ 63,374
Total Direct Capital Cost				**$ 2,472,226**
Indirect Capital Costs				
SRS Engineering & Design Support		14% of direct capital		$ 328,845
Project/Construction Management		25% of direct capital		$ 587,223
Health & Safety		6% of direct capital		$ 140,934
Overhead		30% of direct capital + indirect capital		$ 1,021,769
Contingency		26% of direct capital + indirect capital		$ 885,533
Total Indirect Capital Cost				**$ 2,964,303**
Total Estimated Capital Cost				**$ 5,436,529**

DAG OU PFAS
Alternative 3
Pump and Treat

Direct O&M Costs						
Annual Costs (Existing System during Post-ROD Design & Const)		1.5%	3 Year Discount Rate[1]			*Years 2027-2029*
Access Controls	1	ea		$ 500	$	500
Maintenance	1	ea		$ 1,900	$	1,900
Subtotal - Annual Costs					$	2,400
Present Value Cost						$4,624.75
Three Year Costs		1.5%	3 Year Discount Rate[1]			*Year 2030*
Post Construction Report	1	ea		$ 100,000	$	100,000
Present Value Cost						$91,454
Annual Costs (Post Construction)		1.9%	30 Year Discount Rate[1]			*Years 2029-2057*
Extraction Well Network O&M	5	well		$ 15,000	$	75,000
Associated with Treatment Facility and Media Replacement/Disposal						
Utilities		1 ea		$ 12,000	$	12,000
Media Disposal and Replacement (Destruction + Media)		22200 lb		$ 2	$	44,400
Media Transport (To and from reactivation facility)		7400 mile		$ 3	$	22,200
Maintenance		1 ea		$ 19,000	$	19,000
Analytical Monitoring		1 ea		$ 16,000	$	16,000
O&M Labor		1 ea		$ 225,000	$	225,000
Reporting/Permitting						
Annual Report		1 ea		$ 84,000	$	84,000
Annual Well Monitoring		1 ea		$ 30,000	$	30,000
NPDES Fee		1 ea		$ 800	$	800
Subtotal - Annual Costs					$	528,400
Present Value Cost					$	10,766,602
Total Present Value Direct O&M Cost						**$10,862,681**
Indirect O&M Costs						
Project/Admin Management		14%	of direct O&M		$	1,520,775
Health & Safety		2%	of direct O&M		$	217,254
Overhead		30%	of direct O&M + indirect O&M		$	3,780,213
Contingency		20%	of direct O&M + indirect O&M		$	2,457,138
Total Present Worth Indirect O&M Cost					$	7,975,380
Total Estimated Present Worth 30 Year O&M Cost					$	18,838,061
TOTAL ESTIMATED COST					$	24,274,590

[1] Interest rates for costs with 3-year and 30-year durations are based on SRNS Technical Memorandum ERTEC-2017-00002.
Real Interest Rates for OMB Circular No. A-94
Treasury Notes and Bonds of Specified Maturities

