Savannah River
NUCLEAR SOLUTIONS℠

Scoping Summary for the D-Area Groundwater Operable Unit (U)
(Post-Characterization Scoping Phase)

SEMS Number: 63

ERD-EN-2019-0022

November 2023 (Final)

SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

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Prepared for
U.S. Department of Energy
and
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Aiken, South Carolina

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1.0 PROJECT PHASE/STATUS OF SCOPING SUMMARY

Groundwater in D Area has been monitored under the approved *Monitoring Work Plan for the DAG OU (WSRC-RP-2003-4150, Revision 1, June 2004)* since 2004. The U.S. Department of Energy (USDOE) has submitted groundwater monitoring reports or data summary letters annually to the U.S. Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) documenting the monitoring results.

In April 2021, a Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation (RFI/RI) Work Plan scoping meeting was held. The Core Team agreed with the adequacy of current groundwater data for defining problem[s] warranting action and identified two additional data needs as follows: (1) additional sampling and/or installation of a monitoring well in the Gordon Aquifer (GA) for volatile organic compounds (VOCs) and per- and poly-fluorinated substances (PFAS); and surface water and sediment sampling for potential PFAS contaminated groundwater discharge. The *RFI/RI Work Plan for the D-Area Groundwater Operable Unit (D-Area Upgradient Sources)* (SRNS-RP-2019-00394, Revision 0, June 2021) including a Sampling and Analysis Plan (SAP) to address the additional data needs was submitted in June 2021. The Revision 1 report was approved by the USEPA and SCDHEC in May 2022. Twenty-four (24) additional monitoring wells were installed, and additional sampling to complete characterization of DAG OU in support the RFI/RI/Baseline Risk Assessment (BRA) was completed.

At the 6/16/2022 DAG OU Annual Reports Microsoft Teams meeting, the Core Team agreed that there is no longer a need for a long-term monitoring strategy for DAG OU as SRS prepares for submittal of the RFI/RI/BRA on or before 12/10/2024. The Core Team agreed to replace the DAG OU data summary letter (2021 data) due on 7/31/2022 and the groundwater monitoring report (2022 data) due on 7/31/2023 with a single DAG OU Monitoring Report (2021 and 2022 data) due on 1/31/2023. After the 1/2023 monitoring report submittal, the annual DAG OU data reporting will be suspended until a remedial decision is made and agreed to by the Core Team. The *2023 Groundwater Monitoring Report for the D-Area Groundwater Operable Unit* (*2021-2022 Data*) (SRNS-RP-2023-00261, Revision 0, March 2023) was submitted in April 2023, and comments were received from the SCDHEC and USEPA in August 2023.

This scoping summary supports Core Team discussion for the development of the RFI/RI/BRA for the DAG OU, currently scheduled for submittal on or before December 10, 2024. The objectives of the post-characterization scoping meeting are to review the conceptual site model and existing understanding of the nature and extent of contamination DAG OU and reach Core Team agreement that the data quality objectives were satisfied, and the groundwater data is adequate for defining problem[s] warranting action and identification of likely response actions, or whether there are remaining data needs that must be addressed.

2.0 D AREA HISTORY AND BACKGROUND

Savannah River Site (SRS) encompasses 803 square kilometers (km^2) (310 square miles [mi^2]) of South Carolina coastal plain uplands along the Savannah River in Aiken, Barnwell, and Allendale counties. SRS is owned by the USDOE. SRS produced special nuclear materials for the U.S. Department of Defense between 1952 and 1988. The reactors that were used to produce the nuclear materials required heavy water as a moderator to control the speed of neutrons in the reactor. The heavy water was produced in D Area at the SRS. D Area also contained the heavy water rework facility to purify the SRS inventory of used reactor moderator. Other D Area operations included the 484-D Powerhouse that provided electricity and steam for the D-Area facilities and other areas at SRS. After shutdown of the D-Area Bubble Towers, a portion of the area was used for the 411-1D/411-3D Fire Training Area to support the SRS Fire Department.

D Area is located in the southwest quadrant of the SRS, approximately (~) 914-meters (m) (3,000-feet [ft]) east of the nearest site boundary, the Savannah River. The DAG OU, which is located in the Savannah River Floodplain and Swamp watershed, encompasses groundwater beneath D Area, west and southwest to the Savannah River (Figure 1). Groundwater flow is to the southwest in both the Upper Three Runs Aquifer (UTRA) (Figure 2) and GA (Figure 3).

The groundwater in D-Area has been contaminated with trichloroethylene (TCE), tetrachloroethylene (PCE), tritium, beryllium, and other metals from surface or facility sources associated with the D-Area OU (DAOU). The DAOU is comprised of 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. Most of the sources of the groundwater contamination associated with the DAOU have been addressed under remedial and/or removal actions.

2.1 Completed Source Remediation

DAOU consists of the following three main facility areas: the 484-D Powerhouse (Powerhouse Subunit), the D-Area Heavy Water Facility (Bubble Tower Subunit), and the Moderator Processing Facility (Moderator Processing Subunit) (Figure 4). Non-time critical removal (NTCR) actions were completed for the facilities associated with the Bubble Tower Subunit and the Moderator Processing Subunit, and these facilities are no longer a source of tritium or TCE contamination to groundwater. An *Early Action Record of Decision Remedial Alternative Selection for the D-Area Operable Unit (SRNS-RP-2010-00162, Rev. 1.2, July 2011)* integrated the results of the completed removal actions and selected land use controls (LUCs) as the final action for the Bubble Tower Subunit, Moderator Processing Subunit, the northern 25% section of the 489-D Coal Pile Runoff Basin [CPRB] (part of the Powerhouse Subunit), and miscellaneous units (i.e., D-Area Asbestos Pit, and the D-Area Process Sewer Lines as Abandoned inside the area fence).

The Powerhouse Subunit consists of the 484-D Powerhouse building, the 484-17D Coal Storage Area (DCSA), and the 489-D Coal Pile Runoff Basin (CPRB) and associated ancillary facilities for coal and ash storage, runoff, and disposal. The 488-D D-Area Ash Basin (488-DAB) and the D-Area Rubble Pit (DRP) are no longer operational and remedial actions for these surface units were completed under the D-Area Expanded Operable Unit project. The *Record of Decision Remedial Alternative Selection for the D-Area Expanded Operable Unit (WSRC-RP-2004-4007, Revision 1, August 2004)* documents the selection of a low permeability geosynthetic cover system installed over the 488-DAB, and LUCs and groundwater monitoring for the 488-DAB and the DRP.

A coal pile located at the 484-17D DCSA south of the 484-D Powerhouse created acidic leachate from the 484-17D DCSA to collect in the 489-D CPRB. The leachate infiltrated into the vadose zone and collected in the 489-D CPRB. The coal pile was removed following shutdown of the 484-D Powerhouse. The 2020 NTCR action at the 484-17D DCSA to amend the acidic soils by the addition of lime (calcium carbonate) to a depth of 1.2 meters (4 feet) below ground surface to raise the pH of the soils to more natural levels (approximately a pH of 5.5 or higher) within the majority (approximately 4.9 hectares [12 acres]) of the 484-17D DCSA (*Removal Site Evaluation Report / Engineering Evaluation / Cost Analysis (RSER/EE/CA) for the D-Area Coal Storage Area (484-17D) (U)* SRNS-RP-2018-00813, Revision 1). The removal action was completed in December of 2020. Post-action pH soil sampling was conducted in June 2022 and confirmed the soil pH had been raised sufficiently. Improvements in groundwater conditions (i.e. increased pH, lower metal concentration) are not expected to be evident on the order of a decade. The 484-17D DCSA is currently listed on FFA Appendix K.1: D&D Facilities to be Decommissioned. The final action for the 484-17D DCSA will be addressed by the DAOU ROD scheduled for issuance in January 2046.

The 489-D CPRB previously received runoff from the 484-17D DCSA. A NTCR action was completed for the 489-D CPRB northern 25% section in 2011. The southern 75% section of the 489-D CPRB was addressed under a NTCR action in 2017 to remove coal fines and contaminated sediments from the basin and will remain open as a storm water retention structure.

In 2013, the 488-1D Ash Basin, 488-2D Ash Basin, and the 488-4D Ash Landfill were included as subunits of the DAOU.

- A NTCR action was conducted for the 488-1D Ash Basin to consolidate ash in the eastern portion of the basin and install a geosynthetic cover and vegetative layer compliant with the SCDHEC Class Three Solid Waste Landfill Cover requirements. The western portion of the 488-1D Ash Basin was graded for stormwater runoff.
- A time critical removal action was conducted for the 488-2D Ash Basin to dewater and remove bulk ash from the basin and consolidate in the 488-4D Ash Landfill. Fill was placed in the 488-2D Ash Basin and the basin regraded, sloped appropriately and converted to a storm water detention structure.
- A NTCR action was conducted for the 488-4D Ash Landfill to consolidate excavated ash from the 488-2D Ash Basin and install a geosynthetic cover and vegetative layer compliant with the SCDHEC Class Three Solid Waste Landfill Cover requirements over the landfill.

A second Early Action ROD for the DAOU including the 488-1D Ash Basin, 488-2D Ash Basin, 488-4D Ash Landfill and southern 75% section of the 489-D CPRB was issued in July 2020. The final ROD for the DAOU to include the remaining Powerhouse Subunit waste units and D&D facilities is currently scheduled for issuance in January 2046.

2.2 Additional Activities

<u>Treatability Study for Groundwater Injection and Effluent Discharge Canal Treatment</u>

The presence of a low-pH plume in the groundwater is expected to last for decades under natural groundwater conditions. The low-pH groundwater is currently discharging into the D-Area Effluent Discharge Canal which later converges with Beaver Dam Creek and flows through the Savannah River floodplain to the Savannah River (Figure 6)[1]. If the pH of the aquifer can be raised to more normal, less acidic conditions, the groundwater and surface water conditions in the D-Area Effluent Discharge Canal would improve.

An ongoing treatability study is injecting potable water into the Upper Three Runs Aquifer (UTRA) upgradient of the low-pH, metals, and sulfate plume to create a hydraulic head and displace the low-pH groundwater in the aquifer (*Treatability Study Work Plan for Groundwater Injection and Discharge Canal Treatment at the D-Area Groundwater Operable Unit [SRNS-TR-2018-00128, Revision 1, January 2019]*). Field start occurred in December 2019 with the installation of five of the injection wells. Due to the abundance of potentially less accepting sediments encountered (clays and fine sediments), injection testing on the wells was conducted before moving forward with the installation of the remaining injection well field. Once results showed there was enough flow into the wells with short tests, five additional injection wells were installed in 2021. The potable water injections began on March 21, 2023 into the currently installed injection wells and has been constantly injecting. As of August 31, 2023, a total of over 61.4 million gallons of water have been injected. Two calcium carbonate marble chip reactive structures were installed in 2020 downgradient within the D-Area Effluent Discharge Canal. Surface water samples are currently being monitored for pH and metals upgradient, in-between, and downgradient of the reactive structures. Water flow through the reactive structures has been reduced due to sediment and detritus buildup. A maintenance action will be completed before the end of 2023 to clean the marble chips and install check dams help prevent or reduce future sediment buildup. The recent treatability study status and data have been submitted in the third annual data report in January 2023 (*Treatability Study Data Report for Groundwater Injection and Discharge Canal Neutralization at the D-Area Groundwater (OU) (U)*, SRNS-TR-

[1] The D-Area Effluent Discharge Canal is a subunit of the "Savannah River and Floodplain Swamp Integrator Operable Unit (Including Beaver Dam Creek, D-Area Effluent Discharge Canal, and Ash Area Adjacent to and Easterly of D-Area Ash Basins 488-1D and 488-2D)". As noted in the FFA, although the D-Area Effluent Discharge Canal is not a subunit of the DAG OU, a separate schedule for the "D-Area Effluent Discharge Canal and Ash Area Adjacent to and Easterly of D-Area Ash Basins 488-1D and 488-2D" may be developed by the Core Team pending the results of the DAG OU remedial investigation process.

2023-00009). The treatability study results will be used to support the development of the DAG OU Corrective Measures Study/Feasibility Study (CMS/FS).

Between March and November 2020, a removal action was conducted at the 484-17D DCSA to reduce the acidity in the surface and subsurface soils. A lime calcium carbonate neutralization amendment (i.e., Hi-Cal AgLime) was mixed with the soils to a depth of 4 ft below ground surface and a limestone gravel cover was placed over all disturbed areas (Figure 23). Subsequent soil sampling in May 2022 indicated the removal action was a success as the soil pH levels were raised to more natural levels (pH of 5.5 or higher).

The combined (or synergistic) effects of the two actions have not been estimated or considered but will be apparent from the measurements using the parameters described in the treatability study, the 484-17D DCSA RSER/EE/CA, and the DAG OU groundwater and surface water monitoring.

3.0 LAND USE

The DAG OU is located in a future industrial land use zone of SRS as defined by the Land Use Control Assurance Plan. No current or future development of the DAG OU is planned. There is no current or projected future use of the groundwater as a drinking water source.

4.0 D-AREA GROUNDWATER OPERABLE UNIT

Commingled plumes of TCE, PCE, tritium, beryllium, and other metals are present in the groundwater at D Area above maximum contaminant levels (MCLs). Groundwater flow in the UTRA and the underlying GA are both to the west to southwest towards the Savannah River. A schematic of the DAG OU conceptual site model is provided in Figure 6.

