Enclosure 1

Final Remedial Investigation Report for the CFFF Site

(Non-Proprietary)

AECOM

Final Remedial Investigation Report

Columbia Fuel Fabrication Facility
Hopkins, Richland County, South Carolina

Westinghouse Electric Company, LLC

Project Number: 60595649

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Quality information

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Acronyms

AECOM	AECOM Technical Services, Inc.
AOC	Area of Concern
BLS	below land surface
BRA	Baseline Risk Assessment
Brockington	Brockington and Associates, Inc.
CA	Consent Agreement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFFF	Columbia Fuel Fabrication Facility
cis-1,2 DCE	cis-1,2-dichloroethene
COPCs	constituents of potential concern
COPECs	chemicals of potential ecological concern
CSM	Conceptual Site Model
CT	Computed Tomography
CVOCs	chlorinated volatile organic compounds
DHEC	South Carolina Department of Health and Environmental Control
DOE	United States Department of Energy
DPT	direct push technology
Elite	Elite Techniques, Inc.
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ft	feet
ft^2	square feet
ft/day	feet per day
ft/ft	feet per foot
GEL	GEL Laboratories, LLC
GEX	Geologic Exploration, Inc.
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HLC	Henry’s Law Constant
IDW	investigative derived waste
K_d	equilibrium distribution coefficient
K_{oc}	organic carbon partitioning coefficient
$logK_{ow}$	n-Octanol/water partitioning coefficient
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MCL	maximum contaminant level
MDC	minimum detectable concentration
mg/kg	milligram per kilogram
mg/L	milligram per liter
mRem/yr	millirem per year
MS	matrix spike
MSD	matrix spike duplicate
MSL	mean sea level
NCRP	National Council on Radiation Protection and Measurements
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
OU	operable unit
Pace	Pace Analytical Services
PCE	tetrachloroethene
pCi/g	picocuries per gram
pCi/L	picocuries per liter
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act

RI	remedial investigation
RUSLs	Residential Use Screening Levels
SAEDACCO	South Atlantic Environmental Drilling and Construction Company
SNM	special nuclear material
SGS	soil gas survey
SOFs	sum of fractions
SOLX	solvent extraction area
SVOC	semivolatile organic compounds
TAL	Target Analyte List
TBD	Technical Basis Document
Tc-99	Technetium-99
TCE	trichloroethene
TCL	target compound list
THA	Task Hazard Assessment
TMS	Tax Map Series
U	uranium
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VC	vinyl chloride
VOC	volatile organic compounds
Westinghouse	Westinghouse Electric Company, LLC
WL I	West Lagoon I
WL II	West Lagoon II
WWTP	wastewater treatment plant

1. Executive Summary

The Westinghouse Electric Company, LLC (Westinghouse) Columbia Fuel Fabrication Facility (CFFF) consists of 1,151 acres, with the operational area encompassing 75 acres. CFFF manufactures fuel assemblies and components for the commercial nuclear power industry.

The South Carolina Department of Health and Environmental Control (DHEC) and CFFF entered into a Consent Agreement (CA) on February 26, 2019. The CA requires a Remedial Investigation (RI) to further assess the source, nature, and extent of known constituents of potential concern (COPCs) as well as additional areas where historical releases may have occurred. The CA also requires that the RI be followed by a Feasibility Study (FS) to assess cleanup alternatives.

RI activities were conducted from June 2019 through October 2021 and included the following:

- 91 soil and/or lithologic borings were completed;
- 103 soil samples were collected;
- a private water supply well survey was conducted within 1 mile of the property boundary;
- four private water supply wells were sampled;
- 120 groundwater samples were collected from temporary wells;
- 57 additional permanent monitoring wells were installed;
- permanent monitoring wells were sampled semi-annually, including 118 wells in October 2021;
- 12 surface water samples were collected;
- 172 sediment samples were collected;
- five aliquots of sediment and 13 soil samples were analyzed for grain size;
- six locations within CFFF's surface water bodies had pressure transducers installed on staff gages to continuously monitor surface water elevations;
- 13 monitoring wells and one piezometer had pressure transducers installed to continuously monitor groundwater elevations;
- 21 slug tests were conducted in 21 monitoring wells;
- bathymetric surveys of the Gator Pond, Upper Sunset Lake, and Lower Sunset Lake were performed; and
- the borings, new wells, staff gage locations and portions of the stormwater ditches were surveyed.

The data generated by this work confirmed that the following COPCs are present in environmental media (soil, groundwater, sediment and/or surface water): chlorinated volatile organic compounds (CVOCs), nitrate, fluoride, technetium-99 (Tc-99) and uranium (U). The RI did not identify any sources of ongoing impacts. Over 50 years of facility operations have resulted in limited impacts to these media, and the extent of these impacts are well within the facility property boundary. There is no evidence that these impacts have or will affect properties off-site in the future.

A Baseline Risk Assessment (BRA) was conducted as part of the RI to assess what risks these impacts might pose to human health and the environment. The BRA indicates that the impacts pose no unacceptable risk to human health or the environment.

A visual, 3-dimensional Conceptual Site Model (CSM) using data collected during previous investigations and the RI has been created to illustrate the source, nature, and extent of COPCs. The CSM will be used to support the decision process, leading to selection of a cleanup alternative(s).

The following recommendations are based on the findings of the RI:

- The FS should be conducted to assess which cleanup options are appropriate for CFFF.
- To support the CSM and FS, a groundwater fate and transport model should be developed to predict when COPCs in groundwater will fall to below levels of potential concern and/or remain in a steady state condition.

2. Introduction

Westinghouse Electric Company, LLC (Westinghouse) Columbia Fuel Fabrication Facility (CFFF) is located at 5801 Bluff Road (site or property) in Hopkins, approximately 15 miles southeast of Columbia, South Carolina (**Figure 1**). The site includes approximately 1,151 acres, with the operational area encompassing approximately 75 acres centrally located on the site, thereby creating substantial buffers from adjoining properties. The property is surrounded by rural forested and agricultural property. CFFF was opened in 1969 and manufactures fuel assemblies and components for the commercial nuclear power industry. Site features are shown on **Figure 2**.

On February 26, 2019, the South Carolina Department of Health and Environmental Control (DHEC) and CFFF entered into Consent Agreement 19-02-HW (CA). This CA requires Westinghouse to comprehensively assess potential environmental impacts from current and historical operations at the CFFF by following the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process. The CERCLA process requires the following incremental steps: Remedial Investigation (RI), Feasibility Study (FS), Record of Decision, Remedial Design/Remedial Action and Remedial Action completion. This document constitutes the final RI Report that includes data from previous assessments as well as newly acquired data.

Previously, CFFF submitted a *Final Remedial Investigation Work Plan* to DHEC in June 2019 (AECOM, 2019), which DHEC approved on June 19, 2019. Assessment activities outlined in the June 2019 *Final Remedial Investigation Work Plan* (also referred to as Phase I) represented the first step in an iterative process to fulfill the requirements of the CA to assess the source, nature and extent of impacts from historical operations. The RI Phase I work was performed from June to December 2019. Phase I included the installation of 29 monitoring wells (W-69 through W-97).

As agreed with DHEC, an *Interim Remedial Investigation Data Summary Report* (AECOM, 2020a) was prepared to document the findings of the Phase I assessment. Following comments from DHEC, CFFF submitted the *Final Interim Remedial Investigation Data Summary Report* (AECOM, 2020b) on July 15, 2020. On July 30, 2020, DHEC approved the report and requested a Phase II RI Work Plan (also referred to as Phase II) be submitted by September 15, 2020. The *Phase II Remedial Investigation Work Plan* (AECOM, 2020c) was submitted to DHEC on September 15, 2020, and partially approved by DHEC on October 14, 2020. A Phase II Work Plan addendum was submitted on October 29, 2020, to address DHEC's comments on the *Phase II Remedial Investigation Work Plan*, and DHEC approved the Work Plan addendum on November 5, 2020.

A portion of the Phase II field work was performed from October 2020 through June 2021. This work included the installation of 14 new monitoring wells (W-98 through W-100, and W-102 through W-112). Another portion of the Phase II field work included additional monitoring well installations (W-113 through W-126 and replacement well W-4R) and was performed in July and August 2021. Site-wide semi-annual groundwater sampling of the existing monitoring well network has also been performed since 2018.

2.1 Regulatory Framework

CFFF is regulated by both the Nuclear Regulatory Commission (NRC) and DHEC. The NRC regulates activities involving Special Nuclear Material (SNM). These activities are performed under license SNM-1107. In accordance with SNM-1107, CFFF has set aside closure funding to remove radiologically impacted environmental media when the facility is decommissioned (Westinghouse, 2022). DHEC regulates non-SNM activities, including non-radiological air emissions, wastewater discharges, solid and hazardous waste management as well as any impacts to environmental media.

2.2 Project Overview, Objectives, and Report Organization

The purpose of the RI is the following:

- Define the physical characteristics of the study area;
- Refine knowledge of regional and site geology and site hydrogeology;
- Document the source, nature, and extent of COPCs in soil, groundwater, surface water, and sediment;
- Update the site conceptual model; and

- Update the Baseline Risk Assessment.

This RI report provides the results of work performed from June 2019 to August 2021 and is organized into eight sections:

- **Section 1** presents this introduction, an overview of the project, and site background and history.
- **Section 2** outlines the field and analytical methods used to generate the environmental quality data.
- **Section 3** discusses physical characteristics of the area, including site geology and hydrogeology.
- **Section 4** discusses the investigation results and environmental quality data.
- **Section 5** discusses the source, nature, and extent of site-related COPCs.
- **Section 6** presents the Conceptual Site Model.
- **Section 7** summarizes the updated Baseline Risk Assessment (BRA).
- **Section 8** draws conclusions from the data.
- **Section 9** lists references**.**

2.3 Site Description, Physical Setting, and Operational Background

2.3.1 Facility Description and Operational Background

Figures 1 through 3 illustrate the site features discussed below. The CFFF property is located on Bluff Road (SC Highway 48) approximately 15 miles southeast of Columbia, SC and includes approximately 1,151 acres as identified by Richland County Tax Map Series (TMS) numbers 18600-01-01 and 18601-01-02. The property is surrounded by rural forested and agricultural property with some permanent residences located north and east of the site.

The primary plant building is located approximately 2,700 feet (ft) southwest of Bluff Road on the northern portion of the property with the wastewater treatment plant (WWTP) located near the southwest corner of the plant building. Treated wastewater is piped to the Congaree River approximately 3 miles south of the property boundary where it is discharged under National Pollutant Discharge Elimination System (NPDES) permit SC0001848. A 30-40 ft bluff separates the northern, partially developed portion of the property from the southern floodplain portion of the property. Notable features in the floodplain include Mill Creek (including Upper and Lower Sunset Lakes, **Figure 2**), a man-made canal, and man-made stormwater ditches.

Westinghouse purchased the property in 1968, and construction of the CFFF was completed in 1969. Prior to construction the property consisted of farmland and woodlands. The main manufacturing activity is the fabrication of low-enriched U fuel assemblies and components for the commercial nuclear power industry. The manufacturing process generates multiple wastewater streams which are treated by various physical, chemical, and biological processes prior to discharge to the Congaree River.

The facility was divided into eight operable units (OUs) and one Area of Concern (AOC) in recognition of the different types of site activities and potential sources of impact. The OUs are identified as the Northern Storage Area, Mechanical Area (of the plant building), Chemical Area (of the plant building), West Lagoons Area, Wastewater Treatment Area, Sanitary Lagoon Area, Southern Storage Area and Western Storage Area. The "Western Groundwater AOC," was previously identified; however, work conducted during Phase II of the RI concluded the groundwater impact in this area is part of the main chlorinated volatile organic compound (CVOC) plume as described in **Section 4.2.1**. The OUs and the Western Groundwater AOC are depicted on **Figure 4,** were described in detail in the *Final Remedial Investigation Work Plan* (AECOM, 2019), and are summarized in **Appendix A**.

Releases of COPCs have occurred from the wastewater treatment system and manufacturing operations. CFFF has assessed known releases, installed an extensive groundwater monitoring network (beginning in the early 1980s), and initiated various remediation efforts in response to historic events. Additional comprehensive site assessment of groundwater, surface water, sediment and soils has been performed from 2019 – 2021 under the CA. These assessment activities have determined that environmental impacts from historical operations are largely confined to the immediate plant area and there are no offsite impacts. Additional facility background and operational information is in **Appendix B**.

2.4 Historical Investigations

As mentioned above, previous environmental investigations were performed from 1980 to 2019. Summaries of and excerpts from the investigation reports are contained in **Appendix C**.

2.5 Historical Remediation Activities

Environmental remediation activities were performed beginning in 1998. Summaries of and excerpts from remediation activities are contained in **Appendix D**.

3. Methods of Investigation

The RI was performed between 2019 and 2021 and included preparation and planning for field related activities followed by implementation of multiple phases of investigation. In general, the RI efforts included the following:

- Project planning and procurement;
- Completion of 91 soil and/or lithologic borings;
- Analysis of 21 groundwater samples collected from seven temporary groundwater screening locations during Phase I and 99 groundwater samples from 43 screening locations during Phase II;
- Installation, development, and sampling of 57 new permanent monitoring wells;
- Collection and analysis of groundwater samples from the site's monitoring well network semi-annually during the RI period;
- Survey of private water wells near the facility;
- Collection and analysis of groundwater samples from four private wells;
- Collection and analysis of 12 surface water samples;
- Collection and analysis of 172 sediment samples;
- Collection and analysis of 103 soil samples;
- Submittal of five aliquots of sediment and 13 soil samples for grain size analysis;
- Bathymetric surveys of the Gator Pond, Upper Sunset Lake and Lower Sunset Lake;
- Installation of seven surface water staff gages;
- Installation of pressure transducers on six staff gages, in 13 monitoring wells, and in one piezometer;
- Slug tests in 21 wells; and
- Surveying of ditches, borings, new wells, and staff gage locations.

Locations of samples collected during the RI are displayed on **Figure 5**. The preparation activities, methods used to collect environmental samples, and the rational for the sampling efforts are discussed in more detail in this section of the report and are summarized in **Table 2**.

3.1 Field Program Preparation Activities

Preparation for the multiple phases of field work included the following activities: development of project specific Health and Safety Plans (HASP), resolution of site access issues with adjacent property owners, utility clearance, drilling and well installation, investigative derived waste management and disposal, sample analysis, and procurement of necessary field and sampling equipment. These activities are summarized in this section.

3.1.1 Preparation of Health and Safety Plan

Prior to implementation of field efforts, AECOM Technical Services, Inc. (AECOM) prepared a project HASP. The HASP was developed in accordance with the Federal Occupational Safety and Health Administration Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction. The HASP includes AECOM and CFFF specific emergency procedures, a map to the closest emergency medical treatment facility, and Task Hazard Assessment (THA) forms for specific activities performed by field personnel. The HASP provides methods for AECOM and contractor personnel to identify, evaluate, and control safety and health hazards, and outlines emergency response actions for AECOM-managed activities. This HASP was kept on site during field activities and made available to workers including subcontractors and other site occupants for informational purposes. The HASP was updated annually during the RI.

3.1.2 Resolution of Access Issues and Permits

Because limited access was required to private properties surrounding the site, CFFF negotiated access agreements with the property owners. The agreements allowed AECOM and CFFF personnel to access these properties during the RI to obtain groundwater samples from private water supply wells. Sampling of the private water supply wells is discussed in in **Section 2.4.3.2**.

In accordance with the South Carolina Well Standards [R.61-71(H)(1)(a)], AECOM and CFFF obtained approval from SCDHEC for each phase of groundwater screening and/or well installation. This required AECOM and CFFF to submit proposed scopes of work for each phase for which DHEC issued separate monitoring well permits.

3.1.3 Site Reconnaissance

Site reconnaissance was performed prior to individual field activities to observe the accessibility of boring/sample locations and stake out locations. Locations were adjusted as necessary prior to mobilization of the field crews. Sample locations were staked out using either submeter grade global positioning system (GPS) equipment or field observations and marked with paint and/or stakes with flagging tape attached.

3.1.4 Utility Clearance

AECOM coordinated with CFFF to mark and scan each drilling/boring location for the presence of overhead and/or buried underground utility lines. Where available, CFFF utilized historic engineering drawings and plans to identify locations of underground utilities to aid in the process. In addition, AECOM procured a private utility locating contractor (Reed Tech, Inc.) to scan proposed installation locations for underground utilities before drilling efforts were initiated. Utility clearance methodology details are in **Appendix E**.

3.1.5 Drilling Subcontractors

The multiple phases of drilling and well installation required utilization of multiple SC licensed well drilling contractors. The drilling contractors include Geologic Exploration, Inc. (GEX) of Statesville, North Carolina; South Atlantic Environmental Drilling and Construction Company (SAEDACCO) of Rock Hill, South Carolina; and Elite Techniques, Inc. (Elite) of Camden, South Carolina. GEX and SAEDACCO were used to perform the Phase I RI drilling efforts. SAEDACCO and Elite were used to perform the Phase II RI drilling efforts.

3.1.6 Laboratory Subcontractors

RI sample analyses were performed by various SCDHEC certified laboratories. CFFF procured Pace Analytical Services (Pace, formerly Shealy Environmental Services, Inc) based in West Columbia, SC and GEL Laboratories, LLC (GEL) based in Charleston, SC to perform the majority of the analyses. CFFF's certified laboratory also performed a limited set of analyses throughout the RI. The analyses performed by each laboratory are discussed later in this chapter.

3.2 Soil Investigation

The RI soil investigation efforts included advancement of soil and/or well borings using various drilling technologies; collection, visual examination, and classification of soil cores; field screening; collection of surface and subsurface soil samples for physical and/or chemical analyses; and performance of multiple phases of a passive soil vapor sampling effort. The methods utilized during the soil investigative efforts and the rationale for sample locations are discussed in the following sub-sections.

3.2.1 Soil Boring Advancement Methods and Rationale

Soil and/or well borings were advanced across the site during both phases of the RI for purposes including the collection of lithologic data (lithologic borings), collection of samples for groundwater screening and collection of soil samples for physical and chemical analyses. During Phase I of the RI, 14 shallow soil borings (**Figure 6**) and 19 lithologic borings (**Figure 7**) were advanced at the site. During Phase II of the RI, 43 additional lithologic/groundwater screening borings (L-20 through L-62, **Figure 7**) were advanced across the site. A remedial investigation sample summary is in **Table 2**. This table contains the sample depths, locations, brief rationale description for each boring and the analyses for each sample. Soil boring advancement methodology details are in **Appendix E**.

3.2.2 Lithologic Inspection and Classification

In accordance with the *Final Remedial Investigation Work Plan* (AECOM, 2019), soil and well borings advanced during each phase of the RI allowed collection of soil samples and/or cores that were visually examined, classified, and described using the Unified Soil Classification System. Lithologic information obtained from each soil and/or well boring was documented on boring logs and incorporated into the site's conceptual site model (CSM). Copies of boring logs generated during the RI for each soil and well boring are included in **Appendix F.**

3.2.3 Soil Gas Survey

Historical activities on the CFFF property have resulted in the release of CVOCs, specifically tetrachloroethene (PCE, also known as tetrachloroethylene) and its daughter products. The distribution of CVOCs in groundwater suggested a general area where a release(s) may have occurred; however, a source for this impact had not previously been identified. During Phase II of the RI, a passive soil gas survey (SGS) was performed in two phases in the probable CVOC source area along the west side of the CFFF plant building. During the two phases of the SGS, a total of 53 passive absorbent sampling devices were installed at depths of 2-3 ft below land surface (BLS) at 53 locations (**Figure 6**).

SGS methodology details are in **Appendix E**. Copies of the Beacon Environmental reports completed for both SGS events are in **Appendix G**. The results of the SGS were used to develop the scope of work for the CVOC source area soil investigation which is briefly summarized in **Section 2.2.4** below.

3.2.4 Soil Sample Collection

Soil sample collection efforts were completed in accordance with the procedures described in the *Final Remedial Investigation Work Plan* (AECOM, 2019) and the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c).