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Appendix C

2025 Groundwater Investigative Sampling Data

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Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
4/2/2025	DISO-01	26	30	ft	FD	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.9	0.655	1.90	ng/L	U	
4/2/2025	DISO-01	26	30	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.98	0.682	1.98	ng/L	U	
4/2/2025	DISO-01	26	30	ft	FD	EPA533	PERFLUOROBUTANESULFONIC ACID	1.7	0.629	1.70	ng/L	U	
4/2/2025	DISO-01	26	30	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.76	0.654	1.76	ng/L	U	
4/2/2025	DISO-01	26	30	ft	FD	EPA533	PERFLUOROHEXANESULFONIC ACID	3.09	0.629	1.73	ng/L		
4/2/2025	DISO-01	26	30	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	3.27	0.654	1.80	ng/L		
4/2/2025	DISO-01	26	30	ft	FD	EPA533	PERFLUORONONANOIC ACID	25.6	0.629	1.90	ng/L		
4/2/2025	DISO-01	26	30	ft	REG	EPA533	PERFLUORONONANOIC ACID	27.1	0.654	1.98	ng/L		
4/2/2025	DISO-01	26	30	ft	FD	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	5.93	0.629	1.90	ng/L		
4/2/2025	DISO-01	26	30	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	7.02	0.654	1.98	ng/L		
4/2/2025	DISO-01	26	30	ft	FD	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	2	0.629	1.90	ng/L		
4/2/2025	DISO-01	26	30	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	1.98	0.654	1.98	ng/L		S
4/3/2025	DISO-01	37	42	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.86	0.639	1.86	ng/L	U	
4/3/2025	DISO-01	37	42	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	16.5	0.613	1.65	ng/L		
4/3/2025	DISO-01	37	42	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	122	0.613	1.69	ng/L		
4/3/2025	DISO-01	37	42	ft	REG	EPA533	PERFLUORONONANOIC ACID	1090	13.2	40.0	ng/L		
4/3/2025	DISO-01	37	42	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	205	13.2	40.0	ng/L		
4/3/2025	DISO-01	37	42	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	62.5	0.613	1.86	ng/L		
4/4/2025	DISO-01	45	50	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.87	0.645	1.87	ng/L	U	
4/4/2025	DISO-01	45	50	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	15.9	0.619	1.67	ng/L		
4/4/2025	DISO-01	45	50	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	150	0.619	1.71	ng/L		
4/4/2025	DISO-01	45	50	ft	REG	EPA533	PERFLUORONONANOIC ACID	1670	13.2	40.1	ng/L		
4/4/2025	DISO-01	45	50	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	440	13.2	40.1	ng/L		
4/4/2025	DISO-01	45	50	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	80.2	0.619	1.87	ng/L		
4/4/2025	DISO-01	63	68	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.8	0.617	1.80	ng/L	U	
4/4/2025	DISO-01	63	68	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	2.74	0.592	1.60	ng/L		
4/4/2025	DISO-01	63	68	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	4.02	0.592	1.63	ng/L		
4/4/2025	DISO-01	63	68	ft	REG	EPA533	PERFLUORONONANOIC ACID	4.47	0.592	1.80	ng/L		
4/4/2025	DISO-01	63	68	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.15	0.592	1.80	ng/L	J	21
4/4/2025	DISO-01	63	68	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	5.25	0.592	1.80	ng/L		
4/7/2025	DISO-01	76	80	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.93	0.665	1.93	ng/L	U	
4/7/2025	DISO-01	76	80	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.72	0.638	1.72	ng/L	U	
4/7/2025	DISO-01	76	80	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.76	0.638	1.76	ng/L	U	
4/7/2025	DISO-01	76	80	ft	REG	EPA533	PERFLUORONONANOIC ACID	1.93	0.638	1.93	ng/L	U	
4/7/2025	DISO-01	76	80	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.93	0.638	1.93	ng/L	U	
4/7/2025	DISO-01	76	80	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	1.93	0.638	1.93	ng/L	U	
2/11/2025	DISO-02	23	28	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.83	0.628	1.83	ng/L	U	