A flow and transport groundwater model was developed in 2002 to support the DEXOU, provide a baseline for D-Area groundwater understanding, and to show nature and extent of existing groundwater contamination. The model supported the development of the *Monitoring Work Plan for the DAG OU (WSRC-RP-2003-4150, Revision 1, June 2004)* which prescribed annual or semi-annual monitoring of wells and surface water stations. Annual or semi-annual monitoring of wells and surface water stations have provided long-term trend data of the tritium, TCE, and metals plumes that have been reported in groundwater monitoring reports or data summary letters annually since 2004. Twenty-four (24) additional monitoring wells were installed throughout D Area in the UTRA and GA between 2020 and 2023 to further supplement the DAG OU monitoring network and fill identified data needs. Seven additional surface water stations were also installed to support the DAG OU Treatability Study and/or further supplement the DAG OU monitoring network. The current monitoring network includes 107 monitoring wells and 14 surface water stations over an area of approximately 600 acres (Figure 8). This network supports the monitoring of the highest concentrations of the various plumes and relative geometry of each plume as described below.

VOC Plume: The VOC Plume (mainly TCE [Figure 9]) extends from the Bubble Towers Subunit southwest under the 484-17D DCSA, 488-4D Ash Landfill and portions of the Ash Basins, and westward into the D-Area wetlands and comprises an area of approximately 151 hectares (373 acres). The maximum TCE concentration in 2022 was 104 µg/L at monitoring well DCB 62, exceeding the 5 µg/L MCL. Concentrations downgradient of DCB 62 are less than 100 µg/L. The plume area estimated at or above 100 µg/L is approximately 2.9 hectares (7.2 acres). Concentrations farther downgradient into the D-Area wetlands drop to levels ranging from non-detect to above the MCL, with a maximum 2022 concentration of 28.5 µg/L at well DCB 54. The now expanded GA well network has displayed that the vast majority of the TCE plume is restricted to the UTRA as only one GA monitoring well exhibits concentrations above the MCL (DRW001D) (Figure 10). A cross-sectional view of the TCE plume is provided in Figure 11. Surface water concentrations within the DAOU footprint are generally non-detect with occasional detections less than the MCL.

Overall, VOC (TCE and PCE) concentrations are decreasing slightly, with plume attenuation believed to be primarily based on advection and dispersion. PCE has been detected above MCLs in a small number of the groundwater monitoring wells; however, PCE concentrations are much lower than TCE with a 2022 maximum concentration of 6.74 µg/L at well DCB 45C. VOC degradation products are minimal to non-existent, and detected concentrations remain below respective MCLs. Most concentrations of TCE in the UTRA source area are decreasing, indicating depletion of the source and attenuation of the TCE plume. Increases displayed at DCB 26AR are most likely due to plume migration from the higher concentrations upgradient. Intermediate wells (i.e., DCB 27C and DCB 28) show decreasing concentrations and indicate that the plume is not growing in extent. In addition, downgradient wells also display steady or decreasing trends which also supports that the plume is not growing in extent and does not pose an immediate threat to surface water or the D-Area wetlands.

Metals Plume: The low-pH and metals plumes extend to the southwest from the DRP, 484-17D DCSA, and 489-D CPRB. Exposure of coal to rainwater for up to 59 years has caused the dissolution of iron sulfide (pyrite; a mineral commonly found in coal), leading to the creation of sulfuric acid. As a result, the soils underneath the 484-17D DCSA, associated storm water runoff in the 489-D CPRB, and groundwater underlying the area have been acidified. The groundwater downgradient of the DRP, 484-17D DCSA, and 489-D CPRB has a pH less than 4.5 with some areas as low as 3 to 3.5 (Figure 5), considerably lower than the background groundwater in D-Area (pH ~ 5.2). This acidification has resulted in the leaching of metals from both the coal and the natural minerals in the underlying soils, leading to a sulfate and metals groundwater plume in the UTRA. Acidic groundwater (pH < 4) is currently discharging downgradient into the D-Area Effluent Discharge Canal.

Metals including aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, nickel, selenium, and thallium generally exceed their respective MCLs or USEPA Regional Screening Levels (RSLs). The beryllium plume correlates with the low-pH plume (Figure 5). The maximum beryllium concentration during 2022 was 103 µg/L at well DCB 23C, above the 4 µg/L MCL. The beryllium plume covers an area of approximately 111.2 hectares (275 acres). In general, the highest beryllium concentrations, as well as other metal concentrations, are located directly downgradient of the source areas. The plume is in the UTRA (Figure 12) and GA concentrations are below the MCL (Figure 13). Figure 14 shows a cross-sectional view of the beryllium plume. Surface water downgradient of the 484-17D DCSA in the D-Area Effluent Discharge Canal displays low-pH levels (pH < 4.0) and elevated metal concentrations. Current 2022 sampling of GA wells show that the GA is not impacted by low-pH groundwater and metal concentrations are below MCLs/RSLs. Metal trends show lingering contaminant concentrations that are likely due to ongoing acidic pH levels in the vadose zone and in groundwater. Some wells show increasing concentrations due to some plume migration vertically or horizontally, although overall plume footprints have minimally changed.

Tritium Plume: The tritium plume extends from the Moderator Processing Facility to the southwest towards the 488-D Ash Basin and 488-4D Ash Landfill and towards the west into the wetlands and comprises an area of approximately 50.2 hectares (124 acres) (Figure 15). The maximum concentration in 2022 was 152 pCi/mL at well DCB 26AR, exceeding the 20 pCi/mL MCL. The highest concentration area (≥100 pCi/mL) comprises an area of approximately 9.1 hectares (22.6 acres) near the recognized source area and downgradient towards the 488-D Ash Basin. Concentrations downgradient towards the D-Area wetlands drop to levels ranging from non-detect to slightly below the MCL, with a maximum 2022 concentration of 24.5 pCi/mL at well DCB 48A. The GA has not been impacted by the tritium plume (Figure 16). A cross-sectional view of the tritium plume is provided in Figure 17.

Tritium contamination originated from the Moderator Processing Facility. Historical monitoring well data shows tritium maximum levels were above 1,400 pCi/mL during 2001. In 2011, the tritium source in the vadose zone was remediated by detritiation of concrete and soil under a removal action; therefore, declining tritium concentrations in groundwater near the source are expected to continue. Tritium contamination above MCLs is only present in the UTRA as concentrations at GA wells are either non-detect or are less than the MCL. Overall tritium concentrations are decreasing. Surface water samples remain either non-detect or at levels far below the MCL.

PFAS Plume: PFAS constituents are an emerging contaminant and can be sourced from historical use of fluorinated aqueous film-forming foam (AFFF). AFFF was historically used at two known locations in D Area (Figure 18). Fires were extinguished with AFFF at the 411-1D/411-3D Fire Training Area in the DAOU Bubble Tower subunit. In addition, a one-time fuel fire was extinguished using

AFFF at the 715-D Former Gas Station. The presence of PFAS contamination in the groundwater at the 411-1D/411-3D Fire Training Area in the DAOU Bubble Tower subunit and at the 715-D Former Gas Station was initially confirmed during groundwater sampling in 2020. During November 2022, an expanded groundwater and surface water sampling across D Area at 65 monitoring wells and 10 surface water stations to determine the full extent of PFAS contamination in D Area. The results of this sampling event were presented in the 2023 DAG OU Groundwater Monitoring Report. The highest concentration found of the 25 PFAS constituents analyzed for was perfluorononanoic acid (PFNA) at a concentration of 1,980 nanograms per liter (ng/L) at well DCB 62 located downgradient of the 715-D Gas Station (Figure 18). PFNA is associated with legacy AFFF. The PFAS constituents perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were also detected above the current USEPA Health Advisory limits of 0.004 ng/L (PFOS) and 0.02 ng/L (PFOA) and USEPA RSLs of 59 ng/L (PFNA), 40 ng/L (PFOS), and 50 ng/L (PFOA), with maximum concentrations of 387 ng/L (well DCB 62 for PFOS) and 99.4 ng/L (well DCB078 for PFOA). The PFAS plume (PFNA) that is greater than the USEPA RSL of 59 ng/L is 111.2 hectares (275 acres), extends from the source areas down into the D-Area wetlands, and is only within the UTRA (Figures 18 through 22).

Surface water and sediment downgradient of the source areas also contain PFAS constituents. The D006 ditch, the D-Area Effluent Discharge Canal, and Beaver Dam Creek contain detectable concentrations of PFAS constituents; however, PFNA was the only constituent above current RSL limits. The D006 ditch contains the highest concentrations with 4Q2022 results showing a maximum surface water concentration of 100 ng/L at station DSWM-1. Locations upgradient in D-Area or further upgradient towards the D-Area Oil and Seepage Basin were non-detect for PFAS constituents in groundwater and surface water. Sediment concentrations are far below USEPA RSL soil limits. The maximum sediment concentration was 13.5 ng/g at station DSWM-4.

D-Area Groundwater Operable Unit			
Problem(s) Warranting Action	**Remedial Action Objectives**	**Scope of Problem(s)**	**Likely Response Actions**
• Groundwater contains levels of VOCs (TCE and PCE) above the 5 µg/L MCLs. • Groundwater contains levels of metals (aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, nickel, selenium, and thallium) that exceed their respective MCLs or RSLs. • Groundwater contains levels of tritium above the 20 pCi/mL MCL. • Groundwater contains levels of PFAS constituents above the current USEPA RSLs.	• Prevent human exposure to groundwater contaminated with TCE, PCE, metals, tritium, and PFAS constituents above their respective MCLs or RSLs. • Reduce the concentrations of TCE, PCE, metals tritium, and PFAS constituents to below MCLs or RSLs and attenuate the contaminant plumes to the extent practicable. • Limit outcropping of contaminated groundwater above MCLs or RSLs to surface water.	• The VOC (TCE and PCE) plume occupies an area of about 150.9 hectares (373 acres) within the UTRA and GA. • The commingled metals plumes (aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, nickel, selenium, and thallium) occupy an area of about 111.2 hectares (275 acres) within the UTRA. • The tritium plume occupies an area of about 50.2 hectares (124 acres) within the UTRA. • The PFAS plume occupies an area of about 111.2 hectares (275 acres) within the UTRA.	Comprehensive Response • No Action • Monitored Natural Attenuation with LUCs (VOCs and tritium) • Groundwater Monitoring and LUCs (Metals) Contaminant Specific Response[1] • Targeted bioremediation (VOCs only) • pH Adjustment (Metals only) • Phytoremediation (Tritium only) • PFAS reduction by carbon treatment; resin capsulation, etc (or other emerging remediation technologies)

[1] A combination of contaminant specific responses and/or MNA with LUCs would be required to address all problems warranting action. Because contaminants will be left in place, LUCs will be a component of the final remedial action.

Uncertainties
• It is uncertain about the extent of the VOC plume vertically in the Gordon Aquifer, and laterally in the UTRA. This uncertainty impacts the scope of the problem, and this uncertainty will be managed by using groundwater modeling to extend the plume vertically and laterally. • It is uncertain if there are higher concentrations of VOCs in well DRW 1 due to the 30-ft screen zone. This uncertainty impacts the scope of the problem, and it will be managed by conducting depth discrete sampling at the bottom, middle and top of the screen zone. • The effectiveness of the ongoing treatability study (i.e., displacement of low-pH groundwater in the UTRA by injection of potable water) and the 484-17D DCSA NTCR action (i.e., reduction of acidic leachate) in improving groundwater conditions is unknown at this early stage of implementation. These uncertainties may impact the final remedial selection and will be managed by considering the results of the treatability study and NTCR action in the CMS/FS. • It is unknown when/if PFAS will have a final MCL. Currently, the proposed MCLs are lower than the RSLs. This uncertainty impacts the extent of and scope of the problem. • It is unknown if PFAS contamination in surface and/or vadose zone soils continue to pose a contaminant migration risk to groundwater. These uncertainties will be managed by submitting a Work Plan Addendum for characterization of the suspected PFAS source areas.

5.0 OPERABLE UNIT STRATEGY

The RFI/RI/BRA for the DAG OU is currently scheduled for submittal on December 10, 2024. Due to uncertainties associated with the PFAS sources and the ongoing operation and evaluation of the DAG OU treatability study, the Core Team agreed at the November 30, 2023 scoping meeting to extend the submittal of the RFI/RI/BRA to 2026. The scope for the source area characterization to address the uncertainties associated with PFAS sources will be defined in a Work Plan Addendum in fiscal year 2024.

SRNS will submit a formal request and revised implementation schedule to EPA and SCDHEC for approval to extend the DAG OU schedule as agreed to by the Core Team at the November 30, 2023 scoping meeting.