The soil samples collected during the RI, their locations, their depths, rationale for each sample and sample analyses are listed in **Table 2**. Soil samples collected during Phase I of the RI were submitted to GEL for Technetium-99 (Tc-99) analysis via DOE EML HASL-300, Tc-02-RC Modified and samples collected during Phase II of the RI were submitted to Pace and analyzed for CVOCs using United States Environmental Protection Agency (EPA) Method 8260B. Soil sample collection methodology details are in **Appendix E**.

3.3 Groundwater Investigation

The RI groundwater investigation included groundwater screening, the installation of monitoring wells, monitoring well sampling, private water well sampling, and slug testing.

3.3.1 Groundwater Screening Methods and Rationale

Groundwater screening was used to refine the knowledge of the horizontal and vertical extent of COPCs in the surficial aquifer and to optimize the locations and screened intervals for additional monitoring wells to be installed at the site. **Figure 7** shows the locations where groundwater screening was performed during the RI. **Table 2** lists the RI groundwater screening samples, the depths at which they were collected, rationale for the locations and the analytical parameters for each sample. Groundwater screening methodology details are in **Appendix E**.

Groundwater samples collected from the screening borings were submitted to Pace, the on-site CFFF laboratory (fluoride analysis only), and/or shipped to GEL for analysis of CVOCs, fluoride, nitrate, and Tc-99. Groundwater sample collection records are in **Appendix H**. The results of the groundwater screening efforts were used to recommend locations for permanent monitoring wells.

3.3.2 Well Installation Methods and Rationale

During each phase of the RI, permanent monitoring wells were installed at strategic locations across the site. Twenty-nine monitoring wells were installed during Phase I of the RI and 28 monitoring wells were installed during Phase II of the RI. Additionally, one well was replaced (W-4R), one well had repairs completed (W-16) and one piezometer (PZ-1) was installed during Phase II of the RI. The monitoring wells were installed using either rotosonic or hollow stem auger drilling techniques. **Figure 3** depicts the locations of the permanent monitoring wells. **Table 1** lists the monitoring wells located at the site, includes construction information, elevations, and identifies the surficial aquifer zone or aquifer in which each well is screened. **Table 2** lists the wells installed during the RI, rationale for the locations, and the analytical parameters for each sample. Well installation methodology details are in **Appendix E**.

3.3.3 Well Development

Each permanent monitoring well installed during the RI was developed by AECOM personnel in accordance with procedures described in the *Final Remedial Investigation Work Plan* (AECOM, 2019). The purpose of the development was to remove sediment that collected in the well screen and filter pack during installation. Each well was developed no sooner than 24 hours after grouting had been completed. Five monitoring wells (RW-1, W-6, W-22, W-25, and W-27) were also redeveloped during the RI period to either remove sediment from the well. Well development methodology details are in **Appendix E**. Copies of monitoring well development/redevelopment records for the RI are included in **Appendix I.**

3.3.4 Groundwater Monitoring

RI groundwater monitoring included sampling of permanent monitoring wells, collection of groundwater samples during the screening efforts, and sampling of water supply wells. This section briefly discusses the procedures used to perform RI related groundwater sampling.

3.3.4.1 Monitoring Well Sampling

Permanent monitoring wells were sampled in accordance with procedures specified in the *Final Remedial Investigation Work Plan* (AECOM, 2019) and the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c). Groundwater samples were collected at least 24 hours after development. **Table 2** lists the groundwater samples collected from permanent monitoring wells during the October 2021 groundwater sampling campaign, the aquifer zone and/or aquifer that the well is screened, and the analyses that were conducted on each sample. Monitoring well methodology details are in **Appendix E**.

3.3.4.2 Private Water Well Sampling

As part of the RI, CFFF performed a survey of surrounding properties to locate water supply wells within approximately a 1-mile radius of the site. Thirty-one water wells, including two determined to be inactive, were identified during the survey (**Table 3, Figure 8**). Groundwater samples were collected from four water supply wells (identified as WSW-01 through WSW-04) located near the CFFF. Private wells (25 wells) that were upgradient of CFFF or inactive were not sampled. Private well sampling methodology details are in **Appendix E**. Copies of the groundwater sample collection records for both monitoring wells and private wells are included in **Appendix H.**

3.3.5 Hydraulic Data Collection and Conductivity Testing

To assess the hydrogeologic characteristics of the surficial aquifer and the rate of groundwater flow beneath the site, slug tests were performed on multiple wells during both phases of the RI. Slug tests were performed in 17 wells including four during Phase I and 13 during Phase II.

Four wells installed in the floodplain, two in the upper zone of the surficial aquifer (W-96 and W-97) and two in the lower zone of the surficial aquifer wells (W-94 and W-95), were slug tested during Phase I of the RI. Thirteen (13) wells including five screened in the upper zone of the surficial aquifer (W-11, W-67, W-98, W-118, and W-119) and eight screened in the lower zone of the surficial aquifer (W-6, W-19B, W-65, W-68, W-103, W-117, W-120, and W-126) were slug tested during Phase II.

Additionally, slug tests were performed at six wells in 2018 as part of CVOC assessments and are included in this report. These six wells are located above the bluff to the west of the plant. Slug testing included four wells screened in the upper portion of the surficial aquifer (W-13R, W-15, W-39, and W-60) along with two wells screened in the lower portion of the surficial aquifer (W-48 and W-61). Monitoring well locations are depicted on **Figure 3**.

Hydraulic conductivity testing methodology details are in **Appendix E**. The results of the hydraulic conductivity testing are discussed in **Section 3.0**.

3.4 Surface Water Investigation

The RI included an evaluation of surface water quality along with the determination of groundwater-surface water interaction(s) in portions of the site.

3.4.1 Surface Water Sample Collection and Rationale

During Phase I of the RI, surface water samples were collected from 12 locations across the site. **Table 2** lists the RI surface water samples, their locations, rationale for the locations, and the analytical parameters for each sample. Each of these sample points were co-located with sediment sample collection locations. **Figure 9** shows the RI sediment and surface water sample collection locations.

Surface water sample collection methodology details are in **Appendix E**. The results of the surface water sampling are documented in **Section 4.3**.

3.4.2 Surface Water-Groundwater Interaction Evaluation

There are multiple surface water features on the site that interact with and/or locally influence groundwater conditions. During Phase II of the RI, CFFF initiated an evaluation of how the surface water bodies (Gator Pond and Mill Creek) interact with groundwater. A rain gage was installed at the site along with pressure transducers in select monitoring wells and in the surface water bodies.

Figure 2 depicts the locations of the staff gages. Except for the Creek staff gage, each staff gage has a pressure transducer attached to it to measure the surface water elevation. Surface water – groundwater interaction data collection methodology details are in **Appendix E**. The results of the surface water elevation and groundwater to surface water interaction evaluation are discussed in **Section 6.3.6.**

3.5 Sediment Investigation

The RI also included investigation of sediment in various surface water bodies and drainage ditches across the site. Sediment samples were collected from 46 locations during Phase I and 23 locations during Phase II of the RI. Sixty-nine sediment samples were collected from the site during Phase I of the RI, and 115 samples were collected during the Phase II effort. RI sediment and surface water sample collection locations are depicted on **Figure 9**.

3.5.1 Sediment Boring Advancement and Rationale

Sediment samples were collected during the RI using a stainless steel hand auger, a multistage sediment sampler, or a Vibracore Mini Sampler. Sediment boring advancement and sample collection methodology details are in **Appendix E**. **Table 2** lists the RI sediment samples, sample depths, their locations, rationale for the locations, and the analytical parameters for each sample.

3.6 Sample Analysis

Samples collected during the RI were analyzed for a variety of parameters. The analytical program during the RI included a broad list of parameters as is typical of the CERCLA process. Samples collected during the RI were analyzed for the following:

- Target compound list (TCL) volatile organic compounds (VOC) by EPA Method 8260B;
- TCL semi-VOCs (SVOC) by EPA Method 8270D;
- Target analyte list (TAL) metals by EPA Method 6010D/6020B;
- Nitrate by EPA Method 353.2;
- Ammonia by EPA Method 350.1;
- Fluoride by EPA Method 9056A;
- Isotopic uranium (U) by United States Department of Energy (DOE) Environmental Measurements Laboratory Health and Safety Laboratory EML HASL-300 (U-02-RC Modified);

- Isotopic U by EPA Method 200.8/200.2; and
- Tc-99 via DOE EML HASL-300 (Tc-02-RC Modified).

Groundwater, soil for the Tc-99 source area investigation, surface water, sediment, and investigative derived waste (IDW) soil samples were analyzed by Pace Environmental Services and GEL Labs, as appropriate.

Based on the limited detections of TCL SVOCs and TAL metals during Phase I of the RI, these parameters were removed from the analytical suite of parameters for the Phase II efforts as approved in the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c). Samples collected from groundwater screening borings at the site were analyzed for parameters based upon COPC-specific impact in the area where the samples were collected.

A limited number of soil samples collected during Phase II of the RI were analyzed by Schnabel Engineering for grain size. Five aliquots of sediment samples leftover from the sediment sampling were also submitted to Schnabel Engineering for grain size analysis.

3.7 Quality Assurance/Quality Control

As specified in the *Final Remedial Investigation Work Plan* (AECOM, 2019), quality assurance (QA) and quality control (QC) samples consisting of field duplicate, matrix spike (MS)/matrix spike duplicate (MSD), equipment blank, and trip blank samples were collected during all environmental sampling events to provide quantitative data on the precision and accuracy of the sampling and analysis program. QA/QC methodology details are in **Appendix E**.

3.8 Sample Point Location and Surveying

Sample points including soil borings, monitoring wells, soil gas sample locations, sediment sample locations, and surface water sample locations were surveyed. Sample point location and surveying methodology details are in **Appendix E**.

3.9 Equipment Decontamination

Decontamination wastes generated during each phase of the RI were containerized in either department of transportation approved 55-gallon drums and/or 275 gallon high density polyethylene totes. The decontamination waste was managed in accordance with procedures discussed in **Section 2.10.** Equipment decontamination methodology details are in **Appendix E**.

3.10 Investigative Derived Waste Management

IDW generated during the field program were managed in accordance with CFFF procedures and the *Final Remedial Investigation Work Plan* (AECOM, 2019). RI IDW included soil cuttings from drilling or hand augering, drilling fluids, groundwater obtained through well development or well purging, and cleaning/decontamination fluids. IDW management methodology details are in **Appendix E**.

3.11 Deviations From Work Plans

Deviations from the *Final Remedial Investigation Work Plan* (AECOM, 2019) and *Phase II Remedial Investigation Work Plan* (AECOM, 2020c) are described in **Appendix J**. These minor deviations from the work plans did not affect the goal of the RI to assess the source, nature, and extent of historical impacts nor did they affect the conclusions and recommendations.

4. Physical Characteristics of the Study Area

A detailed description of the site setting is included in **Section 1.3**. This section describes the physical characteristics of the site in terms of its topography, surface water hydrology, geology, hydrogeology, cultural resources, and ecology. This section was prepared using information derived from published reports and site assessment reports. This section provides the framework for discussions of the nature and extent of impact (**Section 5**), the Conceptual Site Model (**Section 6**), and human health and ecological risk assessments (**Section 7**).

4.1 Surface Features

The site can be separated into two distinct areas separated by an erosional bluff of the Congaree River: the developed area and planted pine forests to the north of the bluff and the floodplain to the south of the bluff.

Based on topographic data depicted on **Figure 1** and on-site survey data, the elevation of the developed area of the property is approximately 130-140 ft above mean sea level (MSL). Surface features of the developed area include the entry checkpoint, the main plant building, multiple outbuildings, wastewater lagoons, multiple above ground storage tanks and other facility infrastructure, roads and walkways, primary and secondary surface parking, stormwater ditches and undeveloped areas east and west of the main plant building. The eastern and western sides of the developed area are bounded by planted pine forests.

Elevations drop to approximately 110 ft above MSL in the Congaree River floodplain. A bluff that varies from steeply dipping to gradually sloping separates the developed portion of the site from the Congaree River floodplain. The Gator Pond is a man-made surface water body contained within a man-made secondary bluff. Mill Creek (and associated Upper and Lower Sunset Lakes) flows through the floodplain and is described further in **Section 3.3**.

A site wide topographic map created using elevation contour data from the Richland County Geographical Information System website (https://www.richlandmaps.com/apps/dataviewer/) is included in **Appendix K**. The topography of both the developed portion of the property and the floodplain are relatively flat.

4.2 Meteorology

According to the South Carolina Department of Natural Resources State Climatology Office, Richland County receives annual average rainfall of 47.75 inches and has a mean temperature of 66.5 degrees Fahrenheit. The average driest months of the year, in order of least precipitation, are November and October while July and August are the average wettest months. Prevailing wind directions in the Spring are to the southwest, in the Summer to the south and southwest, in the Autumn to the northeast and in Winter to the northeast and southwest. Average wind speeds are between 6 and 10 miles per hour.

Rainfall data began to be collected for CFFF when pressure transducers were installed in select monitoring wells and staff gages beginning on March 25, 2021. From March 25 through May 18, 2021, rainfall data was obtained from the Columbia Metropolitan Airport located approximately 12 miles west northwest of CFFF. On May 19, 2021, CFFF installed a rain gage at the facility to obtain site-specific daily rainfall totals. From March 25, 2021 through March 25, 2022, the facility received 37.19 inches of rainfall.

4.3 Surface Water and Wetlands

Surface water bodies on and within the facility property include the Gator Pond, Mill Creek which contains Upper and Lower Sunset Lakes, and stormwater ditches. These surface water features are displayed on **Figure 2**. Detailed descriptions of these surface water bodies are in **Appendix L**. The dynamics of flow within Mill Creek are discussed in detail in **Section 6.3.6**.

According to the United States Fish and Wildlife Service's National Wetlands Inventory (Federal Geographical Data Committee, 2013), there are two types of wetlands within the property: freshwater forested/shrub wetland and freshwater emergent wetland. The National Wetlands Inventory also documents surface water bodies such as the stormwater ditches and Gator Pond. The locations and types of wetlands identified by the National Wetlands Inventory (including surface water bodies) on the property are shown on **Figure 10**.

Freshwater forested/shrub wetlands are Palustrine non-tidal, inland wetlands containing ocean-derived salts in concentrations less the 0.5 parts per thousand. The shrub variety contains trees less than 6 meters (approximately 20 ft) in height and the forested variety contains trees greater than 6 meters in height. Emergent wetlands are characterized by erect, rooted herbaceous hydrophytes (aquatic plants such as cattails and water lily), excluding mosses and lichens.

4.4 Land Use and Demographics

Land uses in the vicinity of the site are residential, industrial, agricultural and undeveloped. Residential areas are located north and east of the developed area of the property. One former industrial site, SCRDI Bluff Road (formerly known as South Carolina Recycling and Disposal, Inc.) is located north of the property. The SCRDI Bluff Road site is a Superfund site. The adjacent property to the west contains a caretaker's home and is primarily used as a hunting and fishing club including food plots to attract game. Properties to the east and south are undeveloped and are primarily used as hunt clubs with food plots and buildings for hunt club activities.

Except for the operational area of the site, the area surrounding the facility and the undeveloped portion of the property is zoned as rural property by Richland County. Rural property is characterized by residences with larger lot sizes and some agricultural functionality (e.g., personal garden) or hobby farms that are in keeping with the rural nature of the area. The developed portion of the site is zoned for heavy industrial use.

According to the United States Census Bureau's (USCB) 2019 statistics (USCB, July 2019), Richland County's population was 415,759 people with the population being split nearly evenly between blacks (48.7%) and whites (45.4%) with the remaining population being smaller percentages of other ethnicities. The median household income in Richland County between 2015 and 2019 was $54,767 and 16.2% of the population lived below the poverty line.

4.5 Water Supply

The City of Columbia constructed a water line to the facility when it was constructed in 1969. The City of Columbia obtains its water from the Columbia Canal and Lake Murray. Prior to the water line being constructed, private water supply wells were the only source of water in the area. When the water line was installed, property owners were given the option to connect to the municipal water supply.

To assess the presence of water supply wells within a 1-mile radius of the property boundary, AECOM personnel conducted a windshield survey for private water supply wells for upgradient properties, generally including those properties northwest, north and northeast of the facility. This survey identified 30 water supply wells within the search radius. The closest upgradient private water supply well is located approximately 4,000 ft north of the known extent of COPC impact. Results of the private water supply well survey are in **Table 3**. Information in **Table 3** corresponds to the numbers on **Figure 8** that show each private well's location.

CFFF personnel contacted owners of the hunt club properties south of the facility within a mile of the property boundary. Four water supply wells (WSW-01 through WSW-04) were determined to be on properties west, southwest and south of the developed area of the CFFF property. These wells are side gradient to downgradient of the site. The closest downgradient private water supply well is approximately 3,000 ft (over 1/2 mile) southwest of the known extent of COPC impact. The adjacent property to the west also contains two wells that are inactive.

4.6 Soils

Based upon information within the United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey of Richland County (USDA, September 1978), there are six surficial soil types in areas above the bluff and two surficial soil types in the floodplain. Surficial soil types above the bluff consist of loam, fine sandy loam, sandy loam, loamy sand, very fine sandy loam, and the Orangeburg-Urban Land Complex. Surficial soil types below the bluff consist of loam and silty clay loam. Loam is defined as soil with nearly equal parts sand, silt, and clay.

For this survey, soil scientists at the USDA dug numerous holes across the county to expose the surface to near-surface soil profile and recorded the characteristics of the profiles. These characteristics were compared to soils in nearby counties and counties far away to correlate and classify the soils according to nationwide, uniform procedures to generate soil map units. The USDA Soil Survey Map for the property and surrounding areas is displayed on **Figure 11**.

4.6.1 Above the Bluff

The area above the bluff covers approximately 480 acres and includes the developed portion of the site. Soil types above the bluff include:

- the Cantey (Ca) and Smithboro (Sm) loams;
- the Coxville (Cx) fine sandy loam;
- the Faceville (FaA) and Goldsboro (GoA) sandy loams;
- the Orangeburg (ObA) and Vaucluse (VaC) loamy sands;
- the Persanti (Ps) very fine sandy loam; and
- The Orangeburg-Urban Land Complex (OgB).

4.6.2 Below the Bluff

The area below the bluff covers approximately 670 acres, is a portion of the floodplain of the Congaree River, and contains Mill Creek (including Upper and Lower Sunset Lakes) and the Gator Pond (1% of the area below the bluff is water). Soil types below the bluff include:

- The Congaree (Co), Chewcala (Ce) and Toccoa (To) loams, and
- The Chastain (Cd) and Tawcaw (Tc) silty clay loams.

More detailed descriptions of these soil units can be found in **Appendix M.**

4.7 Geology

CFFF is located within the Upper Coastal Plain physiographic province of South Carolina. The South Carolina Coastal Plain is a southeasterly thickening wedge of sediment overlying bedrock of the North American craton. Thicknesses of this wedge of sediment range from 0 ft at the Fall Line (the furthest transgression of the ocean along the southeastern US coast readily evident in the geologic record) to over 3,500 ft in southeastern, SC (Colquhoun, et al., 1983). The Upper Coastal Plain of South Carolina stretches from the Fall Line near Columbia to the northeast to the Orangeburg Scarp to the southwest.

Sediments north of CFFF are a series of northwest to southeast trending, Tertiary aged river terraces (fluvial depositional environment) with the oldest Pliocene Epoch (5.33 million to 2.58 million years ago) sediments being located south of the boundary of the Fort Jackson Army base. Sediments comprising the vadose zone and surficial aquifer of the property are a Quaternary Age, Pleistocene Epoch (2.58 million to 11,700 years ago) river terrace, whereas the sediment in the floodplain portion of the site were deposited during the late Pleistocene Epoch (130,000 to 11,700 years ago) to Holocene Epoch (11,700 years ago to present day). The river terrace deposits and floodplain sediment were deposited by the Congaree River which is located approximately 3 miles south southwest of the southern property boundary. The South Carolina Department of Natural Resources Geological Survey Fort Jackson South Geologic Quadrangle map (DNR Geologic Survey, 2011) is included in **Appendix N**.

Surficial aquifer sediments generally occur to a depth of 30 to 40 ft BLS at the site, depending on topography, and can be differentiated into overbank deposits consisting of clayey silt, clayey sand, silt, sandy silt to silty sand (approximately 8-10 ft thick) and a coarsening downward sand (approximately 20 to 30 ft thick) river channel deposit. Silt and clay lenses and lower permeability silty or clayey sands occur at varying depths within the coarsening downward sands of the surficial aquifer. Geologic cross sections depicting site lithologies are displayed on **Figures 12 through 16**.