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
2/11/2025	DISO-02	23	28	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	0.687	0.603	1.63	ng/L	J	21
2/11/2025	DISO-02	23	28	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	3.86	0.603	1.66	ng/L		
2/11/2025	DISO-02	23	28	ft	REG	EPA533	PERFLUORONONANOIC ACID	632	6.60	20.0	ng/L		
2/11/2025	DISO-02	23	28	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	28	0.603	1.83	ng/L		
2/11/2025	DISO-02	23	28	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	39.6	0.603	1.83	ng/L		
2/13/2025	DISO-02	28	31	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.81	0.623	1.81	ng/L	U	
2/13/2025	DISO-02	28	31	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	6.76	0.598	1.61	ng/L		
2/13/2025	DISO-02	28	31	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	43.1	0.598	1.65	ng/L		
2/13/2025	DISO-02	28	31	ft	REG	EPA533	PERFLUORONONANOIC ACID	1200	16.5	50.0	ng/L		
2/13/2025	DISO-02	28	31	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	180	16.5	50.0	ng/L		
2/13/2025	DISO-02	28	31	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	67.7	0.598	1.81	ng/L		
2/17/2025	DISO-02	38	42	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.79	0.616	1.79	ng/L	U	
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	20	5.0	20	ng/L	U	
2/17/2025	DISO-02	38	42	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	2.15	0.591	1.59	ng/L		
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	PERFLUOROBUTANESULFONIC ACID	1.8	0.47	5.0	ng/L	J	21
2/17/2025	DISO-02	38	42	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	13.1	0.591	1.63	ng/L		
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	PERFLUOROHEXANESULFONIC ACID	14	0.92	5.0	ng/L		
2/17/2025	DISO-02	38	42	ft	REG	EPA533	PERFLUORONONANOIC ACID	524	6.60	20.0	ng/L		
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	PERFLUORONONANOIC ACID	480	0.52	5.0	ng/L		
2/17/2025	DISO-02	38	42	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	46.4	0.591	1.79	ng/L		
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	PERFLUOROOCTANESULFONIC ACID (PFOS)	42	1.2	5.0	ng/L		V
2/17/2025	DISO-02	38	42	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	20.7	0.591	1.79	ng/L		
2/17/2025	DISO-02	38	42	ft	SPL	EPA1633	PERFLUOROOCTANOIC ACID (PFOA)	19	1.0	5.0	ng/L		
3/26/2025	DISO-03	16	20	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.77	0.610	1.77	ng/L	U	
3/26/2025	DISO-03	16	20	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	0.993	0.586	1.58	ng/L	J	21
3/26/2025	DISO-03	16	20	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	6.6	0.586	1.62	ng/L		
3/26/2025	DISO-03	16	20	ft	REG	EPA533	PERFLUORONONANOIC ACID	226	6.60	20.0	ng/L		
3/26/2025	DISO-03	16	20	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	48.4	0.586	1.77	ng/L		
3/26/2025	DISO-03	16	20	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	23.4	0.586	1.77	ng/L		
3/27/2025	DISO-03	48	52	ft	FD	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.82	0.627	1.82	ng/L	U	
3/27/2025	DISO-03	48	52	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.81	0.622	1.81	ng/L	U	
3/27/2025	DISO-03	48	52	ft	FD	EPA533	PERFLUOROBUTANESULFONIC ACID	1.63	0.601	1.62	ng/L		
3/27/2025	DISO-03	48	52	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.65	0.597	1.61	ng/L		
3/27/2025	DISO-03	48	52	ft	FD	EPA533	PERFLUOROHEXANESULFONIC ACID	17.5	0.601	1.66	ng/L		
3/27/2025	DISO-03	48	52	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	14.9	0.597	1.65	ng/L		
3/27/2025	DISO-03	48	52	ft	FD	EPA533	PERFLUORONONANOIC ACID	220	6.60	20.0	ng/L		
3/27/2025	DISO-03	48	52	ft	REG	EPA533	PERFLUORONONANOIC ACID	224	6.60	20.0	ng/L		