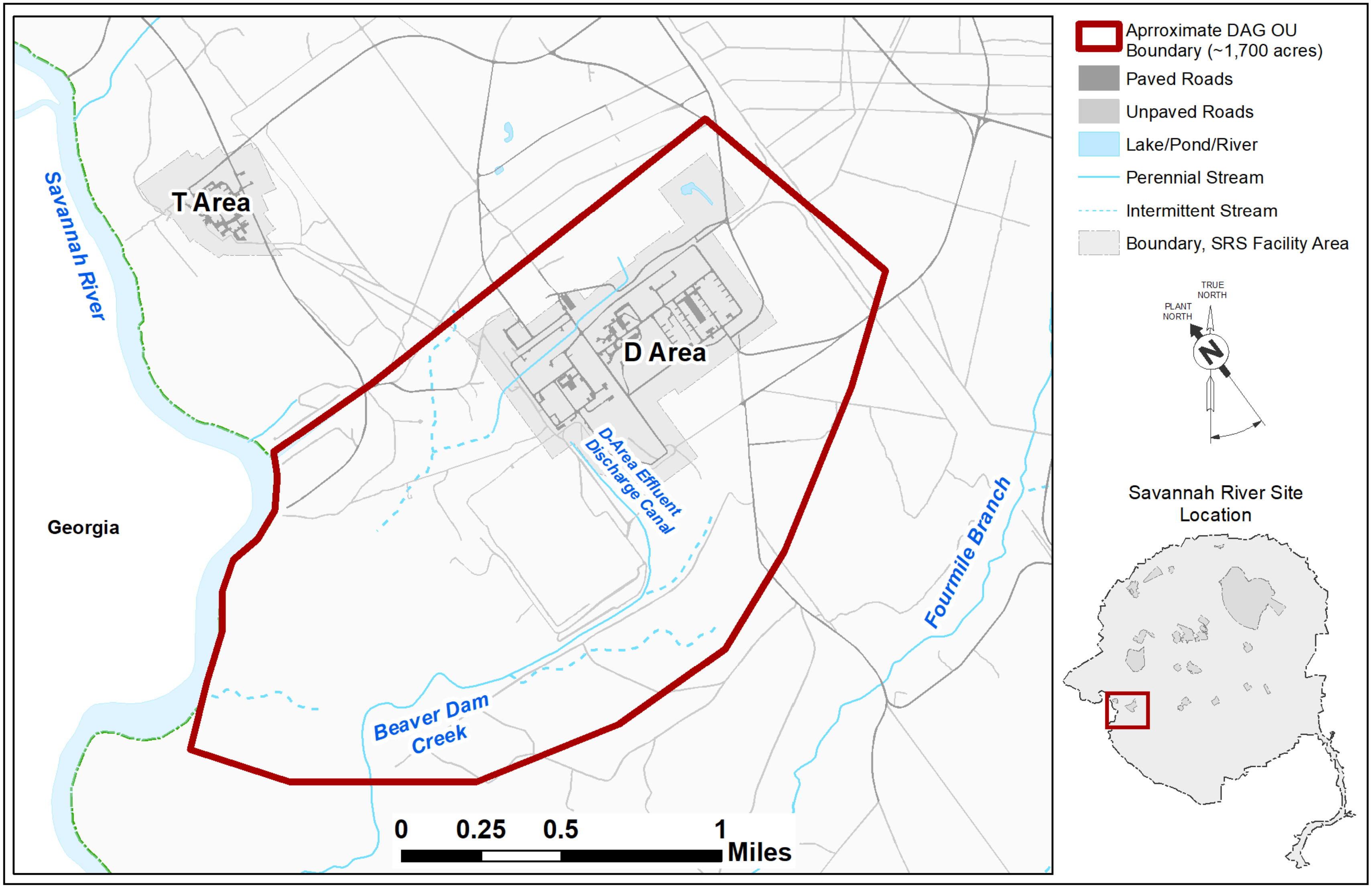

Figure 1. DAG OU Location

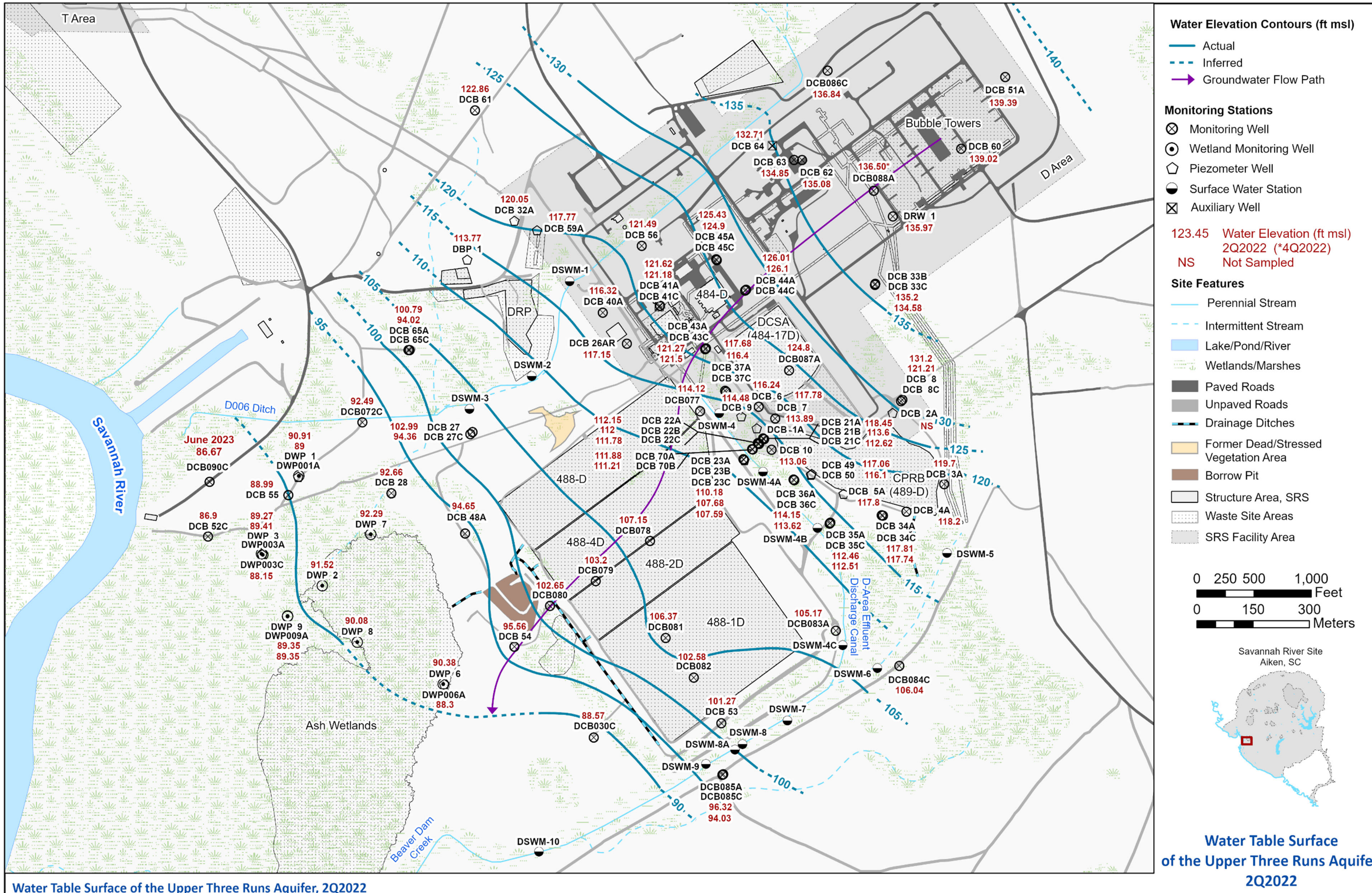

Figure 2. DAG OU Upper Three Runs Aquifer Groundwater Flow Direction (2Q2022)

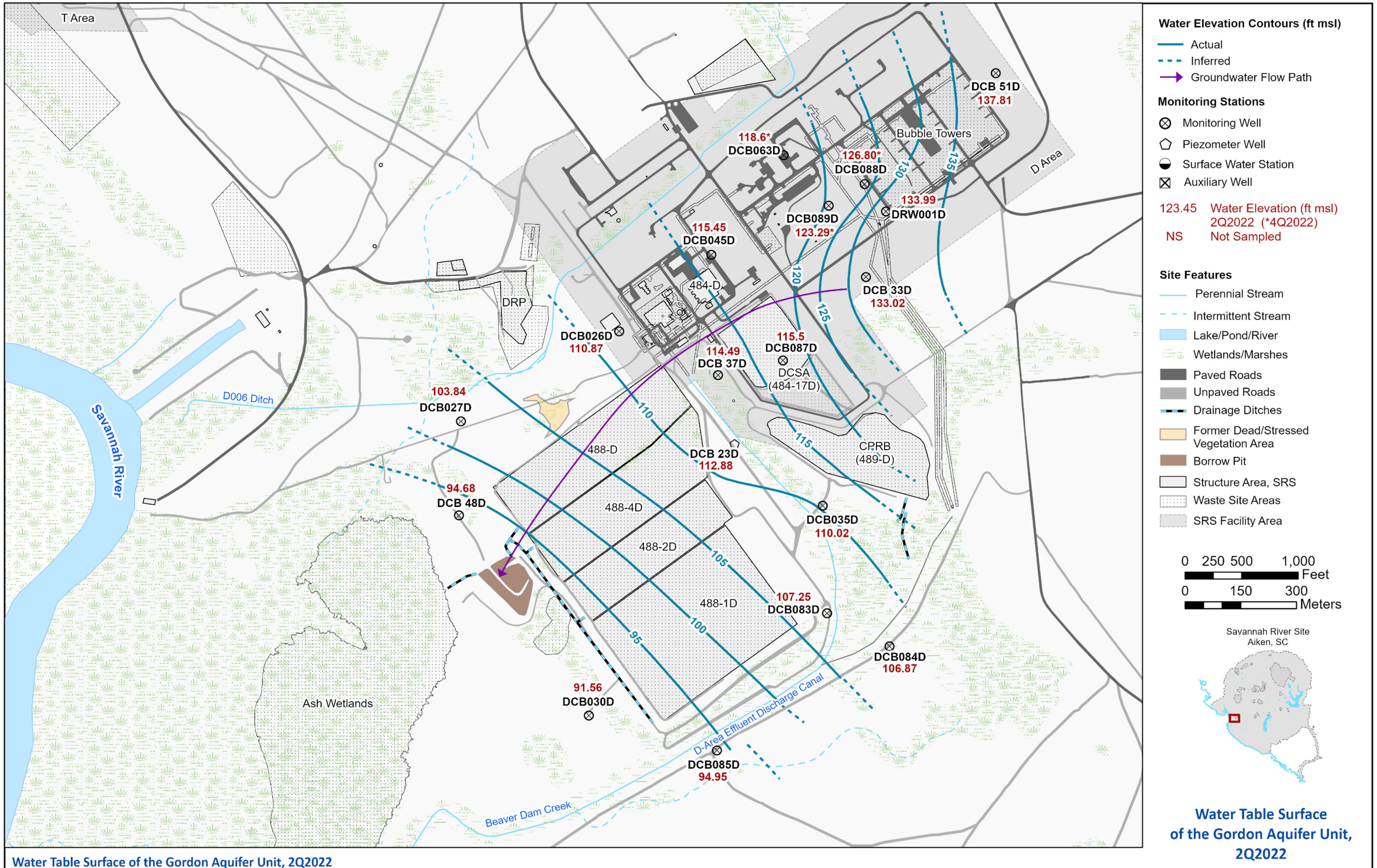

Figure 3. DAG OU Gordon Aquifer Groundwater Flow Direction (2Q2022)