Two notable subsurface geologic anomalies were discovered during the RI. The first anomaly is near the location of paired monitoring wells W-95 and W-111 (**Figure 12**) where there is over 80 ft of sediment above the Black Creek confining clay. Further assessment of this anomaly was performed during Phase II of the RI and indicated that the incisement into the Black Creek confining clay is localized to this area. The second geologic anomaly is associated with well pair W-85/W-86 (**Figure 15**) where over 25 ft of clay overlies lower permeability sands and clay. A similar subsurface sequence was also encountered during the installation of nearby monitoring well W-83/lithologic boring L-

41 where clay was encountered to a depth of 23 ft BLS. This clay deposit may represent a former oxbow lake or abandoned stream channel that was slowly filled by silt and clay overbank deposits.

Sediments of the surficial aquifer unconformably overlie the Upper Cretaceous, late Campanian Age sediments (83.6 million to 72.1 million years ago, a gap of approximately 70 million years) comprising the Black Creek Formation (Nystrom, Jr. et al., 1991). The upper portion of the Black Creek Formation beneath the site is a confining bed composed of dry silt/clay and brittle shale that is encountered throughout the site. This confining clay varies in thickness from 38 to 83 ft based on data gathered during the installation of the four Black Creek Aquifer wells (W-3A, W-49, W-50 and W-71). The elevation of the top of the Black Creek confining clay is undulating but is generally highest west of the plant building in the operational portion of the property and decreases radially in all directions with the lowest elevations being within the floodplain. Due to the amount of time that this formation was exposed to precipitation and subsequent erosion, the surface of this clay is undulating. A surface contour map of the top of the Black Creek confining clay is displayed on **Figure 17**.

Beneath the clay confining unit is a sand aquifer within the lower Black Creek Formation known as the Black Creek Aquifer that is artesian in some areas of South Carolina. Four site monitoring wells (W-3A, W-49, W-50 and W-71) are screened within the Black Creek Aquifer. These sediments were deposited in an upper delta plain, fluvial environment and overlie crystalline bedrock of the North American craton.

4.8 Hydrogeology

The CFFF is underlain by three hydrogeologic units: the surficial aquifer, the Black Creek Aquifer, and the Middendorf Aquifer. The predominant direction of groundwater flow in the surficial aquifer is to the southwest with components of flow to the west and south. The inferred groundwater flow direction in the Black Creek Aquifer is to the southwest. **Table 4** summarizes the depth to water and groundwater elevations from the October 2021 synoptic water level gauging event. **Figures 18 through 20** are groundwater elevation contour (potentiometric) maps for the surficial aquifer – upper zone, surficial aquifer – lower zone, and the Black Creek Aquifer, respectively, for October 2021. Wells installed on top of or within 5 ft of the Black Creek confining clay are designated as surficial aquifer - lower zone monitoring wells with the rest of the surficial aquifer comprising the upper zone.

Hydraulic conductivity tests (slug tests) were performed during previous scopes of work and during the RI. The hydraulic conductivity values determined by slug tests ranged from 0.06 to 125.20 ft per day (ft/day). Based on these values, the average hydraulic conductivity calculated for the site is 16.44 ft/day. Slug test results are presented in **Table 5**. Hydraulic characterization data analysis sheets from the RI are in **Appendix O**.

Hydraulic gradient is the change in total head (water elevation) over distance in a given direction (Fetter, 1994). Gradients exists horizontally and vertically within an aquifer. Because the water table generally mimics topography and the bluff represents a comparatively dramatic change in elevation over a short distance, the horizonal hydraulic gradient were assessed for areas of the site above the bluff, near the bluff and below the bluff. Horizontal hydraulic gradients for CFFF are in **Table 6**. Across area of groundwater impact (from well pair W-36/W-122 to well pair W-20/W-109), an average hydraulic gradient of 0.0075 ft per foot (ft/ft) was calculated for the surficial aquifer for October 2021.

Table 7 presents the vertical gradient calculations from 24 well pairs within the surficial aquifer and four surficial aquifer to Black Creek Aquifer well pairs for synoptic water elevation gauging events from October 2019 through October 2021. Positive values indicate that there is upward flow and negative values indicate that there is downward flow in the vicinity of the well pairs. In general, vertical groundwater flow within the surficial aquifer is downward ranging from -0.002 to -0.414 ft/ft. Upward vertical gradients were calculated in the surficial aquifer for well pairs W-22/W-6, W-32/W-11, W-91/W-90 and W-95/W-111 ranging from 0.012 to 0.525 ft/ft. Two of the well pairs (W-32/W-11 and W-91/W-90) with upward gradients are located near areas of steep topography (e.g., the bluff, Western Ditch incisement). Upward gradients in these wells are the result of the upper zone of the water table decreasing in elevation faster than the lower zone.

Groundwater velocity is calculated using Darcy's Law which incorporates hydraulic gradient, hydraulic conductivity and effective porosity. Using an assumed effective porosity of 30 percent (0.30), the average hydraulic gradient and average hydraulic conductivity, a groundwater flow velocity for the surficial aquifer at CFFF of 150 ft/year was calculated. Additional site hydrogeology information is in **Appendix P**.

Although groundwater flow velocities above the bluff and down the bluff are calculated to be higher than those in the floodplain (**Appendix P**), the slower groundwater flow velocity in the floodplain inhibits groundwater in a connected aquifer system from flowing faster than the slowest portion of the aquifer. Slower groundwater flow rates in the floodplain cause groundwater from above the bluff and down the bluff to push against slower moving groundwater in the floodplain. Therefore, groundwater flow velocities in the floodplain limit the overall flow rate in the surficial aquifer.

4.9 Cultural Resources

CFFF contracted Brockington and Associates, Inc. (Brockington) to complete a *Cultural Resources Survey of the Westinghouse Electric Company's Columbia Fuel Fabrication Facility* of their property to assess if historic properties are present at CFFF that may be affected by ongoing operations (Brockington, 2022). The cultural resources survey (CRS) identified, documented and evaluated five archaeological sites, six aboveground historic resources, the man-made canal and Denley Cemetery. The State Historic Preservation Office concurred with the recommendations in the Brockington report that there are no resources on the CFFF site that meet the criteria for listing in the National Register of Historic Places. Of the evaluated locations, only Denley Cemetery requires management consideration. This cemetery is protected from desecration under South Carolina laws and by CFFF's management plan.

4.10 Ecology

The *Baseline Risk Assessment* (AECOM, 2022) documents that the site is comprised of two main ecological communities: 1) a maintained, herbaceous community within the developed area of the facility and 2) a swamp community associated with the Congaree River floodplain. There are extensive areas of planted pines to the north, south, east and west of these communities.

Vegetation within the developed area includes various grasses, rushes, sedges and ruderal, weedy herbs. The herbaceous community within the developed area is limited in height due to periodic mowing which also prevents the growth of shrubs or trees. Because of this site maintenance limiting the flora and the industrial use of the property, the fauna of this community is expected to be limited. Terrestrial wildlife that may use this area includes but is not limited to rodents, birds, reptiles, and amphibians. Wild boar, whitetail deer, fox, bobcat and other animals that reside in the planted pines or swamp community may periodically visit this area to feed. Aquatic wildlife that may occur within the ditches include but are not limited to minnows, tadpoles, and insects.

The swamp community within the property extends along Mill Creek and includes densely forested wetlands, bottomland hardwood forest and the open waters of Lower Sunset Lake and the Gator Pond. The forest canopy within Mill Creek is dominated by tupelo but also includes cypress, whereas the upland portions are dominated by pine, maple, and oak. Periodic flooding of this area deposits nutrient rich soil across the entire community. Due to this, there is an abundance of flora within the floodplain and this area is highly suitable for its former use as farmland. Subsequently, this area hosts a wide variety of birds, mammals, reptiles, amphibians and obligately aquatic animals such as fish, tadpoles, crayfish and insects.

There are five federal and five state species listed as threatened and endangered species within Richland County based on information from the South Carolina Heritage Trust website in conjunction with the South Carolina Department of Natural Resources. Information on this website was last updated on February 16, 2022. None of the federally or state-listed species known to occur in Richland County have been observed at the CFFF facility. Based on the known ranges and the habitat requirements of these species, their occurrence on or adjacent to the facility is unlikely except for two species which have a moderate potential for occurrence. These species are the Rafinesque's big-eared bat and the spotted turtle.

5. Remedial Investigation Results

This section of the report presents the analytical results of the multi-media assessment of historical impacts.

5.1 Soil Investigation Results

During Phase I of the RI, soil samples were collected in accessible potential source areas for Tc-99 analysis. Some areas of the site are not accessible for sample collection due to site infrastructure such as overhead and underground utilities, above ground storage tank containment, and wastewater treatment lagoons. In Phase II of the RI, a passive soil gas survey was conducted in the area with the greatest CVOC impact in groundwater to assess where to collect CVOC samples for laboratory analysis and to evaluate the potential presence of a residual source zone.

The soil gas survey indicated two potential areas of interest beneath the roadway west of the plant building (**Appendix G**). Based on the results of the passive soil gas survey, soil samples were collected in these two areas for laboratory analysis of CVOCs. The results of these soil sampling campaigns are discussed below.

5.1.1 Technetium-99

Soil samples were collected for Tc-99 analysis at 14 locations (SS-1 through SS-14) in potential Tc-99 source areas as documented in **Table 2**. No Tc-99 was detected in the soil samples above the laboratory's minimum detectible concentration (MDC).

One field duplicate sample (SS-13 5-7 ft BLS) exceeded the Residential Use Screening Level (RUSL, [NUREG, 2006]), albeit at a concentration below the MDC. Concentrations below the MDC cannot be relied upon because they cannot be distinguished from the instrument's background value. RUSLs are based upon a residential, light farming exposure modeling scenario (including ingestion of homegrown produce) where a full-time resident spends 200 days/year (yr) indoors, 70 days/yr outdoors and 4 days/yr gardening for a total time of direct exposure of 274 days/yr, 24 hours/day for a dose equivalent of 25 millirem per year (mRem/yr).

These screening levels are highly conservative and are not representative of an industrial worker exposure scenario (e.g. active contact with the soil containing these concentrations by CFFF employees). Even these conservative assumptions result in only a low dose (25 mRem/yr) of radiation exposure. According to the NRC website, the average person's dose equivalent exposure to radiation per year from natural and manmade sources is approximately 620 mRem/yr (NRC, 2020). For reference, the National Council on Radiation Protection and Measurements (NCRP) reports that the radiation dosage of a full body Computed Tomography (CT) scan is approximately 1,000 mrem/exam and a CT scan of the head is approximately 200 mrem/exam (NCRP, 2009).

Analytical results for Tc-99 are summarized in **Table 8** and soil sampling locations are displayed on **Figure 6**. Soil analytical results are in **Appendix Q**.

5.1.2 CVOCs

Based on the results of the soil gas survey, soil samples were collected for CVOC analysis at 13 locations (SS-17 through SS-29). Two samples were collected from each location: one sample at the depth interval with the highest OVA PID reading and one sample from the total depth interval of 7-8 ft BLS which is approximately one foot above the top of the water table.

Soil from four borings (SS-20, SS-21, SS-27 and SS-28, **Figure 6**) contained concentrations of PCE, TCE, and/or cis-1,2-Dichloroethene (cis-1,2-DCE) concentrations in the shallower sample intervals. Soil samples at the total depth of each boring (7-8 ft BLS) did not contain detectable concentrations of CVOCs; therefore, it can be concluded that impacted soil would not continue to be a source for groundwater impact and further assessment was not necessary.

Analytical results for CVOCs are summarized in **Table 8** and are displayed on **Figure 21**. Soil laboratory analytical results are located in **Appendix Q**.

5.1.3 Grain Size

During Phase II of the RI, surface to near surface soils were collected for grain size with hydrometer analysis from borings across the site to document near surface soil properties. These borings are: L-28, L-31, L-35, L-42, L-45, L-58, L-59, and W-101. Sample depths are shown in **Table 2**, sample locations are shown on **Figure 7**, grain size analytical results are in **Appendix R** and the results are summarized below.

Sample ID	% Gravel	% Sand	% Silt	% Clay
L-28 0-2'	0.1	70.5	8.5	20.8
L-28 2-5'	0	35.5	19.6	44.9
L-31 0-3'	0	4.3	66.9	28.8
L-31 3-5'	0	5.9	64.3	29.8
L-35 0-3'	0	11.7	66	22.3
L-35 3-5'	0	54.6	33	12.4
L-42 0-2'	0	8.7	65.1	26.2
L-45 0-1'	9.8	64	18.4	7.8
L-45 1-2'	0.4	48.9	41.5	9.2
L-45 2-5'	0	9	74.4	16.6
L-58 0-2'	0	20.4	46.7	32.9
L-59 0-2'	0	29.4	42.4	28.2
W-101 0-2'	0	32.6	31.3	36.1

5.2 Groundwater Investigation Results

Based on previous groundwater assessment activities, COPCs in groundwater are CVOCs, nitrate, fluoride, U, and Tc-99. As discussed herein, no evidence of additional COPCs or ongoing releases of COPCs has been identified. The extensive groundwater assessment discussed below has been conducted to delineate the extent of the known COPCs. Groundwater samples collected during this RI included:

- various depths in 50 direct push technology (DPT)/Sonic screening borings (121 total samples),
- 118 permanent monitoring wells (October 2021 only), and
- four private water supply wells.

Groundwater sample locations are displayed on **Figures 3, 7, and 8**. A summary of DPT/sonic groundwater screening analytical results is displayed in **Table 9**, a summary of groundwater analytical results is displayed in **Table 10**, and private water supply well groundwater analytical results are displayed in **Table 11**. Laboratory analytical data sheets are in **Appendix S**. **Table T1** contains groundwater analytical results for the entire list of analytes from the RI, **Table T2** contains the groundwater stabilization parameter data, and both tables are in **Appendix T**.

5.2.1 Groundwater Screening Results

Groundwater screening borings were completed in three general site areas (**Figure 7**):

- The west and north sides of the plant building;
- South of Upper Sunset Lake and Lower Sunset Lake; and
- South of the plant building extending south toward Lower Sunset Lake.

The screening was performed during in four phases: August 2019, November through December 2020, February through March 2021, and May 2021. Prior to each phase of screening, sample locations were pre-selected for screening of specific COPCs. Sample locations were based on evaluation of data gaps preventing adequate horizontal and vertical delineation of that corresponding COPC within the site groundwater in the approximate and anticipated direction of groundwater flow. After each phase of groundwater screening, the data was plotted on site maps, analyzed, and presented to DHEC. As the groundwater screening progressed, plume delineations were refined, and the screening data were used to decide where to install permanent monitoring wells.

Groundwater screening samples were analyzed for CVOCs and select samples were also analyzed for nitrate, fluoride, and/or Tc-99 in areas with known impact by these COPCs (**Table 2**). Analytical results were compared to the maximum contaminant level (MCL) for each COPC. Groundwater sample collection records are included in **Appendix H**.

PCE concentrations exceeded its MCL of 5 micrograms per liter (µg/l) in 24 screening samples from 14 borings at concentrations ranging from 6.5 µg/L to 360 µg/L. TCE concentrations exceeded the MCL in five screening samples at concentrations ranging from 5.9 µg/L to 96 µg/L. Vinyl chloride (VC) concentrations exceeded the MCL in five screening samples at concentrations ranging from 2.1 ug/L to 5.8 µg/L (**Table 9**). CVOCs detected in groundwater screening samples are displayed on **Figure 22.**

Previous assessments did not identify a source of CVOCs that would explain their presence at monitoring well W-19B. This area was previously referred to as the Western Groundwater AOC and the plume in this area was referred to as the "Western Groundwater AOC plume". Groundwater screening results from borings L-21 through L-28, and L-45 through L-62 revealed that there is a preferential groundwater flow path from the western portion of the developed area of the facility that allows groundwater impacted with CVOCs to migrate to the former Western Groundwater AOC. As discussed in the *2020/2021 Annual Groundwater Monitoring Report* (AECOM, 2021), the plume in this western area is part of the main plume.

Nitrate was analyzed in groundwater screening samples from nine borings (L-8, L-9, L-10, L-19, L-20, L-35, L-36, L-37, and L-38) and was detected in screening samples from each boring (**Figure 22**). These borings were located on a gently sloping portion of the bluff (L-20) or in the floodplain downgradient of the known extent of nitrate in groundwater. The nitrate MCL of 10 milligrams per liter (mg/L) was exceeded in one groundwater sample collected from the surficial aquifer - upper zone in screening boring L-20 at a concentration of 11 mg/L. This boring is located within the floodplain near the bluff and immediately south of the developed area of the site.

Fluoride was analyzed in groundwater screening samples from nine borings (L-8, L-9, L-10, L-19, L-35, L-36, L-37, L-38, and L-42) and was detected in at least one screening sample from eight of the nine borings (**Figure 22**). These borings were located in the floodplain downgradient of known extent of fluoride in groundwater. The fluoride MCL of (4 mg/L) was exceeded in one groundwater sample collected from the surficial aquifer - upper zone in screening boring L-19 at a concentration of 7.8 mg/L. Boring L-19 is located within the floodplain near the bluff and immediately south of the developed area of the site.

Tc-99 was analyzed in groundwater screening samples from 10 borings (L-20 and L-35 through L-43) east of the known extent of TC-99 above its MCL, on a gently sloping portion of the bluff (L-20), and in the floodplain downgradient of known Tc-99 extent in groundwater. The samples were analyzed for total and dissolved Tc-99 to assess the effects of turbidity on Tc-99 results. Total and dissolved Tc-99 were detected above the MDC, but below the MCL (900 picocuries per liter [pCi/L]) in surficial aquifer - lower zone samples from screening borings L-39 and L-43 (**Figure 22**). The screening sample from boring L-39 contained total and dissolved Tc-99 at concentrations of 10.9 pCi/L and 9.98 pCi/L, respectively. The screening sample from boring L-43 contained total and dissolved Tc-99 at concentrations of 39.4 pCi/L and 31.1 pCi/L, respectively (**Table 9**). Tc-99 results were below the MDC in the remaining eight borings.

5.2.2 Monitoring Well Results

At the beginning of the RI, 61 monitoring wells existed at the site. During the RI work, 57 additional monitoring wells were installed in four phases as knowledge of COPC extent was gained from the DPT groundwater screening discussed in **Section 4.2.1**, resulting in a total of 118 monitoring wells at the site (**Figure 3**). Four of the monitoring wells (W-3A, W-49, W-50 and W-71) are screened in the Black Creek Aquifer (**Table 1**).

Groundwater sampling from the monitoring well network that existed at the time of the groundwater sampling campaign has been performed on a semi-annual basis since October 2019. Semi-annual groundwater sampling campaigns in October 2019 and April 2020 are summarized in the *2019/2020 Annual Groundwater Monitoring Report*

(AECOM, 2020d). Results from October 2020, February 2021, and April 2021 are summarized in the *2020/2021 Annual Groundwater Monitoring Report* (AECOM, 2021).

Groundwater sample results from the October 2021 monitoring well sampling campaign are discussed in this report and are summarized in **Table 10**. Groundwater analytical results for the entire list of analytes from the RI are in **Table T1** in **Appendix T**. Groundwater sample collection records are in **Appendix I** and laboratory analytical reports are included in **Appendix S**. The following sections include discussions of the plumes of each COPC in groundwater.

5.2.2.1 Chlorinated Volatile Organic Compounds

Four CVOCs (PCE, TCE, cis-1,2-DCE, and VC) were detected in the upper and lower zones of the surficial aquifer. TCE, cis-1,2-DCE, and VC are breakdown products of the dechlorination of PCE as discussed in **Section 6.2**. The PCE plume has the highest concentrations with the TCE plume having a similar configuration but lower concentrations. The VC plumes are comparatively small and occur in two floodplain wells downgradient of the PCE/TCE plumes. No samples contained cis-1,2-DCE above its MCL; therefore, a cis-1,2-DCE plume does not exist at CFFF. CVOCs were not detected in the groundwater samples collected from the Black Creek aquifer monitoring wells (W-3A, W-49, W-50, and W-71). As discussed in **Section 5.2.1**, the CVOC plumes are contained onsite.