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
3/27/2025	DISO-03	48	52	ft	FD	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	15.3	0.601	1.82	ng/L		
3/27/2025	DISO-03	48	52	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	16.6	0.597	1.81	ng/L		
3/27/2025	DISO-03	48	52	ft	FD	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	46.5	0.601	1.82	ng/L		
3/27/2025	DISO-03	48	52	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	45.7	0.597	1.81	ng/L		
3/28/2025	DISO-03	62	67	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.89	0.649	1.89	ng/L	U	
3/28/2025	DISO-03	62	67	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.68	0.622	1.68	ng/L	U	
3/28/2025	DISO-03	62	67	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.72	0.622	1.72	ng/L	U	
3/28/2025	DISO-03	62	67	ft	REG	EPA533	PERFLUORONONANOIC ACID	1.28	0.622	1.89	ng/L	J	21
3/28/2025	DISO-03	62	67	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.89	0.622	1.89	ng/L	U	
3/28/2025	DISO-03	62	67	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	1.03	0.622	1.89	ng/L	J	21
3/28/2025	DISO-03	76	80	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.87	0.643	1.87	ng/L	U	
3/28/2025	DISO-03	76	80	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.11	0.617	1.66	ng/L	J	21
3/28/2025	DISO-03	76	80	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.7	0.617	1.70	ng/L	U	
3/28/2025	DISO-03	76	80	ft	REG	EPA533	PERFLUORONONANOIC ACID	1.87	0.617	1.87	ng/L	U	
3/28/2025	DISO-03	76	80	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.87	0.617	1.87	ng/L	U	
3/28/2025	DISO-03	76	80	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	2.18	0.617	1.87	ng/L		
4/1/2025	DISO-03	101	106	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.9	0.652	1.90	ng/L	U	
4/1/2025	DISO-03	101	106	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.69	0.626	1.69	ng/L	U	
4/1/2025	DISO-03	101	106	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.73	0.626	1.73	ng/L	U	
4/1/2025	DISO-03	101	106	ft	REG	EPA533	PERFLUORONONANOIC ACID	1.9	0.626	1.90	ng/L	U	
4/1/2025	DISO-03	101	106	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.9	0.626	1.90	ng/L	U	
4/1/2025	DISO-03	101	106	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	1.9	0.626	1.90	ng/L	U	
2/21/2025	DISO-04	18	23	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.8	0.620	1.80	ng/L	U	
2/21/2025	DISO-04	18	23	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	0.768	0.595	1.60	ng/L	J	21
2/21/2025	DISO-04	18	23	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	4.39	0.595	1.64	ng/L		
2/21/2025	DISO-04	18	23	ft	REG	EPA533	PERFLUORONONANOIC ACID	111	0.595	1.80	ng/L		
2/21/2025	DISO-04	18	23	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	18.1	0.595	1.80	ng/L		
2/21/2025	DISO-04	18	23	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	19.4	0.595	1.80	ng/L		
2/24/2025	DISO-04	28	32	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.86	0.641	1.86	ng/L	U	
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	4.2	1.1	4.2	ng/L	U	
2/24/2025	DISO-04	28	32	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	0.692	0.615	1.66	ng/L	J	21
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	PERFLUOROBUTANESULFONIC ACID	0.71	0.10	1.1	ng/L	J	21
2/24/2025	DISO-04	28	32	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	5.24	0.615	1.70	ng/L		
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	PERFLUOROHEXANESULFONIC ACID	6.5	0.20	1.1	ng/L		
2/24/2025	DISO-04	28	32	ft	REG	EPA533	PERFLUORONONANOIC ACID	195	6.60	20.0	ng/L		
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	PERFLUORONONANOIC ACID	190	0.11	1.1	ng/L		
2/24/2025	DISO-04	28	32	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	22.7	0.615	1.86	ng/L		