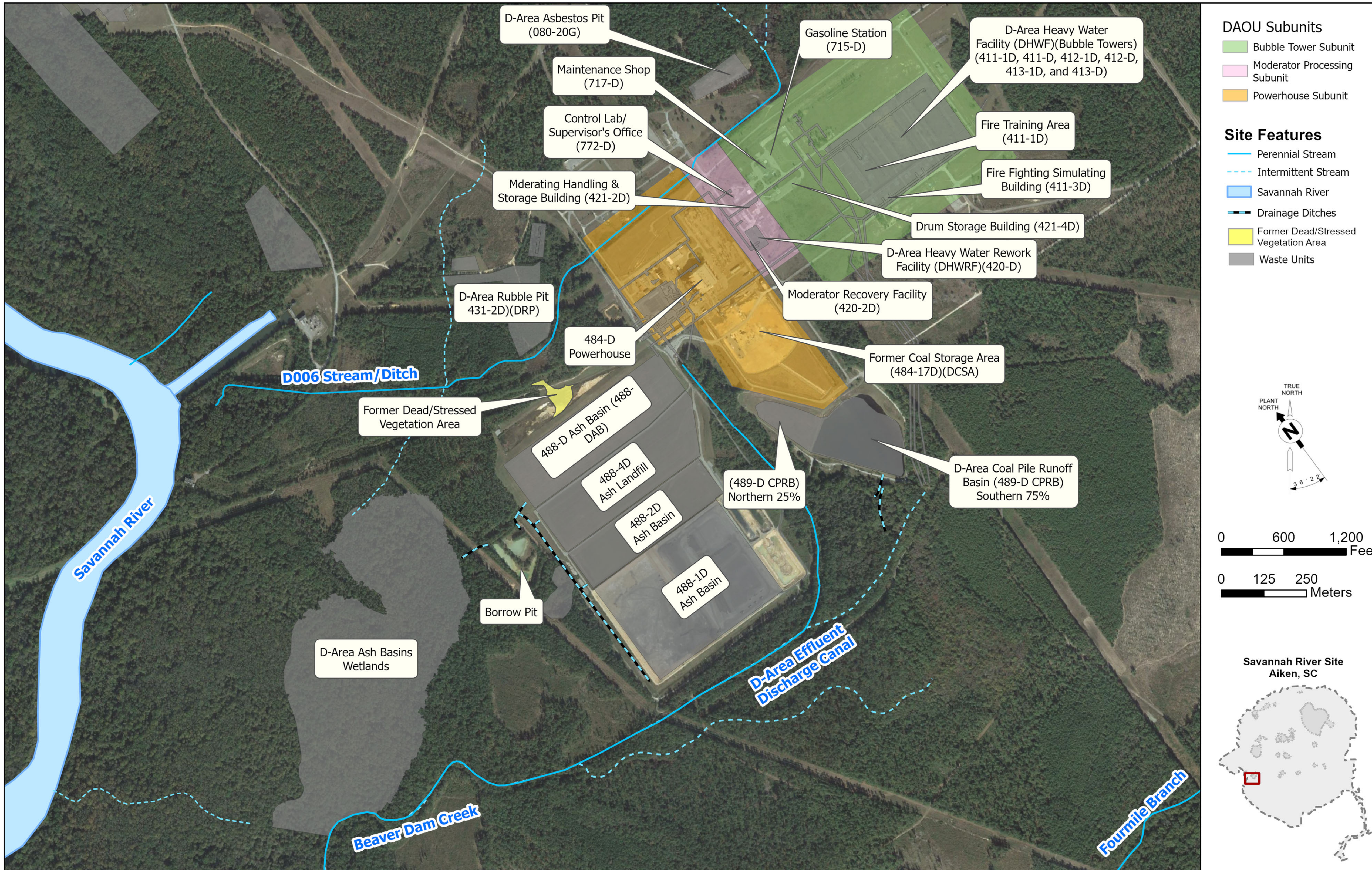

Figure 4. DAOU Subunits and Facilities

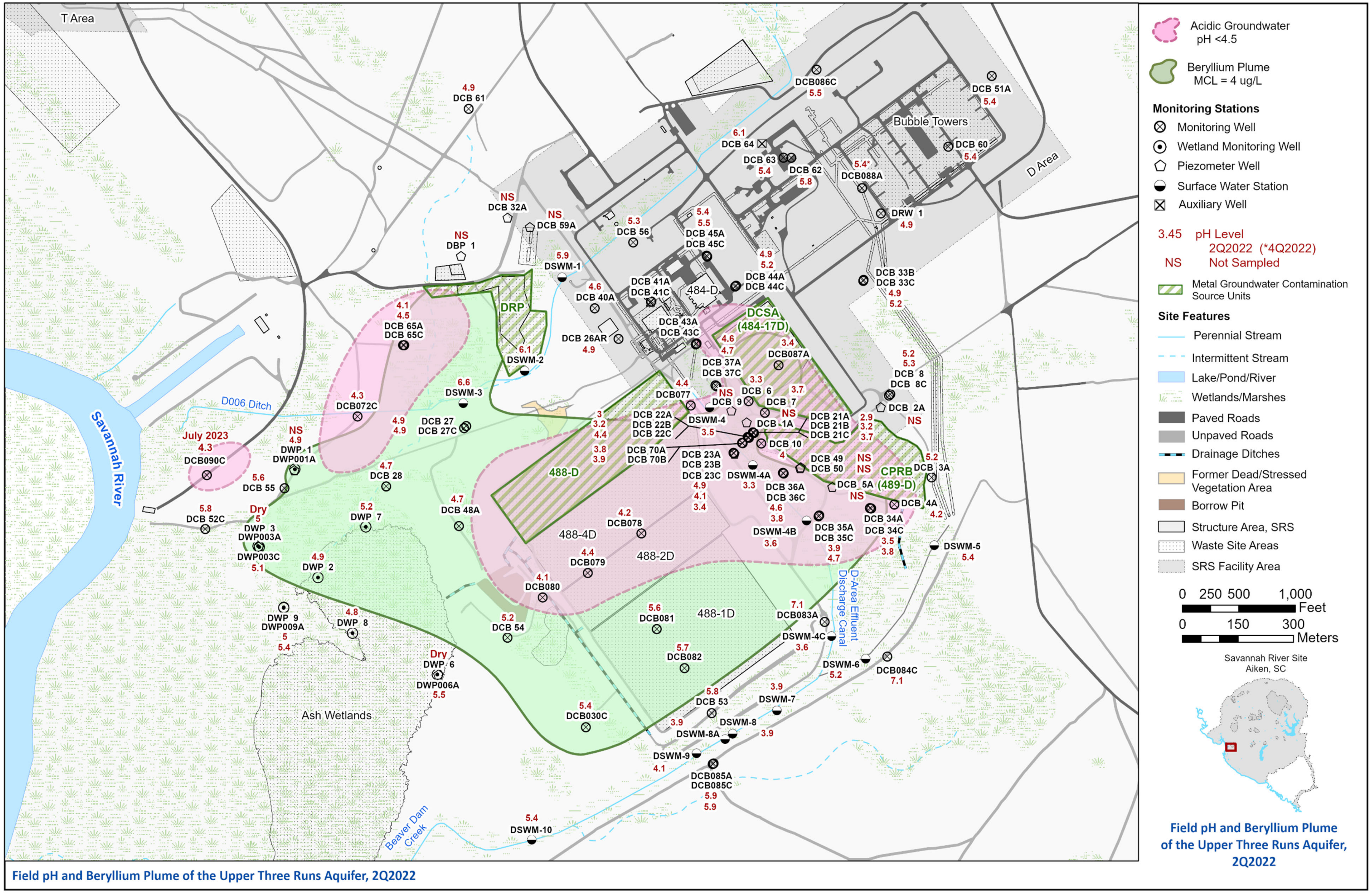

Figure 5. DAG OU Low-pH and Beryllium Plume (2Q2022)