PCE

PCE was detected in groundwater at concentrations at or above its MCL of 5 µg/L in 27 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**). There are two PCE plumes at CFFF. These CVOC plumes are referred to as the main plume and the southern plume and are displayed on **Figures 23 and 24**, respectively. As described in **Section 4.2.1**, the main plume and the former Western Groundwater AOC are connected, thereby making this area of impact part of the main plume. PCE concentrations in the surficial aquifer upper and lower zones are discussed below.

PCE in the Surficial Aquifer – Upper Zone

Figure 23 displays the PCE concentrations in the surficial aquifer - upper zone during the October 2021 sampling period. PCE was detected above the MCL in groundwater samples from monitoring wells W-39, W-41R, W-66, W-118, W-119, and W-121 in the main plume in the surficial aquifer - upper zone. The PCE concentrations exceeding the MCL in the surficial aquifer - upper zone wells in the main PCE plume ranged from 74 µg/L to 270 µg/L. PCE was detected at concentrations below the MCL in samples from two monitoring wells in the main plume and the inferred non-detect boundary of the west plume is shown by a dashed line on **Figure 23**.

PCE was detected in the surficial aquifer – upper zone in the southern PCE plume in samples from monitoring wells W-13R, W-15, W-67, and W-97 at concentrations ranging from 5.6 µg/L to 41 µg/L. PCE was detected at concentrations below the MCL in samples from five monitoring wells in the southern plume and the inferred non-detect boundary of the southern plume is shown by a dashed line on **Figure 23**.

PCE in the Surficial Aquifer – Lower Zone

Figure 24 displays the PCE concentrations in the surficial aquifer – lower zone during the October 2021 sampling period. The main PCE plume is the only plume present in the surficial aquifer – lower zone and was observed directly west of the facility in the same area as the main PCE plume observed in the surficial aquifer – upper zone, but with a greater aerial extent. PCE was detected above the MCL in groundwater samples from 17 monitoring wells in the surficial aquifer – lower zone. The PCE concentrations exceeding the MCL in the surficial aquifer – lower zone ranged from 11 µg/L to 340 µg/L. PCE was detected at concentrations below the MCL in samples from seven monitoring wells in the main plume and the inferred non-detect boundary of the southern plume is shown by a dashed line on **Figure 24**.

TCE

TCE was detected in groundwater at concentrations at or above its MCL of 5 µg/L from 11 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**). The extent of TCE is similar to PCE but at lower concentrations. There are three TCE plumes at CFFF in the surficial aquifer, referred to as the main plume, the northern plume, and the southern plume. The northern TCE plume exists as a TCE only plume near the southwestern corner of the plant building. These plumes are displayed on **Figures 25 and 26**. TCE in the surficial aquifer – upper and lower zones is discussed below.

TCE in the Surficial Aquifer – Upper Zone

The main TCE plume in the surficial aquifer – upper zone is located in the vicinity of monitoring well W-41R, where TCE exceeded the MCL in the groundwater sample from monitoring well W-41R at a concentration of 8.5 µg/L. TCE was detected at concentrations below the MCL in five wells and the inferred non-detect boundary of the main plume is shown by a dashed line on **Figure 25**.

The northern TCE plume is located near the southwestern corner of the plant building. TCE exceeded the MCL in groundwater from monitoring well W-76 in the northern TCE plume at a concentration of 26 µg/L. TCE was detected at concentrations below the MCL in two wells (W-38 and W-30) located near W-76 and the inferred non-detect boundary of the northern plume is shown by a dashed line on **Figure 25**.

The southern TCE plume in the surficial aquifer – upper zone is located in the vicinity of monitoring well W-67 near the southern extent of the developed area at the bluff. TCE exceeded the MCL in groundwater from monitoring well W-67 in the southern TCE plume at a concentration of 7.4 µg/L. TCE was detected at concentrations below the MCL in seven wells in the southern TCE plume and the inferred non-detect boundary of the southern plume is shown by a dashed line on **Figure 25.**

TCE in the Surficial Aquifer – Lower Zone

In the surficial aquifer – lower zone, TCE exceeded the MCL in groundwater samples from monitoring wells W-33, W-65, W-87, W-120, and W-RW2 in the main TCE plume at concentrations ranging from 6.6 µg/L to 41 µg/L. TCE exceeded the MCL in the northern TCE plume in groundwater from monitoring well W-102 at a concentration of 6.4 µg/L. TCE exceeded the MCL in groundwater samples from monitoring wells W-103 and W-123 in the southern TCE plume at concentrations of 5.2 µg/L and 7.7 µg/L, respectively. TCE was detected below the MCL in nine wells (W-6, W-11, W-17, W-19B, W-48, W-63, W-68, W-74, and W-93). The inferred non-detect boundary of the TCE plumes is encompassed by a dashed line on **Figure 26**.

Cis-1,2-Dichloroethene

Concentrations of cis-1,2 DCE did not exceed the MCL of 70 µg/L in groundwater within the monitoring well network in October 2021 (**Table 10**). Cis-1,2-DCE was detected at concentrations ranging from 1.0 µg/L to 13 µg/L in groundwater from 19 of the 114 surficial aquifer monitoring wells during the October 2021 sampling period.

Vinyl Chloride

Groundwater from monitoring wells W-95 and W-107 contained VC at concentrations of 4.2 and 3.7 µg/L, respectively during the October 2021 sampling period, which exceeds the VC MCL of 2 µg/L (**Table 10**). VC concentrations for the October 2021 sampling along with the inferred non-detect boundary of the VC plumes is displayed on **Figure 27**. Both monitoring well locations are on the southern side of Upper and Lower Sunset Lakes.

5.2.2.2 Semivolatile Organic Compounds

During the Phase I of the RI investigation period, groundwater samples from the monitoring wells were analyzed for SVOCs. Groundwater analytical results demonstrated that SVOCs are not a COPC at the site. SVOC removal from the analyte list for Phase II of the RI was approved by DHEC in the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c).

5.2.2.3 Nitrate

Nitrate was detected in groundwater at concentrations above its MCL of 10 mg/L from 25 of the 114 surficial aquifer monitoring wells in October 2021 ranging in concentration from 14 to 550 mg/L (**Table 10**). Nitrate concentrations for the October 2021 sampling along with the inferred non-detect boundary of the nitrate plume are displayed on **Figure 28**. Nitrate was not detected in groundwater from Black Creek Aquifer monitoring wells (W-3A, W-49, W-50, and W-71) during the October 2021 sampling event (**Table 10**).

5.2.2.4 Fluoride

Fluoride was detected at concentrations at or above its MCL of 4 mg/L in groundwater from 13 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**) at concentrations ranging from 4.09 mg/L to 14.8 mg/L. Fluoride concentrations for October 2021 sampling along with the inferred non-detect boundary of the fluoride plume is displayed on **Figure 29**.

Fluoride was detected in groundwater from the four Black Creek Aquifer monitoring wells (W-3A, W-49, W-50, and W-71) during the October 2021 sampling below its MCL at estimated concentrations (J flagged by the analytical laboratory) ranging from 0.01 mg/L to 0.0860 mg/L (**Table 10**). As discussed in **Section 5.2.3**, fluoride is a naturally occurring element and these detections in the Black Creek Aquifer are naturally occurring.

5.2.2.5 Uranium

Total U was detected in groundwater at concentrations at or above its MCL of 30 µg/L from 3 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**) at concentrations ranging from 121 to 143 µg/L. Total U concentrations along with the inferred non-detect boundary of the U plumes are displayed on **Figure 30**. The exceedance of the MCL for U is localized to two areas adjacent to the plant building: one area on the west side of the building near the southwest corner (monitoring wells W-55 and W-56) and another area on the south side of the building (monitoring well W-77). The plume associated with monitoring wells W-55 and W-56 is referred to as the northern U plume and the plume associated with monitoring well W-77 is referred to as the southern U plume.

U isotope U-238 was detected in groundwater from the four Black Creek Aquifer monitoring wells at concentrations below the laboratory reporting limit (J flagged estimated concentrations) ranging from 0.0700 µg/L to 0.180 µg/L. As discussed in **Section 5.2.4**, U is a naturally occurring element, with U-238 being the most prevalent naturally occurring isotope, and these detections in the Black Creek Aquifer are naturally occurring.

5.2.2.6 Technetium-99

Tc-99 was detected above its MCL of 900 pCi/L in groundwater from surficial aquifer – lower zone monitoring wells W-6 and W-11 in October 2021 (**Table 10**) at concentrations of 2,500 pCi/L and 1,230 pCi/L, respectively. Tc-99 concentrations along with the inferred non-detect boundary are displayed on **Figure 31**. Tc-99 was not detected in groundwater samples from the four Black Creek monitoring wells.

The lateral extent of groundwater impacts for the COPCs exceeding their respective MCLs at CFFF are displayed on **Figure 32**.

5.2.3 Private Water Supply Well Results

Groundwater samples were collected during the period from October 15 through October 24, 2019, from four private water supply wells (WSW-01 through WSW-04) located west northwest, southwest, and south of CFFF (**Figure 8**). Three of the four private water supply wells are located within the 1-mile private water supply well search radius of the site property boundary as specified in the *Final Remedial Investigation Work Plan* (AECOM, 2019). The fourth private water supply well is between the southern edge of this radius and the Congaree River. These private water supply wells are located side gradient to downgradient of the known extent of groundwater impact. The closest private water supply well, WSW-03, is approximately 3,000 ft (over 1/2 mile) downgradient of the known extent of COPC impact and is likely screened in the Black Creek Aquifer.

Groundwater samples from the four private water supply wells did not contain CFFF COPCs above their respective MCLs (**Table 11**). Of the COPCs, CVOCs and Tc-99 were not detected in groundwater samples from the four private wells. Concentrations of nitrate, fluoride, and/or the U isotope U-238 were detected in at least two of the water well samples at the following concentrations:

- Nitrate was detected in private water supply wells WSW-01 and WSW-04 at concentrations of 0.020 mg/L and 0.067 mg/L, respectively. These nitrate concentrations are greater than 100 times below the MCL of 10 mg/L.

- Fluoride was detected in the private water supply wells at concentrations ranging from 0.013 mg/L to 0.103 mg/L. These fluoride concentrations are greater than 40 times below the MCL of 4 mg/L.

- The U-238 isotope of U was the only isotope detected and it was reported in three of the private wells at concentrations ranging from 0.272 µg/L to 0.776 µg/L. The total U concentrations are greater than 30 times below the MCL of 30 µg/L.

As discussed in the COPC specific subsections in **Section 5**, these compounds, elements, and isotopes occur naturally. The detected concentrations are indicative of naturally occurring concentrations and are not indicative of impacts from the facility. The downgradient water supply wells are likely screened within the Black Creek Aquifer which is not impacted by historical operations of CFFF.

5.3 Surface Water Investigation Results

During Phase I of the RI, surface water samples were collected from 12 locations within the stormwater ditches, Gator Pond, Upper Sunset Lake and Lower Sunset Lake. One location within the Middle Ditch (SW-15) was dry during the sample collection campaign; therefore, a surface water sample was unable to be collected. Surface water sample locations and detections above background concentrations are displayed on **Figure 33**. As documented in **Appendix E**, background concentrations were calculated as two times the mean background concentration. A summary of surface water analytical results is displayed in **Table 12** and calculated background concentrations are displayed in **Table 13**. **Table T3** contains surface water analytical results for the entire list of analytes from the RI and is in **Appendix T**. Laboratory analytical data sheets are in **Appendix U.**

5.3.1 Gator Pond

Surface water from the Gator Pond contained concentrations of ammonia, fluoride, various metals, nitrate, Tc-99, and U-238. The surface water sample from the Gator Pond (SW-23) contained fluoride above its MCL of 4 mg/L at a concentration of 4.94 mg/L. The remaining detections did not exceed their respective MCLs. Concentrations of COPCs in the surface water sample from the Gator Pond indicate that this surface water body has been impacted by the historical operations of the facility. The Gator Pond is an isolated surface water body that is not in direct connection with the other surface water bodies.

5.3.2 Stormwater Ditches

Surface water from the stormwater ditches contained concentrations of ammonia, CVOCs, fluoride, various metals, nitrate, Tc-99, and U. Surface water samples SW-11 and SW-12 (**Figure 9**) are considered to be background samples for the stormwater ditches because they are far enough upstream to not have the potential to be impacted by facility operations. Surface water samples SW-17 and SW-18 contained PCE above its MCL of 5 µg/L at concentrations of 16 and 14 µg/L, respectively. The remaining detections did not exceed their respective MCLs. Concentrations of COPCs in surface water samples above background concentrations from the stormwater ditches indicate that these surface water bodies have been impacted by the historical operations of the facility in a localized area (**Figure 33**).

5.3.3 Mill Creek

Two surface water samples were collected in both Upper Sunset Lake (SW-19 and SW-20) and Lower Sunset Lake (SW-21 and SW-22), part of Mill Creek. Surface water from the Upper and Lower Sunset Lakes contained concentrations of ammonia, fluoride, various metals, and U. Concentrations of these COPCs did not exceed their respective MCLs.

Fluoride concentrations in Mill Creek (Upper and Lower Sunset Lakes) ranged from 0.154 mg/L to 0.494 mg/L versus a background concentration in the stormwater ditches of 0.422 mg/L. This comparison indicates little to no fluoride impact to surface water in Upper and Lower Sunset Lakes from facility operations. Moreover, the fluoride concentrations reported in Mill Creek are roughly an order of magnitude below fluoride's MCL of 4 mg/L.

Surface water samples SW-19 and SW-20 collected in the Upper Sunset Lake portion of Mill Creek contained estimated U-235 concentrations of 0.174 and 0.274 µg/L, respectively. These surface water samples also contained U-238 at concentrations of 0.507 and 1.11 µg/L, respectively. Surface water samples from Lower Sunset Lake (SW-21 and SW-22) did not contain U-235 and the estimated (J flagged by the laboratory) U-238 concentrations were 0.16 and 0.199 ug/L, respectively. Although U was detected in surface water in Sunset Lakes, these U concentrations are greater than an order of magnitude below the total U MCL of 30 µg/L.

5.3.4 Routine Surface Water Sampling

Surface water samples are obtained monthly by CFFF personnel from the Gator Pond, the Eastern Ditch at the confluence with the Middle Ditch, Upper Sunset Lake Dike, Lower Sunset Lake, the Lower Sunset Lake Dike, and Mill Creek at both the Entrance and Exit Dikes (**Figures 2 and 3**). Per CFFF's nomenclature, the Eastern Ditch sample is known as Roadway, the Upper Sunset Lake Dike sample is known as Causeway, Lower Sunset Lake is known as Lower, and the Lower Sunset Lake Dike sample is known as Spillway. These samples are analyzed for gross alpha, gross beta, isotopic U, Tc-99, pH, ammonia, and fluoride. Additionally, weekly surface samples are taken from the Eastern Ditch, Upper Sunset Lake Dike and Lower Sunset Lake Dike. These surface samples are analyzed for pH, ammonia, and fluoride. Per the facility's SNM -1107 license from the NRC, surface water samples are taken from the Congaree River on a quarterly basis at the following locations: 1) the Blossom Street Bridge, 2) 500 yards upstream of the WWTP discharge, 3) 500 yards downstream of the WWTP discharge, and 4) Mill Creek where it converges with the Congaree River. Per the license, these samples are analyzed for gross alpha; however, the facility also analyzes these samples for gross beta, isotopic U, and Tc-99.

Routine surface water sample results confirm that the fluoride concentrations are above the MCL in the Gator Pond. This is the only COPC detected above MCL in CFFF's routine surface water samples. These results confirm that surface water is not being impacted outside of the property boundary.

5.4 Sediment Investigation Results

During the RI, 172 sediment samples were collected from the Gator Pond, the stormwater ditches, and Mill Creek (including Upper and Lower Sunset Lakes). Additionally, four sludge samples (SED-25 through SED-28) were collected during Phase I of the RI: two from the Sanitary Lagoon and two from the former East Lagoon. Sample locations are displayed on **Figure 9** and analytical results are summarized in **Table 14**. **Table T4** contains analytical results for the entire list of analytes from the RI and is in **Appendix T**. The laboratory analytical results are in **Appendix U**. Sediment samples SED-11 and SED-12 and sediment samples SED-51 through SED-59 are considered background samples for the ditches and Mill Creek, respectively. Background sediment concentrations are displayed in **Table 13**.

5.4.1 Gator Pond

Sediment from the Gator Pond contained concentrations of acetone, ammonia, fluoride, nitrate, various metals, Tc-99, and U. As discussed in **Section 5.4.1**, 2-butanone (also known as methyl ethyl ketone), acetone, ammonia, fluoride, nitrate and metals, including U occur naturally. COPC impacts of sediment in the Gator Pond are displayed on **Figure 34.**

Ammonia concentrations in Gator Pond sediment samples ranged from 70.5 to 1170 milligrams per kilogram (mg/kg). Fluoride concentrations in sediment from the Gator Pond ranged from 24.9 to 152 mg/kg. Nitrate concentrations in sediment from the Gator Pond ranged from 0.20 to 6.3 mg/kg. The RUSL for Tc-99 (19 picocuries per gram [pCi/g]), as described in **Section 4.1.1**, was exceeded in sediment from the six sampling locations within the Gator Pond at concentrations ranging from 22.9 pCi/g to 312 pCi/g. Sediment from multiple sample intervals also contained Tc-99 below the RUSL.

U is a naturally occurring, radioactive metal as discussed in **Section 5.3.4**. As displayed in **Table 13**, U-233/234, U-235/236, and U-238 background sediment activity in the stormwater ditches and Mill Creek ranged from 2.07 to 3.64 pCi/g, 0.25 to 0.285 pCi/g, and 1.91 to 3.26 pCi/g; respectively. Although the Gator Pond is not directly connected to the other surface water bodies, these background concentrations provide site-specific U data for sediment at the facility. U activity in sediment from the Gator Pond is within the background sediment activity range (**Table 14**) and do not exceed the RUSL.

Sediment within the Gator Pond has been impacted by historical facility operations. Based upon data from both the RI and routine surface water sampling, groundwater impacted with fluoride, nitrate, and Tc-99 is discharging through the sediment into the Gator Pond.

5.4.2 Stormwater Ditches

Sediment from the stormwater ditches contained concentrations of ammonia, acetone, fluoride, nitrate, various SVOCs, metals, PCE, Tc-99, and U. COPC impacts of sediment in the stormwater ditches are displayed on **Figure 34**.

Ammonia and acetone concentrations in the stormwater ditch sediment were below background concentrations.

Fluoride impacts above background concentrations in stormwater ditch sediment occurred in locations SED-16, SED-60 and SED-61 located in the southern end of the Middle Ditch. Nitrate impacts in stormwater ditch sediment above background concentrations were from locations SED-16, SED-17 and SED-61 located in the southern end of the Middle Ditch and downstream (SED-17) in the Eastern Ditch where groundwater is also impacted with nitrate. Sediment from sample location SED-17 contained PCE at a concentration of 5.5 micrograms per kilogram (µg/kg). This sample was collected at the same location as surface water sample SW-17 which contained PCE above its MCL.

Several SVOCs were detected in sediment from sample location SED-13 and to a lesser extent in sediment from sample location SED-14 which is downstream from SED-13. As discussed in **Section 5.4**, these SVOCs are the result of runoff from the primary parking lot. Minimal impact to sediment with SVOCs is confined to the area of the Eastern Ditch near SED-13 and SED-14.

Concentrations of Tc-99 and U were limited to sediment from the southern end of the Middle Ditch. Tc-99 concentrations were below the RUSL and ranged from below the MDC to 8.28 pCi/g. Concentrations below the MDC cannot be relied upon because they cannot be distinguished from the instrument's background value. Concentrations of U isotope 233/234 exceeded its RUSL (13 pCi/g) in sediment from sample locations SED-16, SED-60, and SED-61 at concentrations ranging from 14.9 to 67.2 pCi/g.

Impacts by multiple COPCs in sediment above background concentrations indicate sediment in localized areas of the Middle and Eastern Ditches have been impacted by historical operations of the facility as displayed on **Figure 34**.