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	PERFLUOROOCTANESULFONIC ACID (PFOS)	21	0.26	1.1	ng/L		V
2/24/2025	DISO-04	28	32	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	25.4	0.615	1.86	ng/L		
2/24/2025	DISO-04	28	32	ft	SPL	EPA1633	PERFLUOROOCTANOIC ACID (PFOA)	25	0.22	1.1	ng/L		
2/25/2025	DISO-04	38	42	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.93	0.663	1.93	ng/L	U	
2/25/2025	DISO-04	38	42	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.1	0.636	1.72	ng/L	J	21
2/25/2025	DISO-04	38	42	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	8.4	0.636	1.75	ng/L		
2/25/2025	DISO-04	38	42	ft	REG	EPA533	PERFLUORONONANOIC ACID	632	16.5	50.0	ng/L		
2/25/2025	DISO-04	38	42	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	35.2	0.636	1.93	ng/L		
2/25/2025	DISO-04	38	42	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	63.7	0.636	1.93	ng/L		
2/27/2025	DISO-04	64	68	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.95	0.672	1.95	ng/L	U	
2/27/2025	DISO-04	64	68	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.74	0.644	1.74	ng/L	U	
2/27/2025	DISO-04	64	68	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.78	0.644	1.78	ng/L	U	
2/27/2025	DISO-04	64	68	ft	REG	EPA533	PERFLUORONONANOIC ACID	4.91	0.644	1.95	ng/L		
2/27/2025	DISO-04	64	68	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.95	0.644	1.95	ng/L	U	
2/27/2025	DISO-04	64	68	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	3.04	0.644	1.95	ng/L		
3/20/2025	DISO-05	15	20	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.8	0.618	1.80	ng/L	U	
3/20/2025	DISO-05	15	20	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	0.704	0.593	1.60	ng/L	J	21
3/20/2025	DISO-05	15	20	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.53	0.593	1.64	ng/L	J	21
3/20/2025	DISO-05	15	20	ft	REG	EPA533	PERFLUORONONANOIC ACID	2.44	0.593	1.80	ng/L		
3/20/2025	DISO-05	15	20	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	27.7	0.593	1.80	ng/L		
3/20/2025	DISO-05	15	20	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	9.7	0.593	1.80	ng/L		
3/20/2025	DISO-05	25	30	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.99	0.684	1.99	ng/L	U	
3/20/2025	DISO-05	25	30	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.07	0.656	1.77	ng/L	J	21
3/20/2025	DISO-05	25	30	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	9.16	0.656	1.81	ng/L		
3/20/2025	DISO-05	25	30	ft	REG	EPA533	PERFLUORONONANOIC ACID	15.5	0.656	1.99	ng/L		
3/20/2025	DISO-05	25	30	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	8.51	0.656	1.99	ng/L		
3/20/2025	DISO-05	25	30	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	35.5	0.656	1.99	ng/L		
3/21/2025	DISO-05	40	45	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.84	0.632	1.84	ng/L	U	
3/21/2025	DISO-05	40	45	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.39	0.606	1.64	ng/L	J	21
3/21/2025	DISO-05	40	45	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	9	0.606	1.67	ng/L		
3/21/2025	DISO-05	40	45	ft	REG	EPA533	PERFLUORONONANOIC ACID	622	6.60	20.0	ng/L		
3/21/2025	DISO-05	40	45	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	26.7	0.606	1.84	ng/L		
3/21/2025	DISO-05	40	45	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	72.7	0.606	1.84	ng/L		
3/21/2025	DISO-05	60	65	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.94	0.666	1.94	ng/L	U	
3/21/2025	DISO-05	60	65	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.23	0.639	1.72	ng/L	J	21
3/21/2025	DISO-05	60	65	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	8.18	0.639	1.76	ng/L		
3/21/2025	DISO-05	60	65	ft	REG	EPA533	PERFLUORONONANOIC ACID	474	6.60	20.0	ng/L		