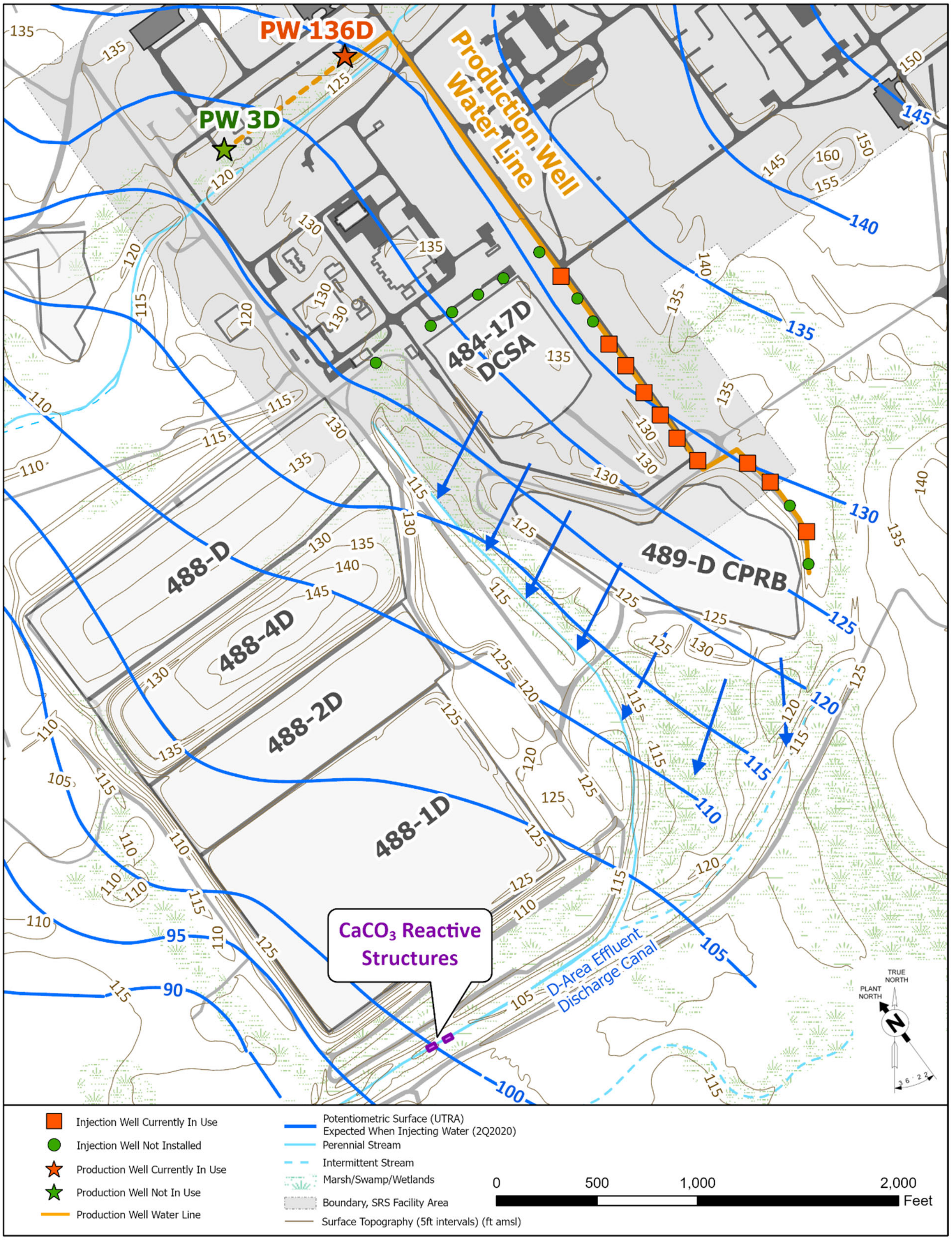

Figure 6. DAG OU Treatability Study and CaCo3 Reactive Structures

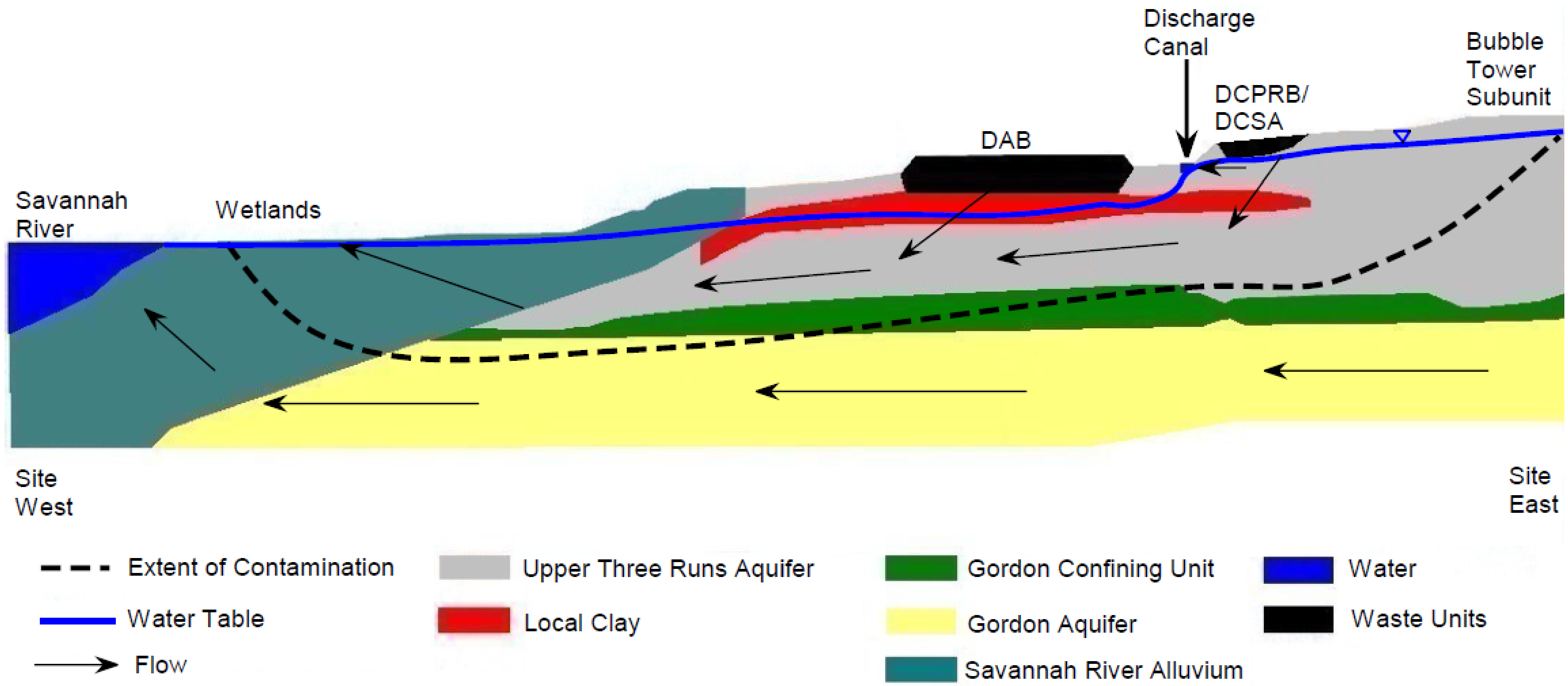

Figure 7. **DAG OU Conceptual Site Model**

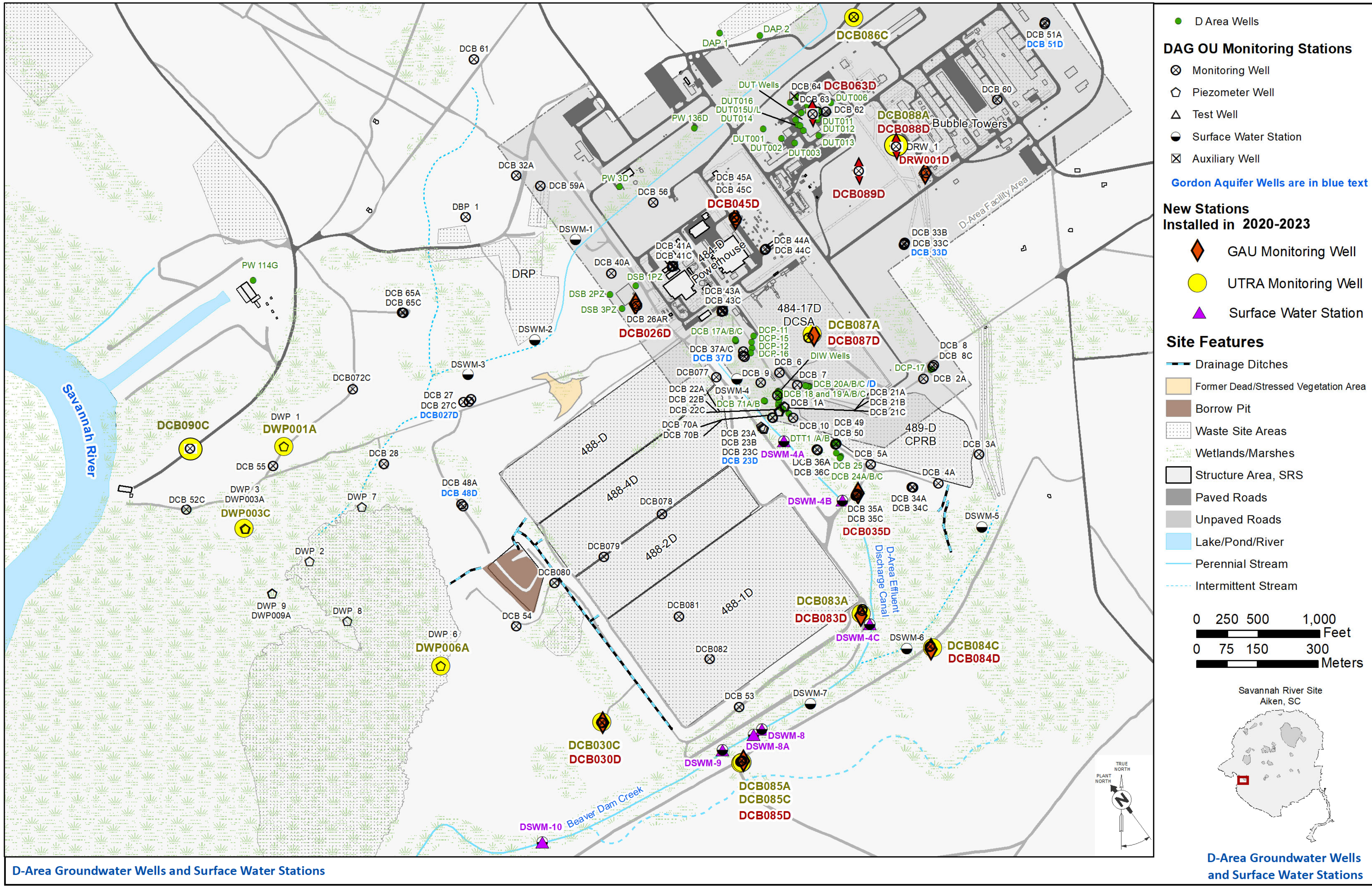

Figure 8. DAG OU Monitoring Network and Additional Wells in D-Area

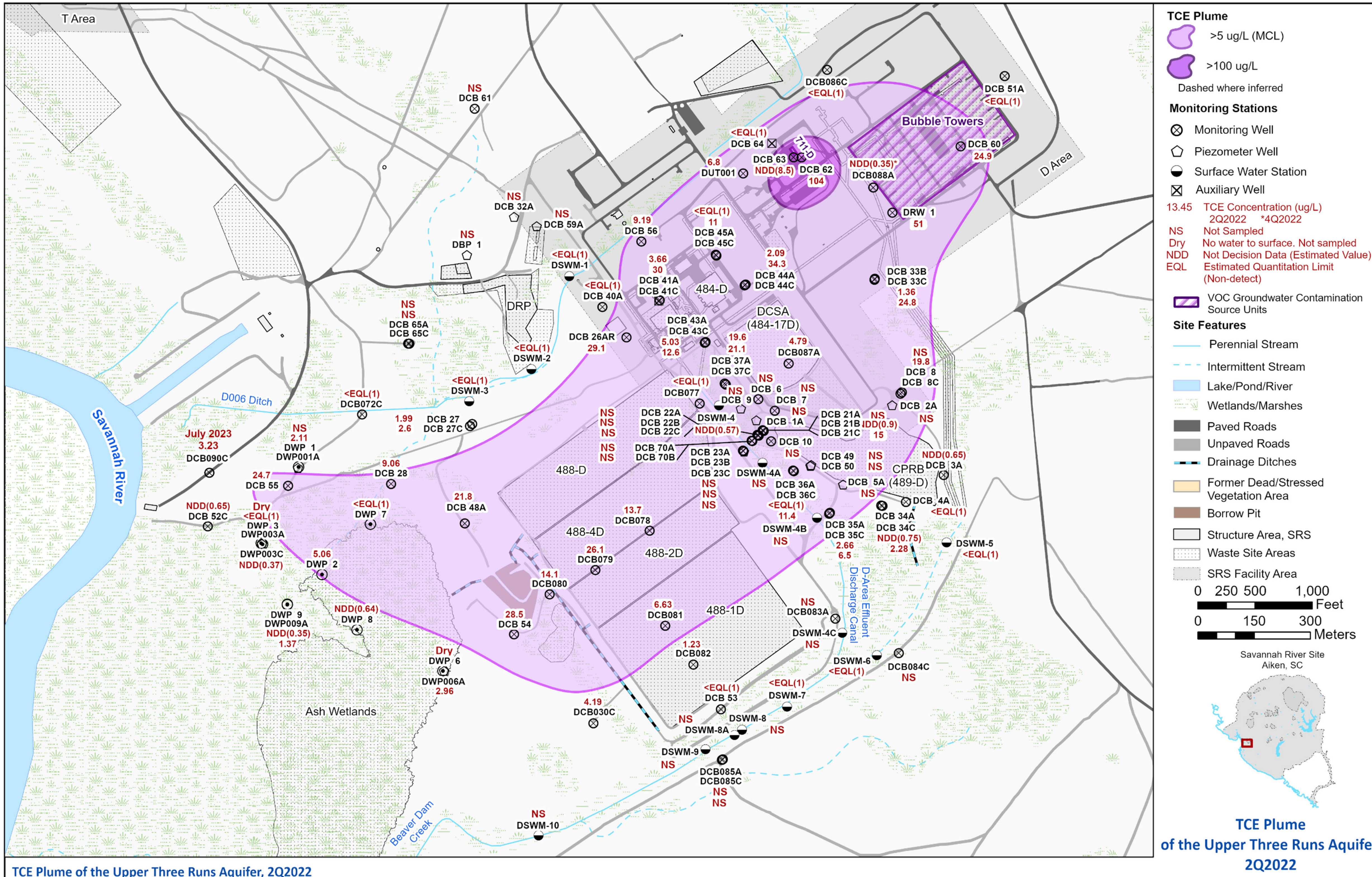

Figure 9. DAG OU Upper Three Runs Aquifer TCE Plume (2Q2022)

Figure 10. DAG OU Gordon Aquifer TCE Plume (2Q2022)

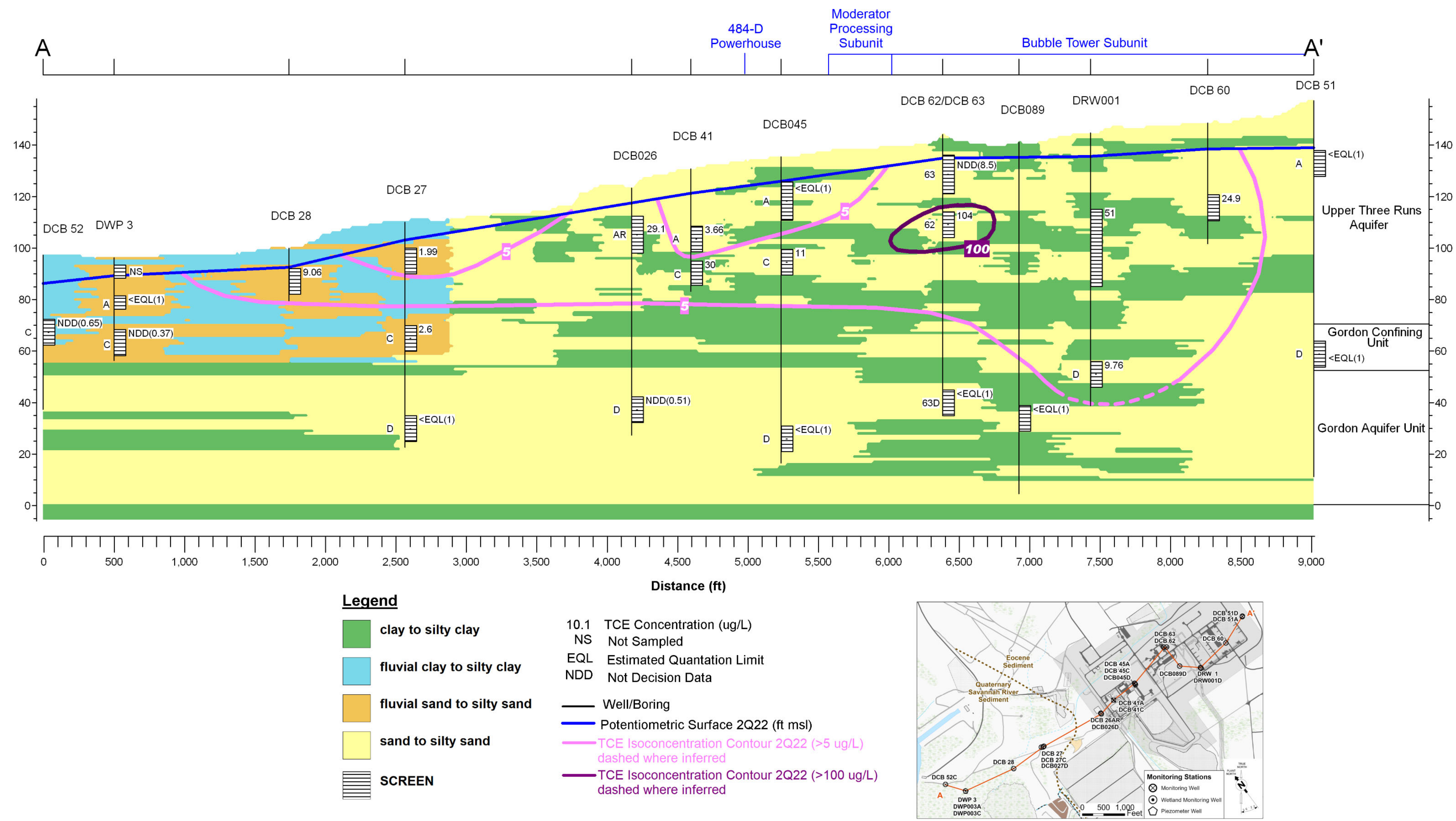

Figure 11. Cross-Section A-A' of the DAG OU TCE Plume (2Q2022)

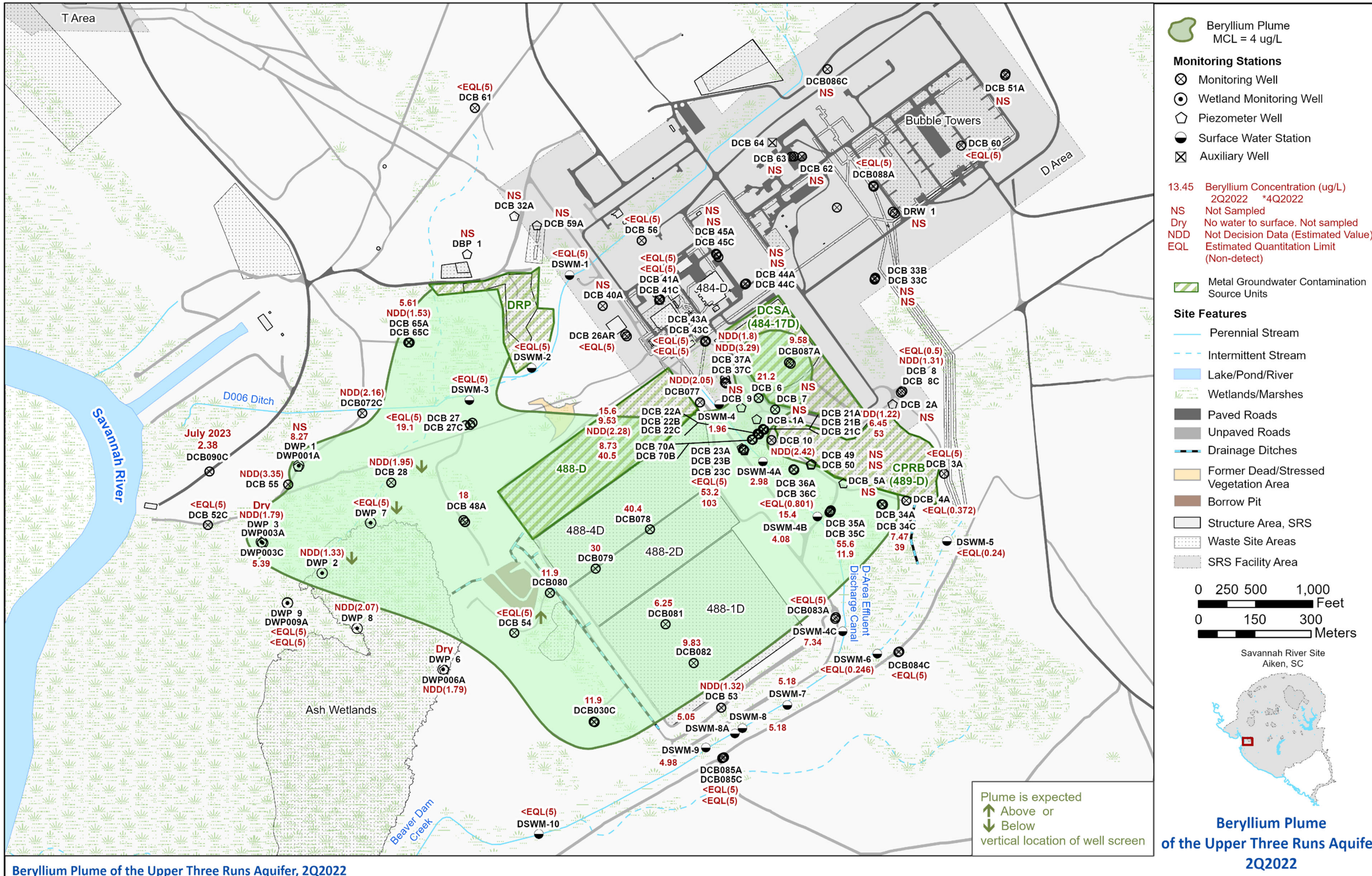

Figure 12. DAG OU Upper Three Runs Aquifer Beryllium Plume (2Q2022)