5.4.3 Mill Creek

As documented in **Section 3.3**, Mill Creek within the CFFF property contains multiple structures that influence flow. These structures include the man-made canal, Canal Dike, Entrance Dike, Upper Sunset Lake Dike, Lower Sunset Lake Dike, and Exit Dike.

5.4.3.1 Southwest of the Entrance Dike

During Phase I of the RI, sediment samples were collected from two transects (SED-51 through SED-53 and SED-54 through SED-56) across Mill Creek southwest of the Entrance Dike to provide background sediment data (**Figure 9**, **Table 13**). Based upon questions from DHEC about whether U concentrations in the samples from this area represented background concentrations due to the flow dynamics in Mill Creek, sediment samples were collected from a third transect (SED-57 through SED-59) across Mill Creek upstream of the man-made canal during Phase II of the RI. As documented in the Leidos Technical Basis Document ([TBD], Leidos, 2022) in **Appendix V**, U concentrations in the transect upstream of the canal were similar to the U concentrations downstream of the canal; therefore, data from the three transects represent background sediment data. The background sediment contained concentrations of ammonia, acetone, fluoride, nitrate, various metals, 2-butanone (also known as methyl ethyl ketone or MEK), and U.

5.4.3.2 Upper Sunset Lake

Sediment samples from Upper Sunset Lake contained concentrations of acetone, ammonia, fluoride, nitrate, various metals, Tc-99, and U.

Except for two sediment samples, acetone concentrations were within or closely comparable to the background acetone concentrations (Table 14). Acetone concentrations of 370 and 410 µg/kg in sediment samples SED-47 and SED-50 (both 0-6 inches) exceed the background acetone concentration of 250 µg/kg. Although these concentrations minimally exceed background, they are likely naturally occurring.

Ammonia concentrations in sediment from Upper Sunset Lake ranged from 54.7 to 1,980 mg/kg, whereas background ammonia concentration was calculated to be 825 mg/kg.

Fluoride concentrations in sediment from Upper Sunset Lake ranged from a concentration of 1.86 to 120 mg/kg whereas background fluoride concentration in sediment was calculated to be 2.73 mg/kg.

Nitrate concentrations in sediment from Upper Sunset Lake ranged from a concentration of below detection limit to 6.1 mg/kg whereas background nitrate concentrations in sediment was calculated to be 0.91 mg/kg.

Concentrations of Tc-99 in sediment from Upper Sunset Lake range from below MDC to 23.7 pCi/g, whereas background Tc-99 sediment concentrations were below MDC. Sediment samples from two locations (SED-B1 and SED-B2, both 0-6 inches) exceeded Tc-99's RUSL of 19 pCi/g at concentrations of 19.1 and 23.7 pCi/g.

Concentrations of U in sediment from Upper Sunset Lake exceeded its RUSL in 14 locations (SED-19, SED-20, SE-43, SED-44, SED-66, SED-67 and SED-B1 through SED-B8) for U-233/234, U-235/236 (SED-44 only), and/or U-238 (SED-20 and SED-44). U concentrations in sediment samples collected from location SED-44 in Upper Sunset Lake during Phase II of the RI exceeded the sum of fractions (SOF) calculation under the industrial use scenario.

SOF is used to assess the cumulative potential dose of radiation exposure of the U isotopes and Tc-99 by adding the fractions of individual U isotopes and Tc-99 divided by their screening levels (RUSL or Industrial Use Screening Level). An RUSL sum greater than 1 indicates that the permissible dose limit established under 10 CFR 20.1402 (radiological criteria for unrestricted use) has been exceeded and a sum less than 1 indicates that the dose limit has not been exceeded. A SOF equal to 1 is equivalent to a dose of 25 mRem/yr under the residential use scenario as discussed in **Section 4.1.1**.

The SED-44 results prompted additional investigation per CFFF's risk-based procedure *RA-433 Environmental Remediation* (Westinghouse, 2020a). The investigation area consisted of a ten square meter bounding box with sediment sample location SED-44 at its center. Sediment samples were collected at the corners of both a three-meter square and a ten- meter square. One additional sediment sample (SED-B1 0-6 inch) from the three meter square bounding box exceeded the industrial SOFs. After the additional samples were collected, a dose risk assessment was conducted to assess if the impacted sediment posed a risk to site workers. This dose risk assessment concluded that even under the worst-case scenario of extreme drought conditions (where the normal cover of water shielding a site worker or trespasser from exposure to radiation), the sediment did not pose a risk to site workers because the potential exposure remained less than 25 mRem/yr. Additional details about the bounding samples and the dose risk assessment are included in the Leidos TBD (Leidos, 2022) in **Appendix V**.

Concentrations of COPCs above background concentrations and/or RUSLs indicate that sediment in Upper Sunset Lake has been impacted by historic operations of the facility. Sediment impacts in Upper Sunset Lake are displayed on **Figures 35 through 37**.

5.4.3.3 Lower Sunset Lake

Sediment samples from Upper Sunset Lake contained concentrations of ammonia, acetone, fluoride, nitrate, various metals, Tc-99, and U.

Acetone concentrations in Lower Sunset Lake were similar to the concentration range of Upper Sunset Lake and are likely naturally occurring.

Ammonia concentrations in sediment from Lower Sunset Lake ranged from 37.2 to 2,110 mg/kg, whereas ammonia's background concentration was calculated to be 825 mg/kg.

Fluoride concentrations in sediment from Lower Sunset Lake ranged from an estimated concentration of 0.668 to 26.5 mg/kg whereas fluoride's background concentration was calculated to be 2.73 mg/kg.

Nitrate concentrations in sediment from Lower Sunset Lake ranged from a concentration of below detection limit to 3.7 mg/kg whereas background nitrate concentrations in sediment was calculated to be 0.91 mg/kg.

Tc-99 was detected in Lower Sunset Lake in four locations at concentrations ranging from 1.12 pCi/g to 2.13 pCi/g, below its RUSL (19 pCi/g).

Concentrations of U-233/234 in sediment from Lower Sunset Lake exceeded its RUSL (13 pCi/g) in sediment from sample locations SED-21, SED-22, SED-38, SED-41, and SED-42 (0-6 inch sample interval in all five) at concentrations ranging from 17 to 117 pCi/g. Sediment from these locations also contained U-235/236 and U-238 at concentrations below RUSL.

In general, COPC concentrations in Lower Sunset Lake were lower than COPC concentrations in Upper Sunset Lake. These concentrations indicate that sediment in Lower Sunset Lake has been impacted by historic operations of the facility. COPC impacts of sediment in the Lower Sunset Lake are displayed on **Figures 35 through 37**.

5.4.3.4 East of the Lower Sunset Lake Dike

Sediment samples from Mill Creek east of the Lower Sunset Lake Dike contained concentrations of ammonia, acetone, fluoride, nitrate, various metals, Tc-99, and U.

Concentrations of ammonia and acetone in sediment from within Mill Creek east of the Lower Sunset Lake Dike were below background concentrations and are likely naturally occurring. One sediment sample (SED-32 0-6 inches) contained nitrate above but comparable to background concentrations (1.1 mg/kg versus a background concentration of 0.91 mg/kg). Because the sediment samples upstream and downstream from the SED-32 location did not contain nitrate or were below background concentrations for nitrate, the nitrate concentration in SED-32 is likely naturally occurring.

Fluoride concentrations in sediment from Mill Creek east of the Lower Sunset Lake Dike ranged from an estimated concentration of 0.858 to 6.63 mg/kg whereas fluoride’s background concentration was calculated to be 2.73 mg/kg. Sediment from 6 sampling locations (SED-30 through SED-35) exceeded the background fluoride concentration (**Figure 36**).

Neither the RUSLs for individual U isotopes for U-233/234, U-235/236, and U-238 nor the SOFs were exceeded in any of the samples, except for one sample as documented in the Leidos TBD (Leidos, 2020) contained in **Appendix W**. Sediment sample SED-32 6-12 inches contained radionuclide concentrations that resulted in a SOF of 1.06.

COPC concentrations east of the Lower Sunset Lake Dike are considerably lower than those in Lower Sunset Lake indicating that sediment in Mill Creek east of the Lower Sunset Lake Dike has been minimally impacted by historic operations of the facility.

5.4.4 Grain Size

Five aliquots of sediment samples from the RI Phase II sediment sampling were submitted to Schnabel Engineering for grain size with hydrometer analysis. These samples included one sample from the Middle Ditch (SED-16 0-1’), one from Mill Creek upstream of the canal (SED-57 1-1.5’), one from Upper Sunset Lake (SED-20 0-1’), and two from Lower Sunset Lake (SED- 21 1-2’ and SED-40 0-1’). Sample locations are shown on **Figure 9**, grain size analytical results are in **Appendix R**, and the grain size results are summarized below.

Sample ID	Location	% Gravel	% Sand	% Silt	% Clay
SED-16 0-1’	Middle Ditch	1.3	84.8	13	0.9
SED-20 0-1’	Upper Sunset Lake	0	3	53.4	43.6
SED-21 1-2’	Lower Sunset Lake	0	42.7	42.8	14.5
SED-40 0-1’	Lower Sunset Lake	0.7	26.3	66	7
SED-57 1-1.5’	Mill Creek	0	6.7	57	36.3

6. Source, Nature, and Extent Assessment

This section of the RI Report discusses the source(s) or source area(s), nature, and extent of historical impacts in terms of their occurrence and distribution at CFFF as required by the CA. Work conducted during the RI did not find evidence of an ongoing release(s) of COPCs into the environment; therefore, impacts discussed below are the result of historic releases during the greater than 50 years of operation of CFFF.

6.1 Soil

As discussed in **Section 4.1**, soil samples were collected in Phase I of the RI in potential source areas of Tc-99 and in Phase II for CVOCs. No residual sources of COPCs were identified.

6.1.1 Tc-99

Tc-99 occurs naturally in very small amounts in the earth's crusty but is primarily a man-made radionuclide, therefore detections of Tc-99 at CFFF above the MDC are the result of impact by historical operations of the facility. Tc-99 analytical results of the soil samples (**Table 8**) that were collected in potential Tc-99 source areas did not identify the presence of Tc-99 above the MDC. Concentrations below the MDC cannot be relied upon because they cannot be distinguished from the instrument's background value. These samples were collected within accessible areas where historical operations indicated the greatest likelihood for a surficial release of Tc-99. These findings indicate that no evidence of impacts from a surficial release into vadose zone soils has been found at this time.

6.1.2 CVOCs

During Phase II of the RI, a passive soil gas survey covering approximately 69,000 square ft (ft^2) was conducted in soil overlying the greatest CVOC impact in groundwater to assess whether a vadose zone source that could continue to impact groundwater currently exists. The passive soil gas survey identified two areas of interest with comparatively elevated levels of CVOCs in soil gas. Soil sample analytical results (**Table 8**) from these areas of interest indicated minimal concentrations of CVOCs in the upper 2 ft of the subsurface and no CVOCs in deeper samples. These minimal impacts were bounded laterally and vertically by soil samples that did not contain CVOCs. PCE in the soil has already begun to degrade into daughter products and the absence of both parent and daughter products at depth does not suggest the minimal impact could migrate to groundwater.

6.1.3 East Lagoon Closure

As documented in **Appendix B**, subliner soils that contained COPCs (CVOCs, fluoride, nitrate, U and Tc-99) above their RUSL and/or EPA Soil Screening Level in Westinghouse's risk-based procedure *RA-433 Environmental Remediation* (Westinghouse, 2020a) were removed to the maximum extent practical (e.g. remove as much soil as possible without causing damage to existing structures or excavating below the water table). As documented in the *East Lagoon Closure Certification* (GEL, 2021), the "as left" RUSL SOFs were exceeded in six locations.

A metal's affinity for adsorbing to soil is known as equilibrium distribution coefficient (K_d), and U has a high affinity for adsorbing to soil. Based on published data (Sheppard and Thibault, 1990), four soil types have the following K_d ranges for uranium: Sand – 0.03 to 2,200 cubic centimeters per gram (cm^3/g, mean 35); Loam – 0.22 to 4,500 cm^3/g (mean 15); Clay – 46 to 395,100 cm^3/g (mean 1,600); and Organic – 33 to 7,350 cm^3/g (mean 410). The higher the K_d value, the greater the affinity for uranium to adsorb to the soil versus migrating in groundwater.

Site-specific K_d values have not been determined for the subsurface soils at the facility but, previous assessment work involving the Contaminated Wastewater Line (AECOM, 2018) indicates subsurface soils have a high K_d. Therefore, impacted soils remaining in place below the former East Lagoon do not likely represent a potential source for groundwater impact by infiltrating precipitation. This conclusion is supported by the absence of elevated U in groundwater samples collected proximal to the East Lagoon.

6.2 Groundwater

As discussed in **Section 4.2**, groundwater beneath the facility has been impacted with concentrations of CVOCs, nitrate, fluoride, U and Tc-99 above their respective MCLs. The areas of these impacts are well defined and occur only on the CFFF property. Groundwater impacts in this report are from the October 2021 monitoring period and are discussed below.

6.2.1 CVOCs

PCE and its degradation products (TCE, cis-1,2-DCE, and VC, details pertaining to this breakdown are discussed in **Section 6.2**) occur in well-defined plumes of limited extent in site groundwater. Relevant points pertaining to each CVOC include the following:

- CFFF made process modifications to eliminate the use of CVOCs in 2020. Therefore, future CVOC impact to groundwater is not possible.
- TCE, cis-1,2-DCE, and VC in groundwater result from reductive dechlorination of PCE. None of these CVOCs are known to have been used in facility operations and the plumes are in the same locations and/or are downgradient of the primary PCE plume.
- No CVOCs were detected in groundwater samples from the four Black Creek Aquifer monitoring wells (W-3A, W-49, W-50, and W-71). Therefore, the Black Creek confining unit effectively prevents CVOCs from migrating to the Black Creek Aquifer.
- No CVOCs were detected in the four private water supply wells (**Figure 8**). These wells are located approximately 3,000 ft (greater than ½ mile) beyond the extent of CVOCs in groundwater at the site.

6.2.1.1 PCE

As described in Section **4.2.2.1**, there are two PCE plumes in the upper zone of the surficial aquifer referred as the main and southern plumes (**Figure 23**). The main plume is the only PCE plume in the surficial aquifer – lower zone (**Figure 24**). The RI has fully delineated the extent of PCE in groundwater in the surficial aquifer. As discussed in **Sections 4.1.2 and 5.1.2**, no residual source of CVOCs has been identified in soil that could impact groundwater in the future.

The main PCE plume in the surficial aquifer – upper and lower zones is located within an area between West Lagoon II (WLII) and the plant building and extends to areas west, southwest, and south-southeast (lower zone only). The main PCE plume appears to have originated in the Western Storage Area OU between WLII and the plant building. (**Figures 4 and 23**).

The western portion of the main plume extends to an area beneath Upper Sunset Lake. The middle portion of the main plume in the surficial aquifer – lower zone is located closer to the developed area of the site and initially flows southwest before turning south and extends to Upper Sunset Lake near the Upper Sunset Lake Dike. A third eastern portion of the main plume extends from the area of the southwestern corner of the plant building to the south-southeast into the floodplain.

The southern PCE plume in the surficial aquifer – upper zone is located from the southern extent of the developed area at the bluff and extends to the southeast below the bluff barely into the floodplain near monitoring well W-97 (**Figure 23**). PCE was not formerly used in the vicinity of these wells. It is believed that the PCE in the southern plume in the surficial aquifer - upper zone near the bluff may be part of the PCE plume in the surficial aquifer – lower zone, rather than the result of a source in the southern area of the plant near the bluff.

The lateral extent of PCE MCL exceedances is well defined and is contained within the CFFF property boundary. In the downgradient direction, the plume is approximately 2,700 ft from the southern CFFF property boundary (**Figure 32**).

6.2.1.2 TCE

TCE was detected in groundwater at concentrations at or above its MCL of 5 µg/L from 11 of the 114 surficial aquifer monitoring wells. There are three TCE plumes at CFFF in the surficial aquifer, referred to as the main plume, the northern plume, and the southern plume (**Figures 25 and 26**). As with PCE, a specific TCE source was not identified and is likely a natural breakdown daughter product of PCE (reductive dechlorination) as discussed in **Section 6.2**.

The surficial aquifer – upper and lower zones main and southern TCE plumes are in the same general locations as the corresponding PCE plumes but encompass a smaller aerial extent (**Figure 25**). Similar to the southern PCE plume, it is believed that the TCE detections in the southern plume in the surficial aquifer - upper zone are actually part of the TCE plume in the surficial aquifer – lower zone, rather than the result of a source in the southern area of the plant. While outside of the main TCE plumes, TCE was also detected in two monitoring wells (W-19B and W-68) at concentrations below the MCL. These monitoring wells are within the area of the western-most PCE MCL exceedances (**Figures 25 and 26**) and is evidence of TCE's source being the natural breakdown of PCE.

The northern TCE plume exists emanates from the southwestern corner of the plant building downgradient of where the solvent extraction area (SOLX) is located within the plant building. TCE concentrations in this area are likely the result of reductive dechlorination, as discussed in **Section 6.2**, of PCE beneath the plant building. TCE was detected in three wells in this area, W-30, W-38, and W-76, with the MCL being exceeded only in monitoring well W-76. TCE was detected above its MCL in the sample from surficial aquifer – lower zone monitoring well W-102, which is located approximately 150 ft downgradient of SOLX. These plumes are displayed on **Figures 25 and 26.**

The lateral extent of TCE MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 3,200 ft from the southern CFFF property boundary (**Figure 32**).

6.2.1.3 Cis-1,2-DCE

Concentrations of cis-1,2-DCE did not exceed the MCL of 70 µg/L in groundwater within the monitoring well network (**Table 10**). Cis-1,2-DCE was detected at concentrations ranging from 1.0 µg/L to 13 µg/L in groundwater from 19 of the 115 surficial aquifer monitoring wells. Cis-1,2 DCE is a natural breakdown product of PCE.

6.2.1.4 VC

VC detected in surficial aquifer – lower zone monitoring wells W-95, W-107, and W-108 indicates that reductive dechlorination is occurring within the floodplain. These wells are located across Upper Sunset Lake and Lower Sunset Lake from the two PCE/TCE sub-plumes of the main plume (**Figure 27**). VC is a natural breakdown product of PCE.

The lateral extent of VC MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 2,100 ft from the southern CFFF property boundary (**Figure 32**).

6.2.2 Nitrate

Nitrate was detected in groundwater at concentrations at or above its MCL of 10 mg/L from 23 of the 114 surficial aquifer monitoring wells (**Table 10**). Nitrate concentrations are displayed on **Figure 28**. The aerial extent of the nitrate plume is primarily around the source areas of nitrate, which is the area of the facility WWTP and West Lagoon II, and extends to areas to the west, southwest, and southeast. Nitrate concentrations exceeding the MCL are in monitoring wells above the bluff. Detected concentrations below the bluff are significantly lower than the MCL. Nitrate in wells south of Upper Sunset Lake and Lower Sunset Lake range from 1-2 orders of magnitude below the MCL to non-detect. In the surficial aquifer, natural attenuation of nitrate and/or denitrification is occurring at or just beyond the bluff. The lateral extent of nitrate MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 2,800 ft from the southern CFFF property boundary (**Figure 32**).

During network-wide monitoring well sampling since 2019, nitrate has occasionally been detected in groundwater from Black Creek Aquifer monitoring wells W-49, W-50, and W-71 below its MCL of 10 mg/L at concentrations ranging from 0.021 mg/L to 0.13 mg/L. Nitrate was not detected in groundwater from Black Creek Aquifer monitoring wells in October 2021.

Nitrate was detected in private water supply wells WSW-01 and WSW-04 at concentrations of 0.020 mg/L and 0.067 mg/L, respectively. These nitrate concentrations are 100 times or more below the MCL of 10 mg/L. The private water supply wells are located 5,500 ft or greater beyond the extent of nitrate in groundwater at the site.

Nitrate occurs naturally in groundwater. According to the EPA, nitrate concentrations greater than 3 mg/L indicate nitrate impact (EPA, 2021 and Madison and Brunette, 1985). A study published in 2010 indicated that nitrate concentrations greater than 1 mg/L indicate human activity (Dubrovsky et al, 2010). The detected concentrations in the Black Creek Aquifer monitoring wells and the private water supply wells are orders of magnitude below the MCL Based on the locations of these wells relative to the surficial aquifer impact and the detected concentrations, the nitrate at these locations is naturally occurring and not a result of facility operations.