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
3/21/2025	DISO-05	60	65	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	6.94	0.639	1.94	ng/L		
3/21/2025	DISO-05	60	65	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	70.9	0.639	1.94	ng/L		
3/24/2025	DISO-05	70	75	ft	FD	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.81	0.622	1.81	ng/L	U	
3/24/2025	DISO-05	70	75	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.84	0.632	1.84	ng/L	U	
3/24/2025	DISO-05	70	75	ft	FD	EPA533	PERFLUOROBUTANESULFONIC ACID	1.61	0.597	1.61	ng/L	U	
3/24/2025	DISO-05	70	75	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.64	0.607	1.64	ng/L	U	
3/24/2025	DISO-05	70	75	ft	FD	EPA533	PERFLUOROHEXANESULFONIC ACID	0.867	0.597	1.65	ng/L	J	21
3/24/2025	DISO-05	70	75	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	0.751	0.607	1.67	ng/L	J	21
3/24/2025	DISO-05	70	75	ft	FD	EPA533	PERFLUORONONANOIC ACID	48.2	0.597	1.81	ng/L		
3/24/2025	DISO-05	70	75	ft	REG	EPA533	PERFLUORONONANOIC ACID	18.3	0.607	1.84	ng/L		
3/24/2025	DISO-05	70	75	ft	FD	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	0.695	0.597	1.81	ng/L	J	21
3/24/2025	DISO-05	70	75	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.84	0.607	1.84	ng/L	U	
3/24/2025	DISO-05	70	75	ft	FD	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	13.5	0.597	1.81	ng/L		
3/24/2025	DISO-05	70	75	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	8.69	0.607	1.84	ng/L		
3/4/2025	DISO-06	17	21	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.87	0.642	1.87	ng/L	U	
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	24	4.9	24	ng/L	U	
3/4/2025	DISO-06	17	21	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.39	0.616	1.66	ng/L	J	21
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	PERFLUOROBUTANESULFONIC ACID	1.4	0.52	6.0	ng/L	J	21
3/4/2025	DISO-06	17	21	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	4.65	0.616	1.70	ng/L		
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	PERFLUOROHEXANESULFONIC ACID	3.8	1.8	6.0	ng/L	J	21
3/4/2025	DISO-06	17	21	ft	REG	EPA533	PERFLUORONONANOIC ACID	3.86	0.616	1.87	ng/L		
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	PERFLUORONONANOIC ACID	5.7	1.9	6.0	ng/L	J	21
3/4/2025	DISO-06	17	21	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	3.4	0.616	1.87	ng/L		
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	PERFLUOROOCTANESULFONIC ACID (PFOS)	4.5	0.97	6.0	ng/L	J	21
3/4/2025	DISO-06	17	21	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	7.82	0.616	1.87	ng/L		
3/4/2025	DISO-06	17	21	ft	SPL	EPA1633	PERFLUOROOCTANOIC ACID (PFOA)	9.5	1.6	6.0	ng/L		
3/5/2025	DISO-06	25	30	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.77	0.609	1.77	ng/L	U	
3/5/2025	DISO-06	25	30	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.58	0.584	1.58	ng/L	U	
3/5/2025	DISO-06	25	30	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	2.42	0.584	1.61	ng/L		
3/5/2025	DISO-06	25	30	ft	REG	EPA533	PERFLUORONONANOIC ACID	5.22	0.584	1.77	ng/L		
3/5/2025	DISO-06	25	30	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.39	0.584	1.77	ng/L	J	21
3/5/2025	DISO-06	25	30	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	4.4	0.584	1.77	ng/L		
3/6/2025	DISO-06	43	48	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.82	0.627	1.82	ng/L	U	
3/6/2025	DISO-06	43	48	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.48	0.601	1.62	ng/L	J	21
3/6/2025	DISO-06	43	48	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	9.5	0.601	1.66	ng/L		
3/6/2025	DISO-06	43	48	ft	REG	EPA533	PERFLUORONONANOIC ACID	734	16.5	50.0	ng/L		
3/6/2025	DISO-06	43	48	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	36.2	0.601	1.82	ng/L		