Figure 13. DAG OU Gordon Aquifer Beryllium Plume (2Q2022)

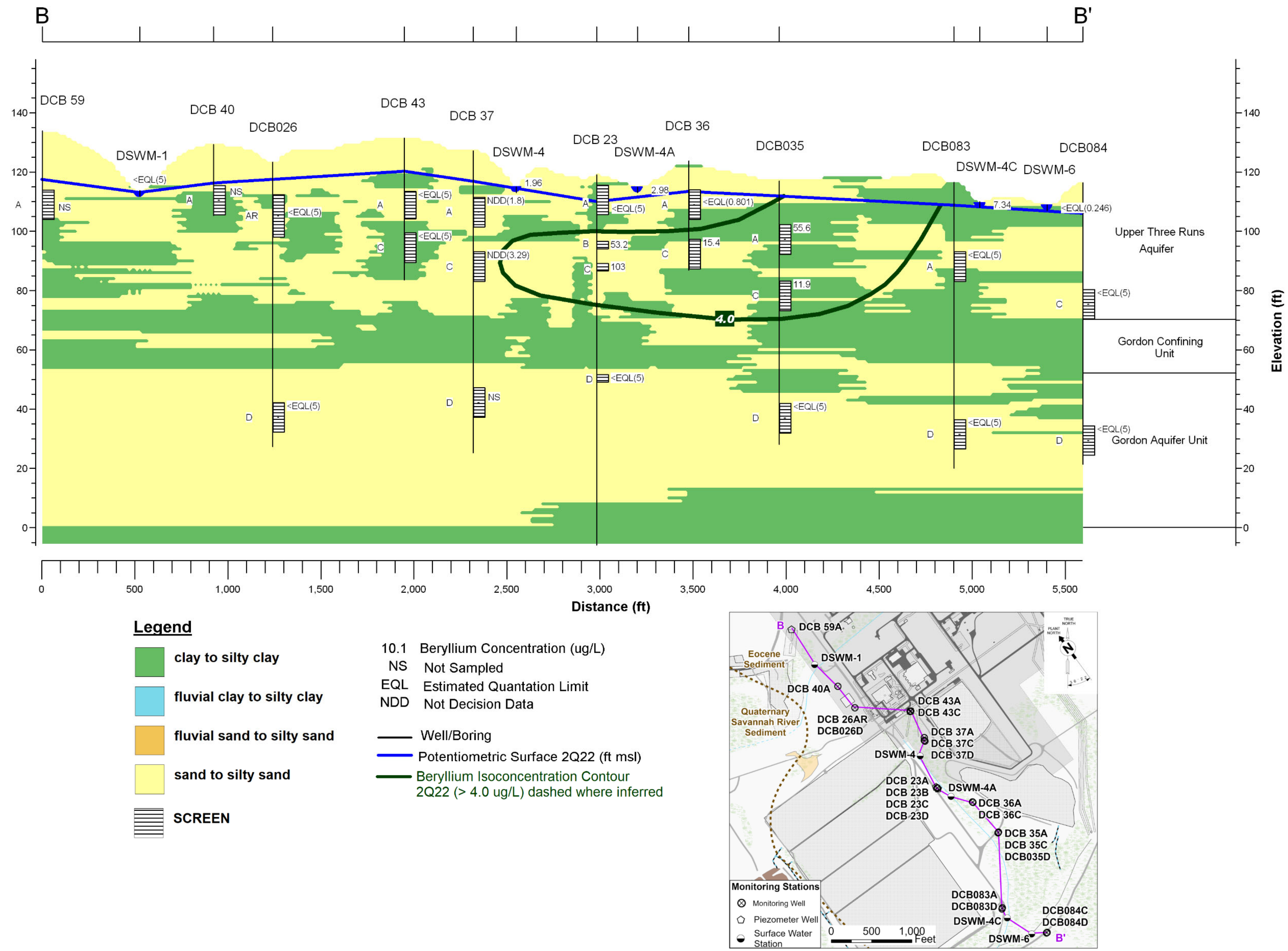

Figure 14. Cross-Section B-B' of the DAG OU Beryllium Plume (2Q2022)

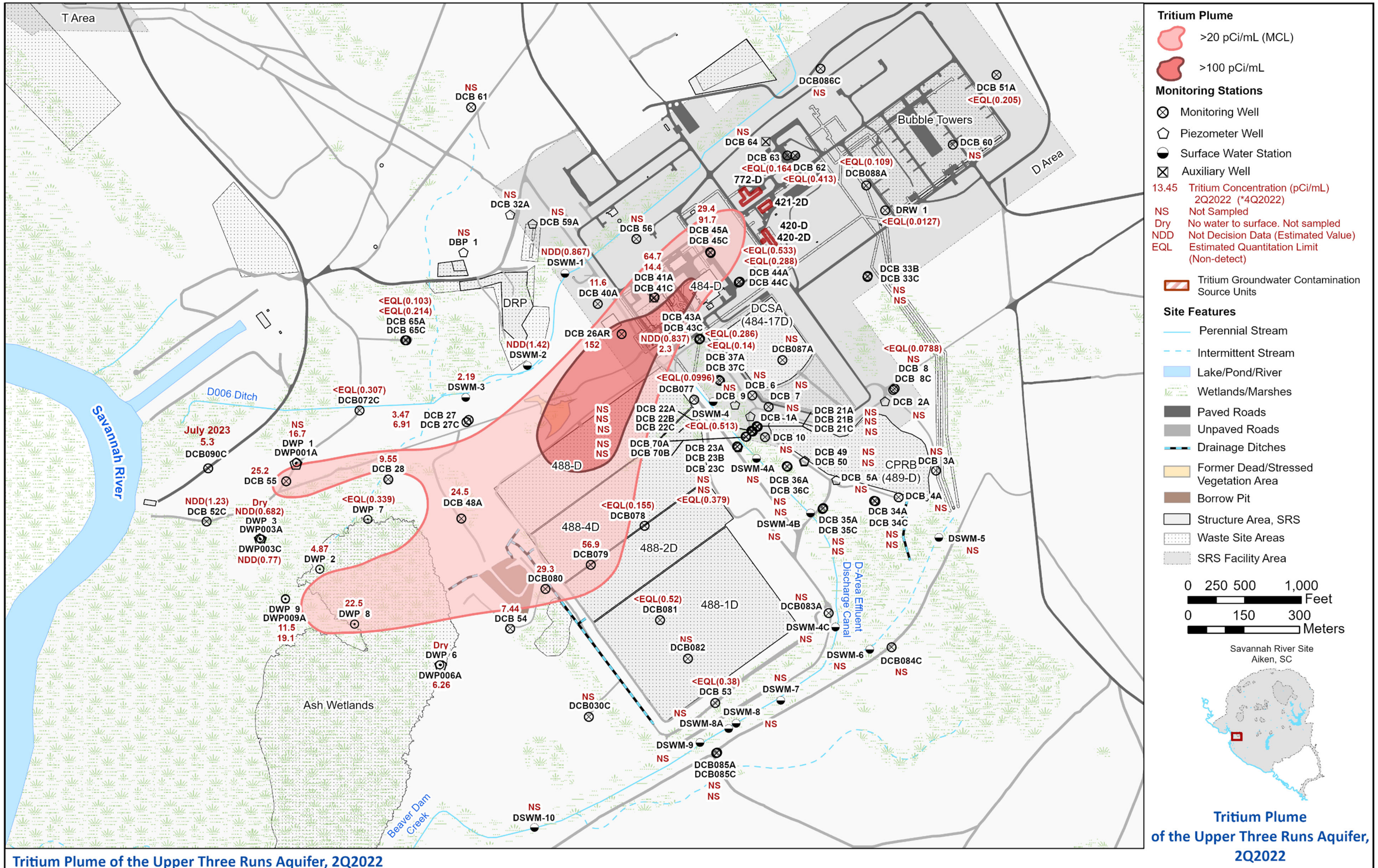

Figure 15. DAG OU Upper Three Runs Aquifer Tritium Plume (2Q2022)

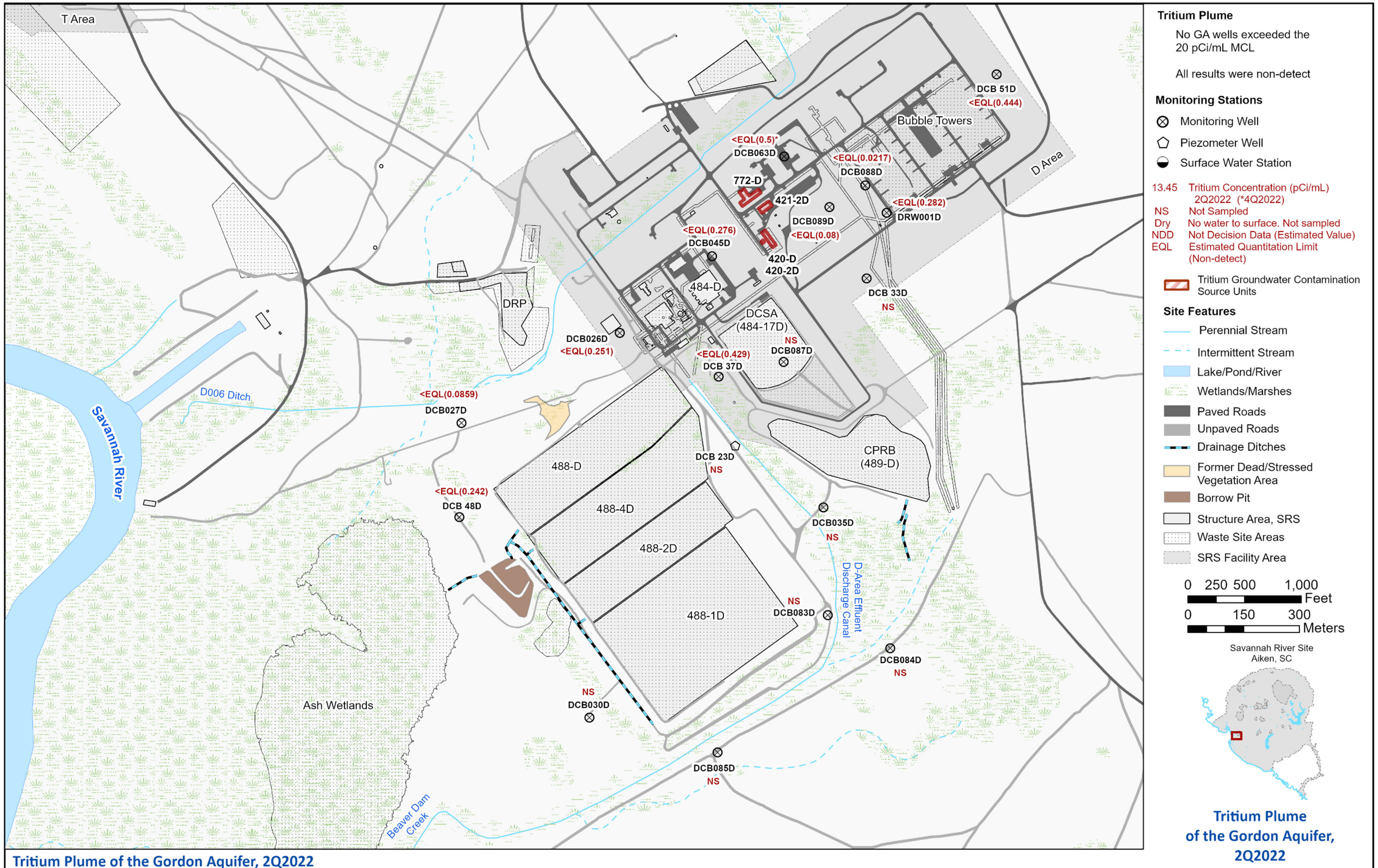

Figure 16. DAG OU Gordon Aquifer Tritium Plume (2Q2022)