6.2.3 Fluoride

Fluoride was detected at concentrations at or above its MCL of 4 mg/L in groundwater from 13 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**). **Figure 29** displays the fluoride concentrations for October 2021.

The greatest fluoride concentrations were detected in the groundwater from surficial aquifer - upper zone wells W-13R, W-30, W-77, and W-78 located at the south end of the plant building and the WWTP during the October 2021 sampling period. The fluoride plume exceeding the MCL in the surficial aquifer is primarily south of the plant building and in the vicinity of the WWTP. The potential sources for fluoride are the WWTP and the plant area north of well W-77, including uranium hexafluoride storage areas and operations in the Chemical Storage Area OU. The lateral extent of fluoride MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 3,100 ft from the southern CFFF property boundary (**Figure 32**).

Fluoride was detected in groundwater from the four Black Creek Aquifer monitoring wells during the October 2021 sampling period and was detected in the private water supply wells at concentrations ranging from of 0.013 mg/L to 0.103 mg/L. These fluoride concentrations are one to two orders of magnitude below its MCL and are naturally occurring.

Fluoride occurs naturally in groundwater. A recent United States Geological Survey (USGS) study concluded that fluoride concentrations in private wells exceeded the MCL in only 1.6% of the wells in the study (USGS, 2020). Fluoride impacts at CFFF exist within the surficial aquifer only, do not extend beyond the property boundary where the private water supply wells are located and most, if not of all, of the private wells are screened deeper than the surficial aquifer within the Black Creek Aquifer. Therefore, the fluoride detections in the Black Creek Aquifer monitoring wells and the private water supply wells are naturally occurring and are not a result of facility operations.

6.2.4 Uranium

Total U was detected at concentrations above its MCL of 30 µg/L in groundwater from 3 of the 114 surficial aquifer monitoring wells in October 2021 (**Table 10**). Total U concentrations are displayed on **Figure 30**. Total U exceeding the MCL is localized to two areas adjacent to the plant building, one area on the west side of the building near the southwest corner (monitoring wells W-55 and W-56) and another area on the south side of the building (monitoring well W-77). The plume associated with monitoring wells W-55 and W-56 is referred to as the northern plume, and the plume associated with monitoring well W-77 is referred to as the southern plume. The lateral extent of U MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 3,900 ft from the southern CFFF property boundary (**Figure 32**).

In the northern U plume, the highest total U concentrations ranged from 121 µg/L to 143 µg/L in groundwater from monitoring wells W-55 and W-56, respectively. Groundwater from monitoring well W-73, located approximately 50 ft downgradient from monitoring wells W-55 and W-56, contained total U at an estimated concentration of 0.133 µg/L. In the southern U plume, the highest total U concentration of 133 µg/L was detected in groundwater from monitoring well W-77. Groundwater from monitoring well W-28 located approximately 50 ft downgradient from monitoring well W-77 contained total U at a concentration of 2.08 µg/L.

Potential sources for the northern and southern U plumes include historical 2008/2011 underground line breaches, SOLX operations, and the plant area north of well W-77, including uranyl nitrate storage and off-loading, uranium hexafluoride storage areas and the HF Spiking Stations #1 and 2. The extent of the northern and southern U plumes above the MCL in groundwater is limited to localized areas adjacent to the plant building. The aerial extent of U above its MCL is the smallest of the COPCs at the CFFF site.

U isotope U-238 was detected in groundwater from the four Black Creek Aquifer monitoring wells at estimated concentrations ranging from 0.180 µg/L to 0.0700 µg/L. U-238 was also the only isotope detected in three of the four private water supply wells at concentrations ranging from 0.272 µg/L (estimated) to 0.776 µg/L. These total U concentrations are greater than 30 times below the MCL. The private water supply wells are located at least 3,800 ft beyond the extent of U in groundwater at the site.

The U-238 detected in groundwater from the Black Creek Aquifer monitoring wells at the site and the four private water supply wells is typical of regional background concentrations and is not a result of facility operations. Total U occurs naturally in groundwater in South Carolina. A study performed in the Aiken, SC and Augusta, GA area reported an average background groundwater U concentration from private water supply wells of 0.35 µg/L (Evans A.G. et al, 1992). Another study of state-wide groundwater from private water supply wells used statistical analysis to predict an average background groundwater U concentration of 1.26 µg/L (Wagner S.E. et al, 2011). Private water supply wells are typically installed in the aquifer below the surficial aquifer (e.g. the Black Creek Aquifer at CFFF).

6.2.5 Technetium-99

Tc-99 is primarily a man-made radionuclide, so detections at CFFF of Tc-99 above the MDC are the result of impact by historical operations of the facility. Tc-99 was detected above its MCL of 900 pCi/L in groundwater from surficial aquifer – lower zone monitoring wells W-6 and W-11 in October 2021 (**Table 10**) at concentrations of 2,500 pCi/L and 1,230 pCi/L, respectively. Tc-99 concentrations are displayed on **Figure 31**. The aerial extent of the Tc-99 exceeding the MCL is within the Wastewater Treatment Area and the Southern Storage Area. The aerial extent of the Tc-99 plume at concentrations below the MCL extends from the Wastewater Treatment Area toward the west, southwest, and southeast.

The Wastewater Treatment Area OU and/or uranyl nitrate spills in the area north of W-77 (including the Chemical Area OU) are believed to be the source area(s) for Tc-99 impacts to groundwater. Current site operations do not have the potential to introduce significant quantities of Tc-99 into the environment and attempting to relate current Tc-99 groundwater conditions to a specific historic event would be speculative (Westinghouse, 2020b). Tc-99 was introduced into the commercial nuclear fuel cycle in 1956 when high-enriched U from U.S. Government military reactors was re-processed (e.g., down-blended) into low-enriched U fuel. Reprocessed U was used in the commercial nuclear fuel cycle until 1977. The lateral extent of Tc-99 MCL exceedances is contained within the CFFF property boundary and, in the downgradient direction, is approximately 3,200 ft from the southern CFFF property boundary (**Figure 32**).

Tc-99 was not detected in groundwater samples from the four Black Creek aquifer monitoring wells or the four private water supply wells.

6.3 Surface Water

As discussed in **Section 4.3**, surface water has been impacted by COPCs in limited areas within the CFFF property. The RI surface water data and the facility's routine surface monitoring data as discussed in **Section 4.3.4** indicate that no offsite impacts to surface water are occurring.

Metals occur naturally in the Earth's crust. Groundwater and surface water is in contact with rocks and soils containing metals which results in concentrations of naturally occurring metals concentrations in water. Elevated concentrations of metals were not identified in Phase I of the RI, and those that were identified were not related to facility operations. Therefore, metals were not analyzed in Phase II of the RI as approved by DHEC in the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c).

6.3.1 CVOCs

Surface water samples collected from the western, deeply incised portion of the Eastern Ditch in July 2019 contained PCE at concentrations of 16 µg/L and 14 µg/L exceeding PCE's MCL of 5 µg/L at sample locations SW-17 and SW-18, respectively (**Figure 33**). Surface water sample SW-17 was collected in the ditch near the location of monitoring well W-41R, and sample SW-18 is downstream from the SW-17 location. Groundwater in monitoring well W-41R contained PCE concentrations ranging from 190 to 200 µg/L during the groundwater sampling campaigns before (January 2019) and after (August 2019) collection of this surface water sample. Surface water from location SW-17 also contained TCE at a concentration of 1 µg/L which is below its MCL of 5 µg/L.

Groundwater containing CVOCs discharges to the Eastern Ditch in this deeply incised portion because the base of the ditch is below the water table. No other CVOCs were detected in surface water during the RI, including in Upper Sunset Lake where the Eastern Ditch discharges.

6.3.2 Nitrate

Concentrations of nitrate below its MCL of 10 mg/L were detected in the Eastern Ditch, the Middle Ditch and in the Gator Pond as shown on **Figure 33**. The highest concentration of nitrate was detected in surface water from the

Gator Pond (7.3 mg/L) with the deeply incised portion of the Eastern Ditch containing the second and third highest concentrations (5.7 and 3.8 mg/L). Groundwater at CFFF has been impacted with nitrate by historical facility operations. The nitrate in surface water indicates that impacted groundwater is discharging to the surface water bodies in these locations at concentrations below its MCL.

6.3.3 Fluoride

Although fluoride occurs naturally, some of the fluoride detected in surface water samples is indicative of impacted groundwater discharging to surface water. In particular, surface water in the Gator Pond contained fluoride at a concentration of 4.94 mg/L which is above its MCL of 4 mg/L as shown on **Figure 33**. Another surface water sample (SW-16) in the Middle Ditch near its confluence with the Eastern Ditch contained a fluoride concentration of 1.69 mg/L. The remaining detected fluoride concentrations in surface water were below the calculated background concentration (0.442 mg/L) which is approximately an order of magnitude below the MCL.

6.3.4 Uranium

U occurs naturally in the Earth's crust and U-238 constitutes more than 99% of the U on Earth. Concentrations of U-238 were detected in every surface water sample except for one (background sample SW-12). Concentrations of U-238 (ranging from an estimated concentration of 0.673 µg/L to 1.11 µg/L) in the surface water samples were over an order of magnitude below the total U MCL of 30 µg/L and are likely naturally occurring.

Estimated concentrations (J-flagged by the laboratory) of U-235 ranging from 0.0174 µg/L to 0.0682 µg/L were detected in Middle Ditch sample SW-16 and in Upper Sunset Lake samples SW-19 and SW-20. Sediment in these locations also contains U-235 and the surface water bodies in these locations are very shallow suggesting that the U-235 is possibly the result of sediment particles in the samples. Surface water samples downstream from these locations did not contain U-235. This data is shown in **Table T3**.

6.3.5 Technetium-99

Tc-99 was not detected in the RI surface water samples, but it has been detected in CFFF's routine surface water samples from the Gator Pond at concentrations that are an order of magnitude or more below the MCL. Tc-99 is a predominantly man-made radionuclide, so detections of Tc-99 above the MDC are the result of impact by historical operations of the facility. This indicates that groundwater impacted with Tc-99 is discharging to the Gator Pond.

6.4 Sediment

As described in **Section 4.4**, sediment at CFFF has been impacted by historical facility operations. The impacts are limited to specific areas and are entirely contained on the site as discussed below.

6.4.1 Background Sediment Concentrations

Sediment samples collected near Bluff Road (SED-11 and SED-12) and west of the Entrance Dike (SED-51 through SED-59) are considered to be unaffected by facility operations and therefore represent natural, background analyte concentrations. These background sediment samples contained concentrations 2-butanone (also known as methyl ethyl ketone), acetone, ammonia, fluoride, nitrate and metals, including U. Calculated background sediment concentrations are summarized in **Table 13** and the methodology used to calculate these values is briefly described in **Appendix E**.

2-butanone, a metabolic byproduct of plants and animals, is released into the atmosphere by volcanoes and forest fires and is commonly found in food such as fruits and vegetables (NIH, 2020). 2-butanone sediment background concentrations are 193 µg/kg to 180 µg/kg for the stormwater ditches and Mill Creek, respectively. A 2-butanone concentration of 190 µg/kg in sediment location SED-50 exceeded the background concentration range and is also likely naturally occurring.

Acetone occurs naturally in plants, trees, forest fires, vehicle exhaust and in the metabolic breakdown of fats in animals (NIH, 2020). Acetone sediment background concentrations are 142 µg/kg and 251 µg/kg for the stormwater ditches and Mill Creek, respectively. Several sediment samples from Upper Sunset Lake, Lower Sunset Lake and Mill Creek southeast of the Lower Sunset Lake Dike exceeded the background acetone concentration range at concentrations ranging from 350 to 530 µg/kg. The locations of the samples are in thicker forested portions of Mill Creek and are likely the result of naturally occurring processes.

According to the EPA Water Quality Criteria website, "Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes." Ammonia concentrations in background sediment samples ranged from 196 to 854 mg/kg. Ammonia concentrations above background were detected in the Gator Pond (SED-24, 1070 to 1170 mg/kg), in eight locations in Upper Sunset Lake and four locations in Lower Sunset Lake. The detection of ammonia above background in the Gator Pond is likely the result of groundwater impacted with ammonia discharging into the Gator Pond and/or the decomposition of organic matter. Ammonia concentrations above background in Sunset Lakes ranged from 896 to 2110 mg/kg. The detection of ammonia above background in Sunset Lakes is likely the result of the decomposition of organic matter and/or nitrogen fixation processes.

Metals detected in sediment are naturally occurring in soil and sediment in South Carolina with the Piedmont Province of South Carolina having higher average metals concentrations (except for calcium) than the Coastal Plain Province (Canova, 1999). As discussed in **Section 3.7**, the fall line that separates the Piedmont from the Coastal Plain occurs in the Congaree River just upstream from CFFF. Sediment comprising the CFFF site were washed downstream from the Piedmont Province by the Congaree River with a short distance of the river's course being within the Coastal Plain. Therefore, the majority of the soil and sediment within the CFFF property are derived from sources with the Piedmont Province of South Carolina. Samples were analyzed for metals during Phase I of the RI only. Concentrations of metals in these samples are naturally occurring and are not the result of historical operations of the facility; therefore, they are not a COPC at CFFF. Metals removal from the analyte list for Phase II of the RI was approved by DHEC in the *Phase II Remedial Investigation Work Plan* (AECOM, 2020c).

6.4.2 CVOCs

Sediment from sample location SED-17 in the deeply incised portion of the Eastern Ditch contained PCE at a concentration of 5.5 µg/kg (**Figure 34**). This sediment sample was collected at the same location where surface water contained PCE above its MCL which indicates that PCE impacted groundwater is discharging to the ditch in this area. Pore spaces within the sediment through which impacted groundwater migrates to discharge to the surface water resulted in the detection of PCE at this location. The remaining sediment samples did not contain any VOCs.

6.4.3 Nitrate

Calculated background sediment concentrations of nitrate for the stormwater ditches and Mill Creek are 0.57 mg/L and 0.91 mg/L, respectively. Concentrations of nitrate were detected above background concentrations in the Middle Ditch, in the deeply incised portion of the Eastern Ditch, in Upper Sunset Lake, and in Lower Sunset Lake. The nitrate is related to either impacted groundwater discharges or a historical releases, including the West Lagoon I (WLI) rupture in 1971.

In 1971 shortly after the facility began operations, WL I ruptured releasing an estimated 1.25 million gallons of wastewater and suspended solids containing nitrate, fluoride, U, and Tc-99. This lagoon is located adjacent to the Middle Ditch. Water and suspended solids flowing from WL I would have flowed into the Middle Ditch with the force of water temporarily pushing the suspended solids and water both to the north and the south within the ditch due to the relatively flat nature of this ditch. As the water in the ditch receded, some of the suspended solids remained in the Middle Ditch and became part of the matrix of sediment/soil (dry areas) of the ditch proximal to the release area and downstream in the ditch.

Sediment sample SED-17, located in the deeply incised portion of the Eastern Ditch where groundwater is impacted with nitrate above its MCL, contained nitrate above background concentrations. As discussed in **Sections 5.3.1** and **5.3.2,** groundwater discharges into this portion of the Eastern Ditch. Impact to sediment in SED-17 is the likely result of nitrate impacted groundwater migrating through sediment before discharging into the ditch. Nitrate above background concentration was not found in other samples collected in the Eastern Ditch.

Sediment in Sunset Lakes contained nitrate concentrations indicative of impact by historical operations (**Figure 35**). This impact extends from near the location where the Eastern Ditch discharges into Upper Sunset Lake (SED-19 and SED-50) to near the Lower Sunset Lake Dike. Suspended solids and wastewater from the 1971 WL I rupture flowed down the Eastern Ditch which empties into the middle part of Upper Sunset Lake. Some suspended solids containing nitrate likely settled in Upper and Lower Sunset Lakes. It should be noted that field personnel did not encounter a layer indicative of settled suspended solids at any of the sediment sampling locations.

As discussed in **Section 3.3**, most of the Mill Creek flow is diverted from Sunset Lake by the man-made canal. The flow, if any, that continues down Mill Creek plus water from the Western and Eastern Ditches are what flows through Sunset Lakes. As a result, there is very little flow in Sunset Lakes except for during flood events and periods of above average rainfall. As discussed in **Section 6.4**, the impacted sediment is anticipated to remain in place for the foreseeable future because there is no motive force to move the sediment.

6.4.4 Fluoride

Calculated background sediment concentrations of fluoride for the stormwater ditches and Mill Creek are 3.61 mg/L and 2.73 mg/L, respectively. Concentrations of fluoride were detected above background concentrations in the Gator Pond, the Middle Ditch, in Upper Sunset Lake, in Lower Sunset Lake, and in Mill Creek east of the Lower Sunset Lake Dike.

Every sediment sample collected in the Gator Pond contained fluoride concentrations above natural background. These elevated fluoride concentrations (24.9 to 152 mg/kg) result from fluoride-impacted groundwater migrating through sediment before discharging into the Gator Pond and fluoride from impacted surface water adsorbing to sediment. As documented in **Section 5.3.3**, water in the Gator Pond also exceeds the MCL for fluoride. Because this surface water body is fully enclosed, fluoride impacts in sediment are contained within its boundaries.

Sediment in the southern portion of the Middle Ditch (SED-16, SED-60, and SED-61) contained fluoride above background at concentrations ranging from 3.04 to 19.2 mg/kg. Similar to nitrate impacts in sediment in this portion of the ditch discussed in the previous subsection, fluoride impacts to sediment in this area are the result of historical operations. Sediment from the northern portion of the Middle Ditch and the remaining ditch sediment samples did not contain fluoride above background concentrations.

Sediment from Upper Sunset Lake, Lower Sunset Lakes and Mill Creek east of the Lower Sunset Lake Dike contained fluoride above background concentrations. As shown on **Figure 36**, the highest fluoride concentrations (up to 120 mg/kg) were in the transect across Upper Sunset Lake south of where the East Ditch empties (SED-19, SED-45, and SED-46). Fluoride concentrations in sediment in the transect west of the SED-19, SED-45 and SED-46 transect were roughly an order of magnitude lower. In general, fluoride concentrations also decrease going towards and into Lower Sunset Lake and further decrease beyond the Lower Sunset Lake Dike. As discussed in **Section 6.4**, the impacted sediment is anticipated to remain in place for the foreseeable future because there is no motive force to move the sediment.

The vertical sediment profiling suggests that fluoride in the sediment is soluble. This allows the fluoride to diffuse into surface water or adsorb to sediment deeper in the sediment column. Migration of fluoride in the sediment column can be seen in multiple locations with sediment samples as deep as 3 ft into the sediment containing fluoride concentrations above background concentrations (**Figure 36**).

6.4.5 Uranium

U was detected in sediment above RUSLs in the Middle Ditch, in Upper Sunset Lake, and in Lower Sunset Lake.

The Middle Ditch contained sediment impacted with U-233/234 above its RUSL of 13 pCi/g at sample locations SED-16, SED-60, and SED-61 at concentrations ranging from 15.1 pCi/g to 67.2 pCi/g (**Figure 34**). This is the area of the Middle Ditch likely impacted by the rupture of WL I. Sediment from the northern portion of the Middle Ditch and the remaining ditch sediment samples do not contain U-233/234 above RUSL.

The RUSL for U-233/234 was exceeded in sediment from 14 sample locations in Upper Sunset Lake, with eight of those locations being bounding samples from the SED-44 study area, and in 5 sample locations in Lower Sunset Lake. The RUSL for U-235/236 was only exceeded in sediment sample SED-44 0-6” in Upper Sunset Lake. The RUSL for U-238 was exceeded in sediment from two sample locations in both Upper Sunset Lake and Lower Sunset Lake. Exceedances of RUSLs in sediment in Upper and Lower Sunset Lakes are displayed on **Figure 37**. There were no U RUSL exceedances in the westernmost transect in Upper Sunset Lake or in the transects in Mill Creek southeast of the Lower Sunset Lake Dike, therefore sediment impact with U is contained with Sunset Lakes. As documented in the previous two subsections, most COPC impacts to sediment within Upper and Lower Sunset Lakes are likely the result of the WL I rupture. As discussed in **Section 6.4**, the impacted sediment is anticipated to remain in place for the foreseeable future because there is no motive force to move the sediment.