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
3/6/2025	DISO-06	43	48	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	60.9	0.601	1.82	ng/L		
3/7/2025	DISO-06	69	73	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.88	0.647	1.88	ng/L	U	
3/7/2025	DISO-06	69	73	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.67	0.621	1.67	ng/L	U	
3/7/2025	DISO-06	69	73	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.71	0.621	1.71	ng/L	U	
3/7/2025	DISO-06	69	73	ft	REG	EPA533	PERFLUORONONANOIC ACID	4.06	0.621	1.88	ng/L		
3/7/2025	DISO-06	69	73	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.88	0.621	1.88	ng/L	U	
3/7/2025	DISO-06	69	73	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	1.88	0.621	1.88	ng/L	U	
3/11/2025	DISO-06	90	95	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.9	0.652	1.90	ng/L	U	
3/11/2025	DISO-06	90	95	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.69	0.625	1.69	ng/L	U	
3/11/2025	DISO-06	90	95	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.72	0.625	1.72	ng/L	U	
3/11/2025	DISO-06	90	95	ft	REG	EPA533	PERFLUORONONANOIC ACID	2.9	0.625	1.90	ng/L		
3/11/2025	DISO-06	90	95	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.9	0.625	1.90	ng/L	U	
3/11/2025	DISO-06	90	95	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	2.03	0.625	1.90	ng/L		
3/13/2025	DISO-07	19	24	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.81	0.621	1.81	ng/L	U	
3/13/2025	DISO-07	19	24	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.61	0.596	1.61	ng/L	U	
3/13/2025	DISO-07	19	24	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.64	0.596	1.64	ng/L	U	
3/13/2025	DISO-07	19	24	ft	REG	EPA533	PERFLUORONONANOIC ACID	1.07	0.596	1.81	ng/L	J	21
3/13/2025	DISO-07	19	24	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.81	0.596	1.81	ng/L	U	
3/13/2025	DISO-07	19	24	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	0.747	0.596	1.81	ng/L	J	21
3/14/2025	DISO-07	29	34	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.84	0.632	1.84	ng/L	U	
3/14/2025	DISO-07	29	34	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.63	0.606	1.63	ng/L	U	
3/14/2025	DISO-07	29	34	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	1.69	0.606	1.67	ng/L		
3/14/2025	DISO-07	29	34	ft	REG	EPA533	PERFLUORONONANOIC ACID	46.8	0.606	1.84	ng/L		
3/14/2025	DISO-07	29	34	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	4.45	0.606	1.84	ng/L		
3/14/2025	DISO-07	29	34	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	6.59	0.606	1.84	ng/L		
3/17/2025	DISO-07	45	50	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.84	0.632	1.84	ng/L	U	
3/17/2025	DISO-07	45	50	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.64	0.606	1.64	ng/L	U	
3/17/2025	DISO-07	45	50	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	2.4	0.606	1.67	ng/L		
3/17/2025	DISO-07	45	50	ft	REG	EPA533	PERFLUORONONANOIC ACID	44.4	0.606	1.84	ng/L		
3/17/2025	DISO-07	45	50	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	8.43	0.606	1.84	ng/L		
3/17/2025	DISO-07	45	50	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	5.14	0.606	1.84	ng/L		
3/18/2025	DISO-07	58	61	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.92	0.660	1.92	ng/L	U	
3/18/2025	DISO-07	58	61	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	2.61	0.633	1.71	ng/L		
3/18/2025	DISO-07	58	61	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	14.2	0.633	1.75	ng/L		
3/18/2025	DISO-07	58	61	ft	REG	EPA533	PERFLUORONONANOIC ACID	478	6.59	20.0	ng/L		
3/18/2025	DISO-07	58	61	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	18.2	0.633	1.92	ng/L		
3/18/2025	DISO-07	58	61	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	56.4	0.633	1.92	ng/L		

Sample Date	Location	Start Depth	End Depth	Unit	Sample Type	Analytical Method	Analyte Name	Result	Detection Limit	Quantitation Limit	Unit	Qualifiers	DQM Reason Code
3/19/2025	DISO-07	86	90	ft	REG	EPA533	HEXAFLUOROPROPYLENE OXIDE DIMER ACID	1.91	0.658	1.91	ng/L	U	
3/19/2025	DISO-07	86	90	ft	REG	EPA533	PERFLUOROBUTANESULFONIC ACID	1.7	0.631	1.70	ng/L	U	
3/19/2025	DISO-07	86	90	ft	REG	EPA533	PERFLUOROHEXANESULFONIC ACID	0.765	0.631	1.74	ng/L	J	21
3/19/2025	DISO-07	86	90	ft	REG	EPA533	PERFLUORONONANOIC ACID	3.2	0.631	1.91	ng/L		
3/19/2025	DISO-07	86	90	ft	REG	EPA533	PERFLUOROOCTANESULFONIC ACID (PFOS)	1.91	0.631	1.91	ng/L	U	
3/19/2025	DISO-07	86	90	ft	REG	EPA533	PERFLUOROOCTANOIC ACID (PFOA)	13.2	0.631	1.91	ng/L		

Notes:
ft – feet
ng/L – nanogram per liter
ft^3/min – cubic feet per minute
Sample types: REG – Regular; FD – Field Duplicate; SLP - Split
Qualifiers: U – Non-detect; J – Estimated

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