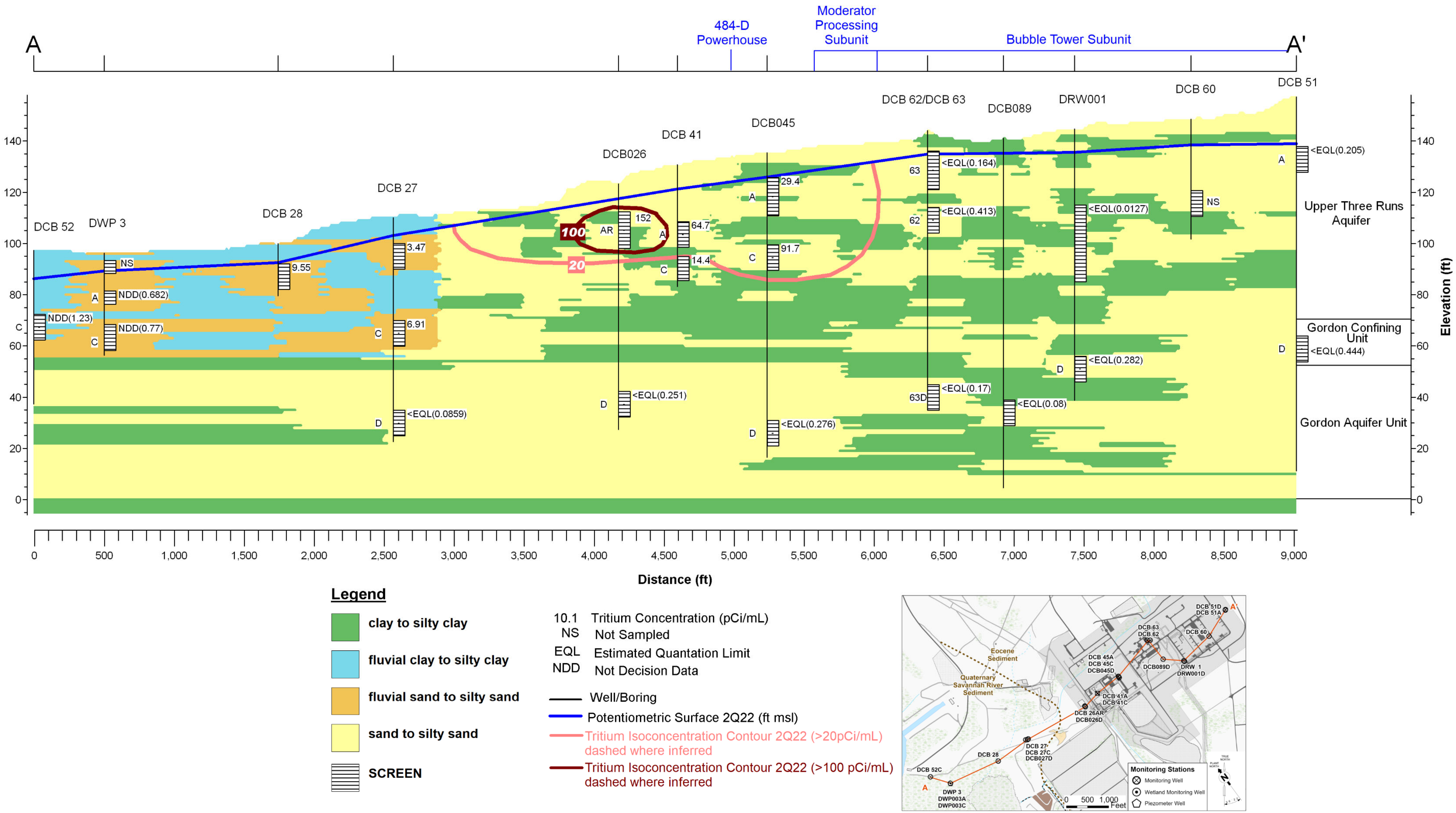

Figure 17. Cross-Section A-A' of the DAG OU Tritium Plume (2Q2022)

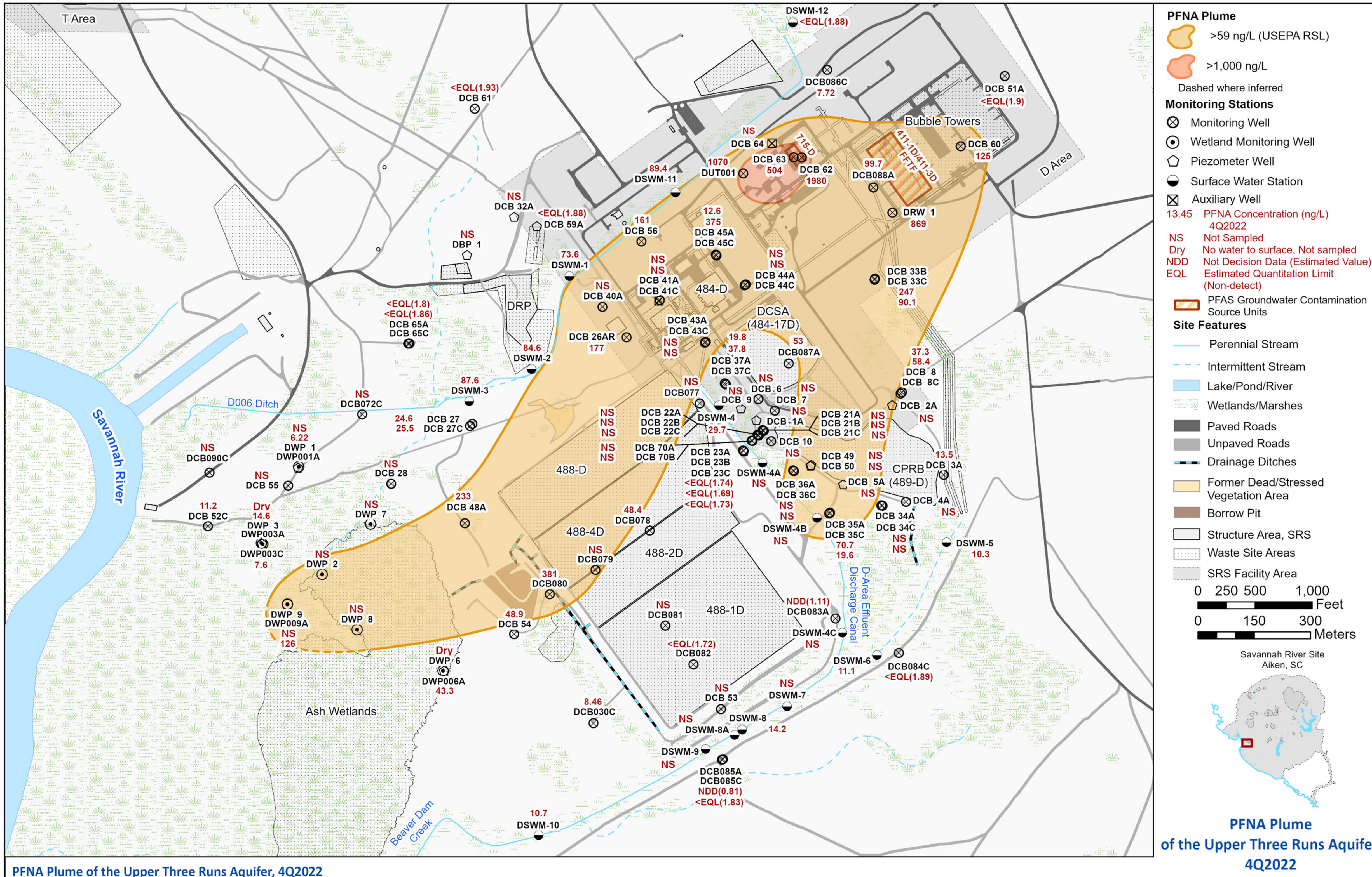

Figure 18. **DAG OU PFAS Sources and Upper Three Runs Aquifer PFNA Plume (4Q2022)**