6.4.6 Technetium-99

Tc-99 is a predominantly man-made radionuclide, so detections of Tc-99 above the MDC are the result of impact by historical operations of the facility. Tc-99 above MDC was detected in sediment from the Gator Pond, the Middle Ditch, Upper Sunset Lake, and Lower Sunset Lake.

At least one sediment sample from each of the six sediment sampling locations in the Gator Pond contained Tc-99 above the MDC. Tc-99 concentrations in the Gator Pond ranged from 0.785 to 312 pCi/g (**Figure 34**). Impacts to sediment in Gator Pond is the result of Tc-99 impacted groundwater discharging into the Gator Pond.

The southernmost portion of the Middle Ditch (SED-16, SED-61, **Figure 34**) contained Tc-99 concentrations above the MDC. This is the same portion of the Middle Ditch impacted with fluoride, nitrate and U. Groundwater in this area is also impacted with Tc-99, albeit below the MCL. Sediment impacts in this area are the result of the historical operations and/or discharge of impacted groundwater through the sediment into the ditch, especially in the deeper sediment samples (6-12 inches and 12-18 inches) at location SED-61. Increasing Tc-99 concentrations as the depth of the sediment samples increases indicates that the effect is likely from impacted groundwater.

Concentrations of Tc-99 above the MDC within the upper foot (0-12 inches) of sediment in Upper Sunset Lake (16 samples) ranged from 0.937 to 23.7 pCi/g and from 1.12 to 2.13 pCi/g in Lower Sunset Lake (4 samples). Sediment at these locations also contained U concentrations above the RUSL. Two sediment samples (SED-B1 and SED-B2, **Figure 37**) located within the 10 meter box of the SED-44 study area (as described in **Section 4.4.3.2**) of Upper Sunset Lake exceeded the Tc-99 RUSL. Based upon the Leidos dose and risk evaluation of sediment in this area (Leidos, 2022), the U and Tc-99 in sediment in Sunset Lakes does not pose a risk of excessive radiation exposure (more than 25 mRem/yr) even under a worst case scenario of extreme drought whereby Mill Creek dries up thereby removing the shielding of the water typically above these sediments. No other sediment samples exceeded the RUSL for Tc-99 in Sunset Lakes.

The westernmost sediment transect in Upper Sunset Lake and the sediment samples east of the Lower Sunset Lake Dike did not contain Tc-99; therefore the extent of sediment minimally impacted with Tc-99 is limited to the eastern third of Upper Sunset Lake and, to a lesser extent, Lower Sunset Lake. These impacts are the result of historical facility operations (e.g. the 1971 rupture of WL I). As discussed in **Section 6.4**, the impacted sediment is anticipated to remain in place for the foreseeable future because there is no motive force to move the sediment.

6.4.7 SVOCs

SVOCs were detected in sediment from sampling locations SED-13 and SED-14 in the Eastern Ditch (**Table T4**). The SVOC concentrations in sediment from the downstream SED-14 location were lower than those detected in sediment from SED-13. A portion of the Eastern Ditch is located underground beneath the facility's primary parking lot. Stormwater drains in the parking lot are connected to the Eastern Ditch. Sediment sample locations SED-13 and SED-14 are approximately 800 and 2,000 ft downstream from where the portion of the Eastern Ditch that is beneath the parking lot intersects with the primary portion of the Eastern Ditch. Stormwater runoff from the parking lot contains SVOCs originating from cars parked in the lot (e.g. drips of motor oil) and degradation of asphalt. These compounds likely adsorbed to sediment within the ditch. The sediment sample from locations SED-11 upstream in the Eastern Ditch and SED-17 downstream in the Eastern Ditch did not contain SVOCs.

7. Conceptual Site Model

This section describes the mechanisms and processes by which historical impacts documented in previous sections came to exist in their current state.

7.1 Sources and Release Mechanisms

Impacts to CFFF from historical operations have been documented in groundwater, surface water and sediment. Although there have been historical impacts to soil, these impacts have either attenuated over time (e.g. low concentrations of PCE in shallow soils that are no longer a source for impact of groundwater) or are in inaccessible areas of the property (e.g. U beneath the plant building that will be removed during decommissioning). Groundwater impact concentrations often act as a tracer back to the source of the impact because the highest concentrations of impacted groundwater are typically measured close to or beneath a source or source area. Thus, groundwater plume locations and COPC concentrations are used to determine the likely source area(s) of each COPC as discussed below.

CFFF began operations in 1969, and the Resource Conservation and Recovery Act (RCRA) was enacted in 1976. RCRA is the primary law that governs disposal of solid and hazardous waste. Prior to the enactment of RCRA, liquids containing hazardous substances or the hazardous substance itself were managed to different standards to what they are today. The most likely source areas for PCE impacts to groundwater are in the Western Storage Area OU, including the Former Oil Houses along the west side of the building and Chemical Area OU, including the SOLX area,

Chlorinated solvents can migrate through concrete floors, mostly through cracks, into the soil beneath the floor and eventually impact groundwater. This release mechanism appears to be the case with the small PCE and the TCE plume emanating from the southwestern corner of the plant building. As discussed in **Section 6.2**, TCE, cis-1,2-DCE, and VC in groundwater result from the reductive dechlorination of PCE. None of these CVOCs are known to have been used in facility operations, and the plumes are in the same locations and/or are downgradient of the PCE plumes.

The Wastewater Treatment Area OU has historically been a source area for U, nitrate, and ammonia based on documented historical spill records and groundwater indicates possible Tc-99 and fluoride releases within the OU as well. The former East Lagoon, the North Lagoon and the South Lagoon are lined lagoons, and the Sanitary Lagoon is unlined. Liners in these lagoons have been replaced as documented in **Appendix A**. Prior to their replacement, failures of these liners may have resulted in the release of wastewater containing these COPCs to the groundwater. Due to the bottoms of these lagoons being near the water table, groundwater beneath them would be impacted.

Additionally, WL II is identified as a source of nitrate impact based on groundwater impact around it. The release mechanism for nitrate from WL II is the same as the other lagoons.

Fluoride impact emanates from the plant area north of monitoring well W-77. This area is inaccessible due to the plant building and facility infrastructure. Presumably, releases of fluoride containing substances migrated through unsaturated soils to the water table. Upon contact with groundwater, fluoride dissolved into groundwater which migrated downgradient to monitoring well W-77.

Similarly, source areas for U impacts to groundwater are located in the plant area north of monitoring well W-77 resulting in a small groundwater plume of U within the Chemical Area OU. Because Tc-99 is associated with U, this area may also be the source of Tc-99 impact in groundwater. A second small U plume is also located along the western side of the plant building with its source area being beneath the Chemical Area OU where there have been historical releases of U as discussed in **Section 5.2.4**. Fluids impacted with U migrated through the unsaturated zone to the water table where U went into solution and impacted groundwater in the vicinity of monitoring wells W-55, W-56, and W-77. Although historical release documents identify the Wastewater Treatment OU as a potential area for U impacts, U does not appear to be emanating or migrating to groundwater within this area.

Groundwater discharges into portions of the Eastern Ditch, the Western Ditch and the Gator Pond. Groundwater that discharges to the Western Ditch has not been impacted by historical operations of the facility, but portions of both the Eastern Ditch and Gator Pond receive discharges of impacted groundwater. The impacted groundwater locally affects sediment that it is migrating through and the surface water that it discharges to in these surface water bodies.

In 1971, WL I ruptured releasing an estimated 1.25 million gallons of wastewater and COPC impacted suspended solids. Wastewater and suspended solids flowed into the Middle Ditch then into the Eastern Ditch and eventually emptied into Upper Sunset Lake. The low flow, low energy environment of Sunset Lakes caused these surface water bodies to act as settling ponds for the COPC impacted suspended solids. Field personnel did not observe a distinct layer resulting from the settling of suspended solids. Impacts to sediment by the 1971 WL I rupture are discussed further in **Section 6.5**.

7.1.1 Migration Pathways

COPCs at CFFF migrate only via groundwater. Underground utilities commonly act as preferential migratory pathways for vapors from CVOCs and COPCs in groundwater; however, there is minimal CVOC impact remaining in soil and CFFF's underground utilities are above the water table. Therefore, underground utilities at CFFF do not act as preferential migratory pathways for COPCs.

Groundwater at CFFF primarily flows to the south southwest with components of flow to the west and south. As discussed in **Section 6.3.6.3**, groundwater flow around the Gator Pond is influenced by the constant head in this surface water body.

During Phase II of the RI, CVOC impacts were discovered north of their source area (resulting in a connection of the main plume to the Western Storage Area). Based upon CVOC data collected from temporary wells, groundwater in the northern portion of the CVOC plume flows north (upgradient) before continuing to migrate to the west and eventually turning back to the south. This migration pattern of CVOCs in an upgradient direction before making the turn west explains the CVOC impact in the Western Groundwater AOC.

This "upgradient" flow can be explained by observations made during installation of the temporary wells. During collection of groundwater screening samples at locations L-24 and L-47 (north of WL II), direct push tooling had to be left in the ground overnight at both locations to collect groundwater samples from the lower zone of the surficial aquifer due to slow rate of groundwater recharge related to apparently low hydraulic conductivities in the surficial aquifer – lower zone at these locations. The elevation of the top of the confining clay is higher in this area than in areas to the north, east and west. Although subtle, there is a north-south trending "ridge" in the confining clay from the southern end of the sanitary lagoon through boring L-47. This topographic high combined with the low conductivity of the lower zone of the surficial aquifer creates a hydraulic barrier to flow in the lower zone in this portion of the property. As displayed on **Figure 19**, groundwater flow in the surficial aquifer - lower zone in this area has a westerly flow direction. As groundwater pushes against the hydraulic barrier, it is forced to flow both north and south along the barrier. When groundwater flowing north reaches the northern extent of the hydraulic barrier, it flows westward and eventually turns to the south.

7.1.2 COPC Properties

Inorganic and organic COPCs have various properties which relate to their fate and transport within both unsaturated and saturated media. Some of these properties include density, molecular weight, water solubility, n-Octanol/water partitioning coefficient, vapor pressure, Henry's Law Constant, and organic carbon partitioning coefficient. These properties for each COPC are listed in **Table 15**. These properties were sourced from the EPA Regional Screening Level Chemical-specific Parameters Supporting Table (EPA, May 2022).

Density is defined as the mass of a given substance per unit volume in its pure form. The density of a COPC is important to compare to the density of water which is roughly one gram per cubic centimeter. COPCs, such as petroleum fuels, with densities less than 1 will tend to float (especially as a light non-aqueous phase liquid) and migrate near the water table (but may migrate downward with natural groundwater flow), whereas COPCs with densities greater than 1 (such as chlorinated solvents) will tend to migrate downward until they encounter a confining unit and be prevalent in deeper portions of the aquifer. Note, however, that the tendency to float or sink applies to COPCs in pure form or in mixtures. As discussed below, once individual COPCs solubilize in water, the COPC molecules will migrate with groundwater flow. No light or dense non-aqueous phase liquids have been identified, and there is no data that suggests their presence.

Water solubility is a measure of how much of a COPC can dissolve in water at a given temperature. In general, COPCs with higher molecular weight are less soluble and vice versa. Tc-99 has a lower molecular weight than U, therefore it solubilizes into groundwater more readily than U. Another example of these COPC properties is the migration of fluoride and nitrate in the sediment column in Sunset Lakes, whereas U impacts remains within the upper foot of the sediment. Fluoride and nitrate have molecular weights that are approximately 4 times less and 6 times less, respectively, than U.

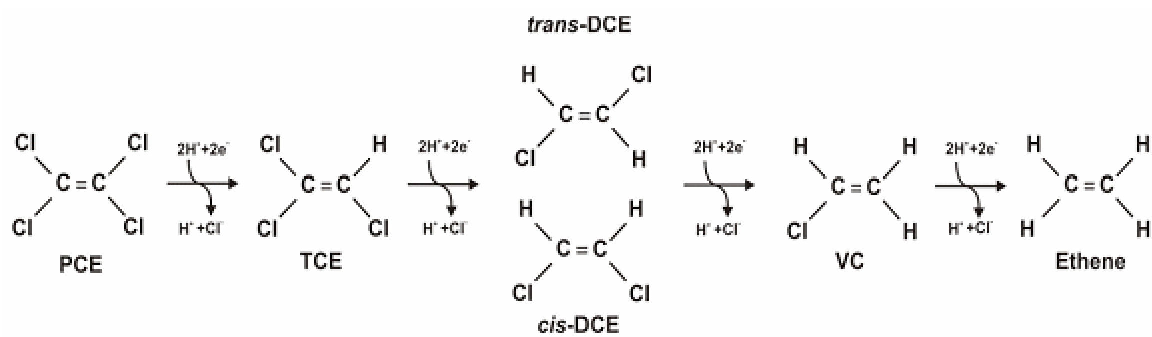
n-Octanol/water partitioning coefficient ($\log K_{ow}$) is defined as the ratio of a COPC in n-octanol and water at equilibrium at a specific temperature. This coefficient is a relative indicator of the tendency of an organic compound to adsorb to soil or an organism, is inversely related to water solubility, and directly proportional to molecular weight. COPCs with higher n-Octanol/water partitioning coefficients will tend to adsorb to organic materials in soils or sediment and have a low tendency to remain in solution. Although a $\log K_{ow}$ value was not listed by the EPA for U and Tc-99, the inverse relationship of water solubility and $\log K_{ow}$ means that U would tend to adsorb to soil as discussed in **Section 5.1.3**.

Vapor pressure is defined as the pressure exerted by a vapor in equilibrium with its solid or liquid phases at 25 degrees Celsius in a closed system and is a measure of a COPC's volatility. The higher the vapor pressure of a COPC, the greater the volatility and vice versa. Henry's Law Constant (HLC) measures the concentration of a COPC in air divided by its concentration in water and represents a COPC's tendency to volatilize from groundwater. COPCs with high HLCs will volatilize from water into pore spaces within the unsaturated zone while COPCs with low HLCs will tend to remain in solution or may be adsorbed onto soil or sediment. Of the CVOCs detected at CFFF, VC is the most volatile and PCE is the least volatile based upon their vapor pressures.

COPCs with a low organic carbon partitioning coefficient (K_{oc}) are less likely to bind with organic carbon in soil whereas those with a high organic carbon partitioning coefficient have a stronger tendency to adsorb to organic matter than remain in solution. Inversely to vapor pressure in the previous paragraph, VC has the highest affinity to bind with organic carbon while PCE has the least.

7.2 Transformation Reactions of Chlorinated Ethenes

Chlorinated ethenes such as PCE can undergo biotic (biological) and abiotic (physical) transformations under both aerobic and anaerobic conditions. Natural, biotic degradation of PCE to produce daughter products at CFFF follows the reductive dechlorination pathway. This pathway is as follows:



(Source: Parsons Corporation, 2004)

In this pathway, only TCE can be dechlorinated into two different DCEs (cis- and trans-). It should be noted that trans-1,2- DCE was only detected in one groundwater screening sample and has not been detected in groundwater from the monitoring well network at CFFF. Multiple bacteria are known to dechlorinate chlorinated ethenes with dehalococcoides being the most prominent. Dehalococcoides is capable of dechlorinating PCE through ethene whereas other bacteria can only dechlorinate PCE to cis-1,2-DCE.

The COPCs detected in groundwater in the floodplain indicate that the reductive dechlorination pathway shown above is occurring at CFFF, dehalococcoides are likely present at CFFF, and the conditions for natural degradation of PCE are present. Optimal conditions for reductive dechlorination are anaerobic conditions (DO <0.5 mg/L), sulfate concentrations less than 50 mg/L, nitrate concentrations less than 1 mg/L, and a pH range of 6 to 8.

7.3 Groundwater Fate and Transport Assessment

Groundwater fate and transport is a complex process driven by the groundwater flow regime within the surficial aquifer as well as physical and chemical processes that affect the flux of COPCs as they flow through the aquifer. Physical processes such as advection and dispersion affect the concentration and flow within the system. Sorption, volatilization, and biochemical reactions also affect concentrations through space and time as dissolved COPCs flow with groundwater through the aquifer. These processes occur at every site for every COPC.

Each of these factors are unique and vary by location based on a range of factors, including but not limited to micro-scale and meso-scale heterogeneities in the aquifer, effective porosity of the soils/aquifer, tortuosity (measure of the actual length of the groundwater flow path divided by the straight line distance of the end points of that path) of the porous network, chemicals under consideration, in situ redox conditions, and microbial populations and their stratification within the matrix.

7.3.1 Advection and Sorption Processes

Advection is a process by which COPCs are transported by flowing groundwater. Most simply, the rate of COPC transport is equal to the average linear velocity of groundwater flowing through the aquifer. However, the rate of COPC transport is often less than the rate of groundwater flow because of various factors. This assumes that the transport of the COPC does not influence the pattern of flow, such as large chain compounds inhibiting the pore spaces of an aquifer.

As groundwater flows through the matrix, dissolved COPCs can undergo sorption, wherein physical and chemical processes promote attachment of the COPC to the soil matrix, thereby reducing groundwater concentrations. Sorption typically occurs through absorption (incorporation of the COPC by the aquifer solids), adsorption (physical adherence or ion bonding onto the matrix), or ion exchange. Sorption dynamics are site-specific phenomena controlled by the geochemistry of the host matrix and the groundwater flowing through the system.

Uranium readily adsorbs to soil as evidenced by the short distance that it has migrated in groundwater (**Figures 30 and 32**) whereas PCE's adsorption capacity is less as evidenced by the distance it has migrated since its release (**Figure 32**)

7.3.2 Dispersion and Diffusion Processes

Dispersion is a naturally occurring process where COPC impacted groundwater mixes with unimpacted groundwater thereby reducing the COPC concentration. This process is the result of mechanical mixing and molecular diffusion in groundwater flow. Diffusion occurs as a process where the COPCs in groundwater moves from areas of higher concentration to areas of lower concentration as the natural system attempts to achieve equilibrium. As the COPCs move through the groundwater matrix, not all the COPCs move at the same speed as the average linear velocity.

Dispersion and diffusion are sometimes incorrectly interchanged in discussions of groundwater concentrations spreading out in space and through time as flow continues through the aquifer/matrix. Simplified, dispersion is a macroscale process caused by non-ideal flow patterns (tortuosity, scalar flow issues, etc.), whereas diffusion is a microscopic process resulting from random molecular motions in the matrix.

The density of Tc-99 combined with downward flow gradients may have caused it to sink to the confining unit where most of the Tc-99 mass remains, but dispersion and diffusion causes lower concentrations to migrate laterally in groundwater. Nitrate and fluoride, however both readily disperse throughout the surficial aquifer.

7.3.3 Volatilization from Groundwater

Volatilization occurs when volatile COPCs that are dissolved in groundwater, or present as nonaqueous phase liquids (of which none have been identified at CFFF), change to a gas phase. This is more commonly associated with organic compounds in saturated and unsaturated zones in aquifer matrices. The volatilization process is controlled by the vapor pressure of the COPC and its state of equilibrium relative to the matrix and groundwater temperature. COPCs will volatilize more readily with increased temperature in the groundwater matrix increasing its vapor pressure. Off gassing of organic compounds (CVOCs at CFFF) results in decreasing COPC concentration in soil and groundwater.

7.3.4 Plume Degradation and Attenuation Processes

Groundwater concentrations in plumes will decrease over time and distance for a variety of reasons, including but not limited to dispersion and diffusion, sorption, volatilization, chemical reaction, and biochemical reactions driven by microbial populations. Concentrations may also be diluted over time and space as a result of further infiltration and groundwater recharge, effectively providing a means for dilution of the plume. As defined by the EPA, natural attenuation of the plume may occur as a variety of physical, chemical, and/or biological process that, under favorable conditions and without human intervention, may reduce the mass, toxicity, mobility, volume, or concentrations of COPCs in soil or groundwater. Monitored natural attenuation is a commonly applied approach for groundwater remediation and is often used in combination with active remediation including physical (e.g., pump and treat, barrier walls, etc.), biological or chemical (e.g., injection, permeable reactive barriers, etc.) treatment that are deemed unnecessary to achieve concentration targets/objectives at designated boundaries.