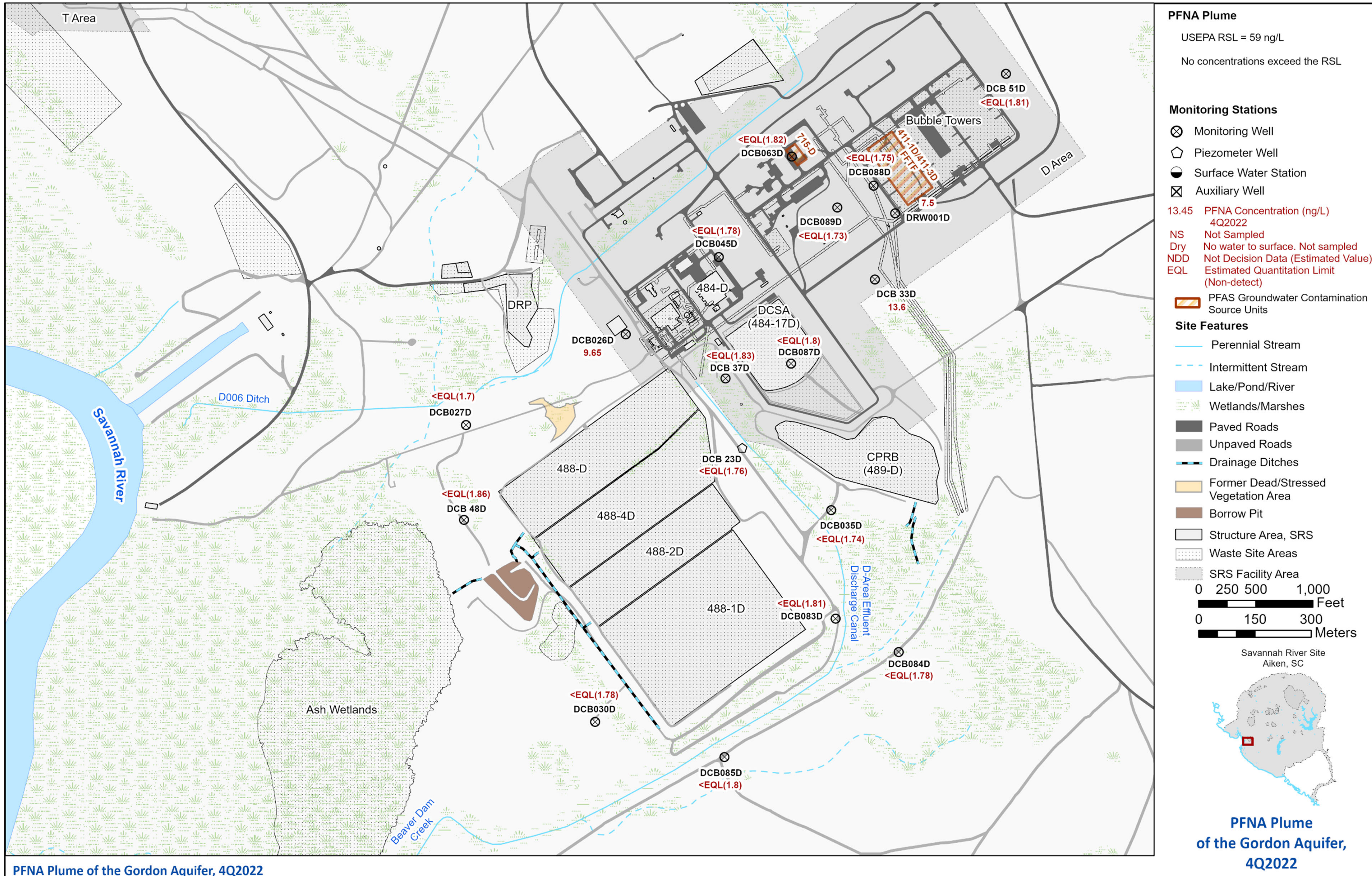

Figure 19. **DAG OU Gordon Aquifer PFNA Plume (4Q2022)**

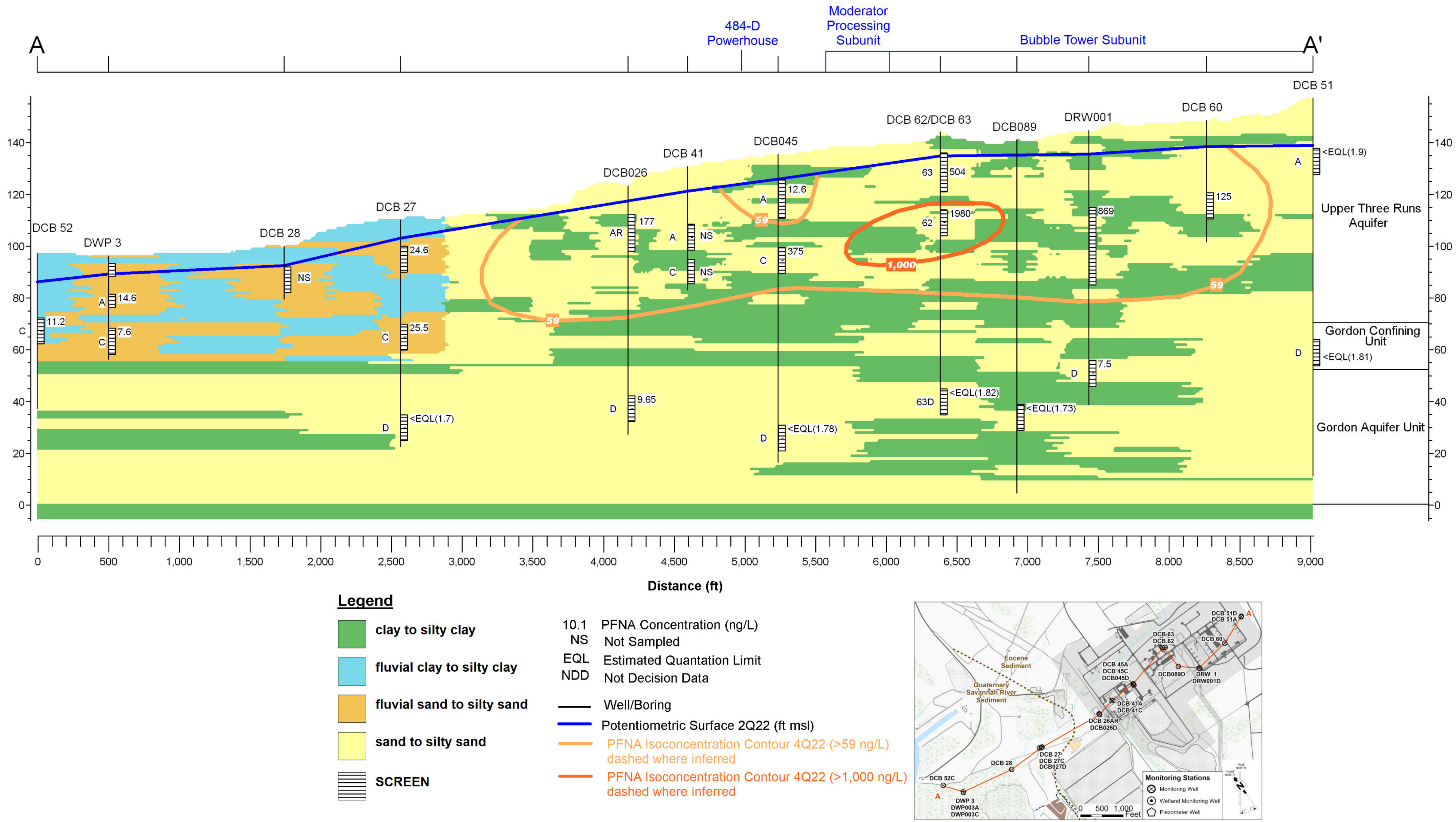

Figure 20. Cross-Section A-A' of the DAG OU PFNA Plume (4Q2022)

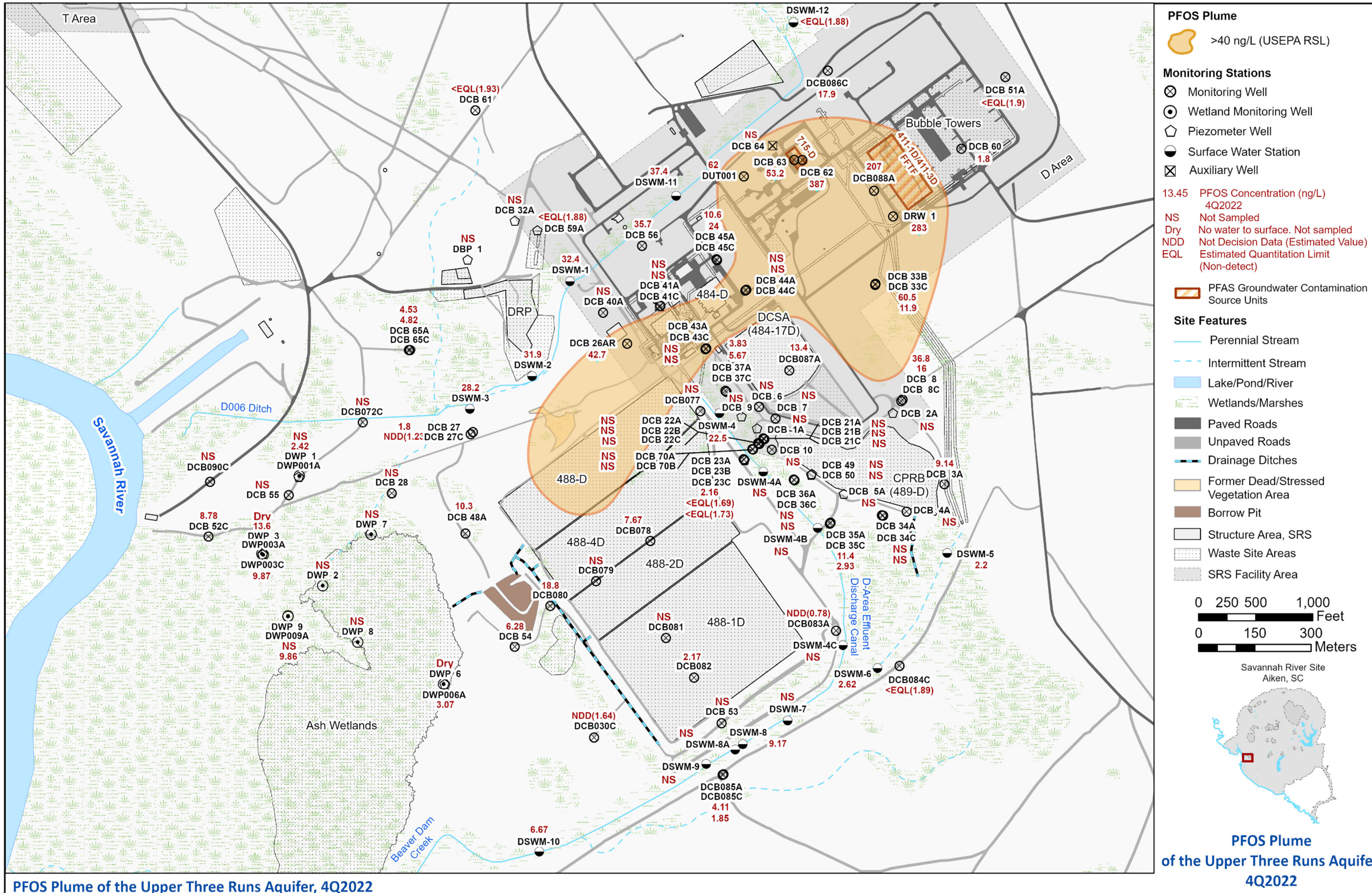

Figure 21. Upper Three Runs Aquifer PFOS Plume (4Q2022)

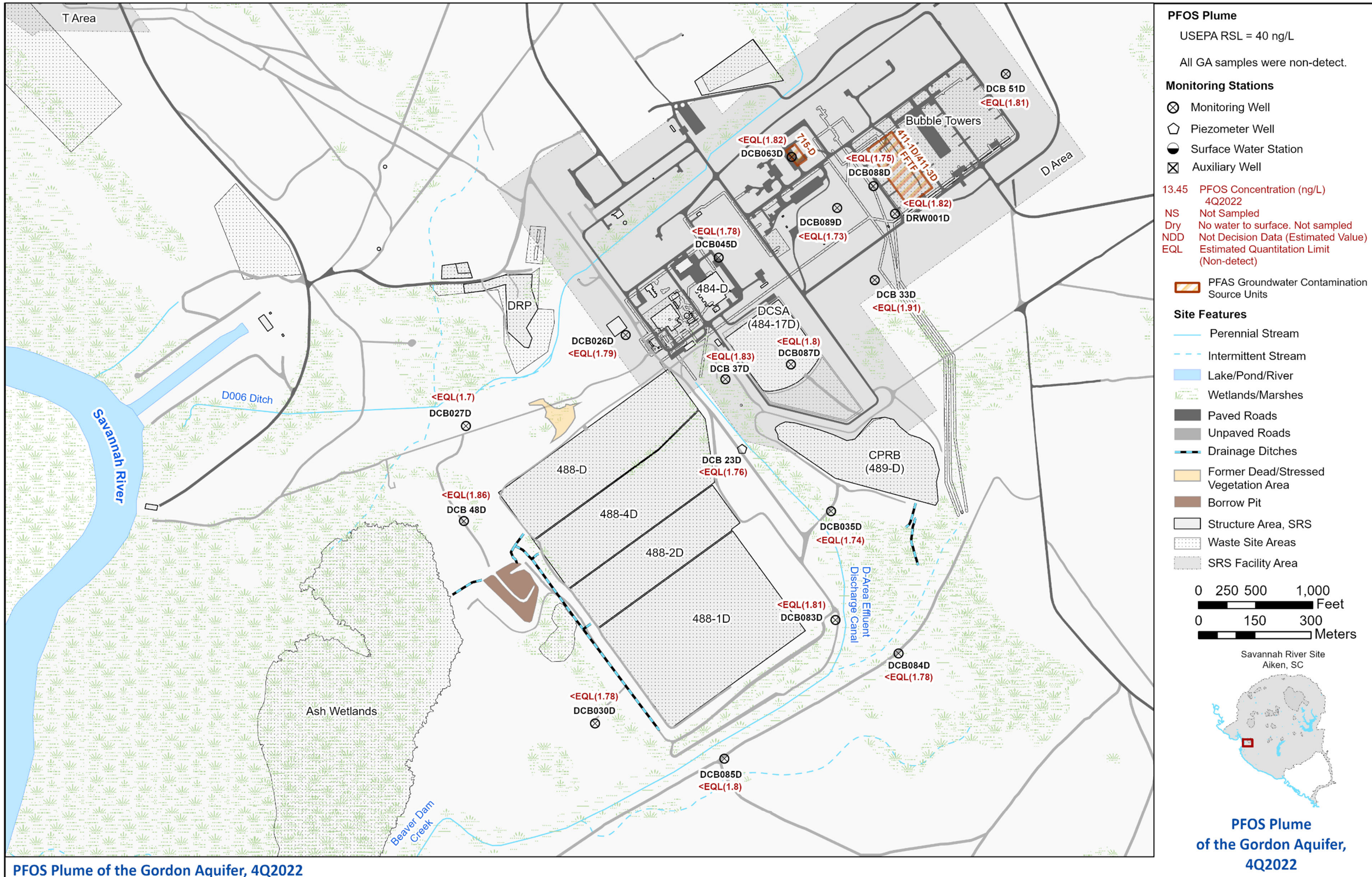

Figure 22. **Gordon Aquifer PFOS Plume (4Q2022)**

Figure 23. Photograph After Completion of the Soil Neutralization at the 484-17D DCSA

Table 1. Record of Key Agreements[2]

Date	Description of Agreement
4/14/2021	The Core Team agreed with the adequacy of current groundwater data for defining problem[s] warranting action with the addition of the following in the RFI/RI Work Plan to address uncertainties: • additional sampling and/or installation of a monitoring well in the Gordon Aquifer for VOCs and PFAS. • Sampling surface water and sediment in co-located points upstream and downstream of potential PFAS contaminated groundwater discharge(s). The Core Team agreed to submittal of the RFI/RI Work Plan and SAP in June 2021.
6/16/2022	The Core Team agreed at the 6/16/2022 DAG OU Annual Reports Microsoft Teams meeting that there is no longer a need for a long-term monitoring strategy for DAG OU as SRS prepares for submittal of the RFI/RI/BRA on or before 12/10/2024. The Core Team agreed to replace the DAG OU Letter report (2021 data) due on 7/31/2022 and the groundwater report (2022 data) due on 7/31/2023 with a single DAG OU Monitoring Report (2021 and 2022 data) due on 1/31/2023. Annual DAG OU data reporting will be suspended after submittal of the 2023 DAG OU Monitoring Report, but groundwater monitoring will continue until submittal of the CMS/FS.
11/30/2023	The Core Team agreed to perform depth discrete sampling for VOCs and tritium at well DRW 1 due to the 30-ft screen zone, which will be documented in the RFI/RI report.
11/30/2023	The Core Team agreed to evaluate phytoremediation for tritium as a remedial action but recognized it will be screened out early due to the presence of the PFAS plume.
11/30/2023	The Core Team agreed to extend the DAG OU schedule for submittal of the RFI/RI to 2026 in order to conduct PFAS source area characterization and continuation of the DAG OU Treatability Study. SRNS will continue sampling of the DAGW network according to the monitoring plan for reporting as follows: 1. PFAS Data – PFAS soil and latest PFAS groundwater data shared in a data report, and discuss optimization of the PFAS groundwater monitoring to include as part of the workplan addendum. 2. Discrete well DRW001 sampling and annual groundwater sampling data shared via email annually until submittal of the RFI/RI (i.e., emails in 2024 and 2025). 3. Continue to submit 488-4D Report annually. 4. Continue to submit Treatability Study results annually.

[2] Core Team agreements are documented at each phase and retained for each successive phase in order to maintain a comprehensive list for the life of the project.

Table 2. Key Changes to Scoping Summary[3]

Date	Section	Description of Change	Rationale for Change
10/2023	All	Updated April 2021 RFI/RI Work Plan Characterization scoping summary to reflect current phase.	Post-characterization scoping phase.
11/30/2023	5.0	Updated November 2023 Post-Characterization scoping summary to reflect Core Team agreements on the OU strategy.	Core Team agreement to extend the submittal of the RFI/RI/BRA to allow for PFAS source characterization as well as continuation and evaluation of the DAG OU Treatability Study.

[3] Significant changes from the previous version of the scoping summary. Changes may include addition, deletion or alteration of problem statements; refined scope of the problems; selection or refinement of response actions; substantial changes in unit strategy; or the addition of supporting materials. The Key Changes table is not a continuous list, but rather, is updated each time the scoping summary is revised.