Microbes such as nitrogen fixing bacteria, methanogens, and dehalococcoides can naturally metabolize various COPCs as their food source depending upon groundwater chemistry. Nitrogen fixing bacteria prefer oxidizing conditions whereas methanogens require reducing conditions to use nitrate as a food source. Similar to methanogenesis, reductive dechlorination discussed in **Section 6.2** requires reducing conditions. In general, oxidizing conditions are greater in the upper zone of the surficial aquifer and above the bluff and reducing conditions are greater in the lower zone of the surficial aquifer and in the floodplain (**Table T2**).

7.3.5 Vertical Migration Potential

As discussed in **Appendix P**, vertical hydraulic gradients in the surficial aquifer at CFFF are primarily downward and low conductivity and low moisture content of the Black Creek confining clay does not allow migration of groundwater from the surficial aquifer to the Black Creek Aquifer. The Black Creek Aquifer has not been impacted by historical operations of CFFF. In the surficial aquifer there is high potential for COPCs to migrate from the upper zone to the lower zone of the surficial aquifer. This potential is evidenced by impacts of COPCs in the lower zone of the surficial aquifer, in particular PCE and Tc-99. Once in the lower zone, these COPCs will continue to migrate laterally in the primary and secondary groundwater flow directions.

7.3.6 Groundwater to Surface Water Pathway

There are three areas of CFFF where groundwater can interact with surface water. These are: the stormwater ditches, the Gator Pond, and Mill Creek (including Upper Sunset Lake, Lower Sunset Lake, and the man-made canal).

7.3.6.1 Stormwater Ditches

Groundwater discharges to the ditches in three deeply incised sections as follows:

- In the Eastern Ditch, the deeply incised section of the ditch extends westward from near the intersection with the Middle Ditch. The portion of the Eastern Ditch west of the dirt roadway (**Figure 3**) is the most deeply incised with an elevation approximately 10 ft deeper west of this road.
- Only the most southern portion of the Middle Ditch consistently receives groundwater discharge.
- The southern portion of the Western Ditch consistently receives groundwater discharge.

Depending on the elevation of the water table as it rises and falls, the remaining portions of the stormwater ditches are either intermittently gaining (receiving groundwater discharge) or are consistently losing streams (dry except for stormwater runoff during precipitation events). The northern reach of the Eastern Ditch receives surface water from wetlands on the north side of Bluff Road (**Figure 10**). Although this ditch flows nearly year- round (upstream of the deeply incised portions of the ditch), this water is the from the wetlands and not the result of groundwater discharge.

7.3.6.2 Pressure Transducer Network

Beginning in March 2021, pressure transducers (In-Situ Inc. Level TROLL 500) were attached to staff gages to monitor surface water elevations with one in the Gator Pond and six in Mill Creek (Canal, Entrance, Upper 2, Upper, Lower and Gator; **Figure 2**). Pressure transducers were also placed in 13 monitoring wells (W-4R, W-15, W-16, W-27, W-60, W-61, W-92, W-96, W-104, W-105, W-124, W-125, and W-126; **Figure 3**) and one piezometer (PZ-1; **Figure 3**) to gather groundwater elevation data. Readings were recorded hourly and used to assess the interaction of surface water and groundwater in these areas. Some of the wells in the floodplain north of Lower Sunset Lake were installed during Phase II of the RI so data in these wells (W-104, W-124, W-125, W-126, and PZ-1) has been collected for a shorter time.

During the nearly yearlong monitoring period, groundwater levels and surface water levels were periodically obtained by field personnel to compare to the transducer data in order to verify that the transducer data represented actual groundwater and surface water elevations. As needed, elevation correction factors were applied to the data sets to accurately (within 0.10 foot) correlate the transducer elevations with those measured in the field. Pressure transducer data download methodology is included in **Appendix E**. Hydrographs of the pressure transducer data and rainfall amounts as measured by the on-site rain gauge (rainfall amounts prior to 5/19/21 are publicly available data from the Columbia Metropolitan Airport located approximately 12 miles west northwest of CFFF) are included in **Appendix X**.

7.3.6.3 Gator Pond

For the evaluation of the groundwater surface water interaction in the Gator Pond, transducers were installed in monitoring wells W-4R (replacement for well W-4), W-15, W-16, W-27, W-60, W-61, and W-92 and a transducer was attached to the Gator Pond staff gage (**Figure 3**). Data obtained from the pressure transducer in well W-4 showed a close correlation to rainfall indicating that the well seal leaked and precipitation had a preferential pathway via the borehole to the water table. Therefore, this well was replaced with W-4R on July 23, 2021 so that accurate water table elevations and groundwater quality data could be collected at this location. Additionally, a small amount of precipitation was getting into the casing of monitoring well W-16, so repairs were made to this well on September 16, 2021, to prevent this from occurring. Surficial aquifer data collected prior to this replacement and repair do not accurately represent the elevation of the water table and are not used in this evaluation.

The man-made Gator Pond was constructed prior to the plant by excavating soil between the present operational area of the site and Lower Sunset Lake, located approximately 115 ft south of the Gator Pond. During construction, less permeable overbank deposit soil (as evidenced by soils encountered during the installation of monitoring wells W-92 and W-4R) was excavated and used to construct a berm (essentially a secondary bluff) on the southern side of the excavated area to impound groundwater discharging from the water table into the excavation, thereby creating the Gator Pond. The low permeability soil in the berm also impedes surface water from infiltrating into the water table along the southern side of the Gator Pond as evidenced by fluoride exceeding its MCL in the surface water in the Gator Pond and not exceeding its MCL in surficial aquifer monitoring wells (W-4R, W-27, and W-92) south of the Gator Pond. The lower portion of the excavation encountered the higher permeability, coarsening downward sands of the water table aquifer, thereby allowing groundwater to readily fill the pond and maintain its surface level.

The berm's low point is in the southeastern corner at an elevation of 117.7 ft above MSL. A sluice in the pond's southwestern corner that allowed drainage into Lower Sunset Lake was removed and backfilled in 1980. This sluice was replaced with a PVC pipe in nearly the same location. This pipe is fitted with a valve that is shut, but still allows a trickle of water to discharge onto the bluff between the Gator Pond and Lower Sunset Lake.

When precipitation fills the Gator Pond above the low point of this berm, surface water slowly runs out of the southeast corner of the pond and onto the land surface. Depending upon the amount of flow, this water either seeps into surficial soils or flows into a man-made ditch that leads into Lower Sunset Lake. Vegetation such as cattails growing along this low point impedes but does not stop flow out of the Gator Pond in this area. Backup at this discharge point allows the water level in the Gator Pond to temporarily exceed the elevation of the low point.

The variation in surface water elevation in the Gator Pond (highest elevation = 117.85 ft above MSL, lowest elevation = 117.33 ft above MSL) was a total of 0.52 ft over the entire monitoring period (March 2021 through March 2022). This stable elevation is the result of the influx of groundwater and the partially impounded low point of the berm allowing the pond to fill higher than its elevation during precipitation events. Groundwater flows into the Gator Pond along the portions of the northern and eastern sides where water table heads are higher than the surface water elevation. Surface water in the Gator Pond flows back into the water table along its eastern flank, western flank, and its bottom. This flow system fits the classic hydrologic model of a flow-through pond.

Influx of surface water into the water table around the Gator Pond creates a groundwater mound that affects the migration of COPCs and thus the configuration of plumes in this area. Groundwater naturally flows from higher heads to lower heads along the path(s) of least resistance. The mounded groundwater creates resistance to the natural flow of upgradient groundwater and deflects its flow around this mounded area. Groundwater in the monitoring well W-16 area has a higher head than the Gator Pond and would therefore discharge into the Gator Pond, whereas the water table head in monitoring well W-15 is lower than the surface water elevation. This would cause groundwater flow in the area near W-15 to deflect around the western side of the Gator Pond. This deflection is evidenced by the shape of the groundwater plumes in this area.

During precipitation events, the water table typically begins to rise before the surface of the Gator Pond. This indicates that precipitation is infiltrating through surficial soils causing the water table to rise. For the monitoring wells on the southern side of the Gator Pond, the rise in the water table may be the result of additional pressure from surface water as precipitation and overland flow fill the pond. The elevation of the surface water in the Gator Pond remained unchanged until the precipitation rate exceeded the rate of influx into the groundwater.

Areas above the bluff have a slower and smaller response to precipitation as evidenced in monitoring well pair W-60/W-61 hydrographs.

7.3.6.4 Mill Creek

For the evaluation of the groundwater surface water interaction in Mill Creek, transducers were installed in monitoring wells W-96, W-104, W-105, W-124, W-125 and W-126, and piezometer PZ-1 near Lower Sunset Lake and a transducer was attached to the Lower staff gage (**Figure 3**). Because the distance of well pair W-27/W-92 is approximately 75 ft from Lower Sunset Lake, albeit on the man-made bluff of the Gator Pond, surficial aquifer elevations in these wells were also included in the Mill Creek groundwater surface water interaction evaluation. There are transducers attached to other staff gages within Mill Creek, but those staff gages are too far from the monitoring well network to be used in the evaluation.

Infiltration of precipitation into groundwater on and/or near the bluff is the driving force on the water table in the floodplain. This observation is particularly evident in the rise in the water table typically starting before the rise of the water level in Lower Sunset Lake. Because the bluff is a relict cut bank created by the Congaree River, the thickness of overbank deposits on the bluff are likely thinner, more permeable, and/or may not be present in some areas on the bluff. The man-made ditch near the bluff north of Lower Sunset Lake removed most, if not all, of the overbank deposit when it was excavated thereby creating a preferential location for infiltration of precipitation in this area.

Grain size analyses of sediment aliquots indicate that sediment lining the bottom of Mill Creek is primarily silt and clay. The low permeability sediment lining Mill Creek has the characteristics of an aquitard, separating surface water in Mill Creek from the surficial aquifer below. In contrast to the higher permeability sediment in the base of the Gator Pond, this aquitard prevents significant interaction between surface water in Mill Creek and groundwater in the more permeable upper surficial aquifer underlying the Creek.

The potentiometric maps (**Figures 18 and 19**) show that the water table on both sides of the Sunset Lakes is several ft below the surface water elevation. As a result, during normal water level conditions, a small amount of surface water may slowly seep into the water table. The water table upgradient of Sunset Lakes is not affected by this seepage under normal water level conditions, whereas the water table downgradient is affected by the seepage as illustrated in higher water table elevations south of Sunset Lakes.

The overall hydraulic gradient on both sides of Sunset Lakes remains towards the Congaree River as illustrated by lower water levels in both the upper and lower zone of the surficial aquifer south of Sunset Lakes. Groundwater mounding around (and beneath) Sunset Lakes appears to deflect COPC migration to the east along Lower Sunset Lake for COPCs migrating east of the Gator Pond. In areas further west, groundwater in the surficial aquifer – lower zone flows beneath the Sunset Lakes, based on trace amounts of cis-1,2-DCE and VC detected in monitoring wells south of the Sunset Lakes.

When surface water levels rise (greater head pressure), the surface area of soil/sediment in contact with surface water and the amount of water being transmitted through these sediments increases. The effects on the water table upgradient of Mill Creek have been observed in the hydrographs; however, this effect is typically localized to areas close to Mill Creek because of the groundwater hydraulic gradient pushing against it. The effects of the increased influx of surface water into the water table due to an increased pressure head was recorded by the transducers during Congaree River flood events on March 26, 2021 and August 22, 2021.

At the start of the March 26 flood, transducers had been placed in the surface water locations (Mill Creek and Gator Pond), but transducers were not installed until March 31st in monitoring wells W-15, W-27 and W-92 around the Gator Pond. This flood resulted from heavy rainfall in the upstate which caused the Congaree River to flood and push water up Mill Creek eventually overtopping the Lower Sunset Lake Dike (elevation = 109.19 ft above MSL) from the downstream side of the dike. The surface water level in Lower Sunset Lake increased 3.20 ft (119.27 ft above MSL to 122.47 ft above MSL) over four days during this flood.

Although the transducers in the monitoring wells were not installed until March 31, 2021, the signal within the water table of this flood is still readily apparent, particularly in well pair W-27/W-92 which is approximately 75 ft from the edge of Lower Sunset Lake (albeit on the man-made bluff of the Gator Pond above Lower Sunset Lake). The water level elevations in both wells were the highest recorded over the one-year monitoring period. Because there was little rain at CFFF preceding the March flood event, the water table upgradient had not risen due to infiltration of precipitation into the water table. This allowed the pressure signal of the influx of surface water into the water table to be observed as far upgradient as monitoring well W-15 located approximately 320 ft upgradient of Lower Sunset Lake. The rise in the water table at W-15 was significantly less (0.13 ft versus what was likely 4-5 ft in well W-92) than in the well pair of W-27/W-92 and the peak of the response in monitoring well W-15 was delayed by 25 hours versus the time when the water table began to fall in the well pair. This delay is the result of the distance that this pressure signal had to travel through the surficial aquifer to cause the rise of the water table elevation in monitoring well W-15.

The August 22nd flood event differs from the March 26th flood event because it was the result of a 4.76 inch precipitation event (the greatest during a 24 hour period over the one-year monitoring period) at CFFF. This flood event was also preceded by 1.02 inches of rain on August 19th. During both precipitation events, the water table rose before either the Gator Pond or Lower Sunset Lake. This flood was also different from the March 26th flood because the surface water elevation in the Gator Pond rose which resulted in a rise in the water table elevation in the wells south of the Gator Pond (W-4R, W-27, and W-92). The water table upgradient of Lower Sunset Lake both above and below the bluff rose prior to the surface water level which increased the pressure head of the water table against surface water infiltrating from Lower Sunset Lake. The surface water elevation rise in the Gator Pond also added to the increased pressure head against water infiltration from Lower Sunset Lake for the wells around the Gator Pond.

The distance between the southern edge of the Gator Pond and the northern edge of Lower Sunset Lake is approximately 115 ft near the W-27/W-92 monitoring well pair. When precipitation events occur which cause both Sunset Lakes and the Gator Pond to rise, groundwater in this area receives surface water infiltration from both bodies. Monitoring well W-92 is screened within the higher conductivity sands of the lower zone of the surficial aquifer on top of the confining clay. Because of the greater hydraulic conductivity in the lower zone, the response of the water table in this zone to both flooding events was greater than the upper zone.

7.3.6.5 Mill Creek – Below the Lower Sunset Lake Dike and Canal

Because Mill Creek below the Lower Sunset Lake Dike spillway is not impounded, there are likely times when the water table is higher than the surface water elevation in Mill Creek and vice versa. Monitoring well W-25 (**Figure 3**) is approximately 120 ft from Mill Creek and 360 ft from the man-made canal. As evidenced by the grain size analysis of the sediment aliquot from Mill Creek prior to reaching the man-made canal (SED-57 1-1.5 ft) and field personnel observation during sediment sample collection, low permeability sediment that acts as an aquitard is present in Mill Creek across the entire CFFF property. Being man-made, excavation of the man-made canal removed the lower permeability overbank deposits at the surface and exposed the coarsening downward, permeable sands.

The low permeability sediment (aquitard) lining the bottom of the undisturbed portions of Mill Creek minimizes, if not precludes, significant interaction between groundwater and surface water. Alternatively, the canal, like Gator Pond, would be a gaining stream or a losing stream depending upon the groundwater and surface water elevations due to the direct interaction of surface water with the coarsening downward, permeable sands of the surficial aquifer.

7.4 Sediment Fate and Transport

Sediment impact occurs in localized, well-defined areas of the Middle Ditch, the Eastern Ditch, the Gator Pond, and Upper and Lower Sunset Lakes. Impacts to sediment in the Gator Pond and Eastern Ditch (except for SVOCs as discussed in **Section 5.4.7**) result from discharge of impacted groundwater to the sediment. Therefore, these impacts are directly related to the fate and transport of impacted groundwater, and sediment in these areas is not subject to sediment fate and transport. SVOC impact to Eastern Ditch sediment is the result of stormwater runoff from the parking lot.

Sediment impacts in the Middle Ditch and Sunset Lakes are the primarily the result of the 1971 rupture of WL I that released an estimated 1.25 million gallons of wastewater and suspended solids into the stormwater ditch system.

Some of the sediment impact in the middle ditch is partly attributed to discharge of impacted groundwater. Sediment analytical results indicated the suspended solids contained fluoride, nitrate, U, and Tc-99. Some of the impacted suspended solids settled in the Middle Ditch while the remaining suspended solids flowed down the Eastern Ditch into Upper Sunset Lake. Upper Sunset Lake is a low flow, low energy surface water body that is part of naturally meandering Mill Creek.

The low flow in Upper Sunset Lake is primarily attributed to diversion of most of the flow of Mill Creek by the man-made canal that has created swamp-like conditions including a thick forest growing in the lake as well as numerous submerged or partially submerged fallen trees. The full impoundment of Lower Sunset Lake created both swamp-like conditions in shallower areas and open water in the main channel along the Lake's northern edge. The predominant flow direction in Sunset Lakes is west to east but, as documented in **Appendix L**, this flow direction can reverse under occasional flood conditions in the Congaree River or heavy precipitation events where discharge from the Eastern and Western Ditches can result in flow to the east and west.

The distribution of COPCs (fluoride, nitrate, U, and Tc-99) in sediment in Upper and Lower Sunset Lakes (**Figures 35 through 37**), suggests that the predominant surface water flow direction within the lakes appears to have been west to east when the 1971 WL I rupture occurred. Wastewater and suspended solids flowing down the Eastern Ditch would have emptied into the middle section of Upper Sunset Lake and flowed towards the Upper Sunset Lake Dike. Most of the suspended solids settled within Upper Sunset Lake with lesser amounts remaining in suspension and flowing into Lower Sunset Lake where the remainder of the impacted suspended solids settled out due to the low flow, nearly stagnant conditions in this portion of Mill Creek. As noted previously, a distinct layer of suspended solids was not observed by field personnel during sediment sample collection. Essentially Upper and Lower Sunset Lakes acted as settling ponds for the suspended solids put into suspension by the rupture of the WL I.

Because of the low flow, low energy depositional environment of Mill Creek, sediment that is deposited or formed by the decomposition of organic materials consists primarily of silt and clay. The impacted suspended solids were incorporated into and buried by additional sediment deposition over the last 50 plus years. Even during flooding events, turbid flow in Sunset Lakes is localized around trees with the large majority of the flow being non-turbid. Because of the cohesive nature of silt and clay, sediment within Mill Creek is resistant to resuspension. This combined with the gentle flow in Sunset Lakes even during flood events resulted in impacted sediment remaining in place for more than 50 years. The impacted sediment is anticipated to remain in place for the foreseeable future because there is no motive force to move the sediment.

Due to the chemical properties (e.g. molecular weight, partitioning coefficients) of fluoride, nitrate, and U, these COPCs have behaved differently since their deposition. U is tightly adsorbed to sediment and has remained within the top foot of sediment (**Figure 37**, **Table 13**). Based upon vertical sediment quality data, fluoride and nitrate (**Figure 35 and 36**) are soluble, not as strongly adsorbed to the sediment, and have migrated downward with the small amount of surface water migrating through the sediment to the water table.

Fluoride and nitrate have gone through cycles of dissolution and adsorption since they were deposited as they equilibrate with both surface water and sediment. Some of the dissolved fluoride and nitrate also likely dissolves into the surface water of Sunset Lakes, albeit at concentrations below MCLs. Routine surface water sampling in Mill Creek by CFFF as a requirement of their NRC operating license as discussed in **Section 4.3.4** has not detected fluoride or nitrate above MCL in the surface water of Sunset Lakes.

8. Baseline Risk Assessment

A BRA is an integral part of EPA programs designed to protect human health and ecological resources from current and potential future threats from chemicals in the environment. EPA defines baseline risks as risks that might exist if no remediation or institutional controls are applied at a site. This BRA for CFFF includes a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) and was submitted to DHEC in August 2022 (AECOM, 2022). The HHRA was conducted in accordance with EPA guidance, principally the *Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual* (Parts A, D, E, and F) (EPA, 1989, 2001a, 2004, and 2009), and *Region 4 Human Health Risk Assessment Supplemental Guidance* (EPA, 2018a). The ERA was conducted in accordance with the *Ecological Risk Assessment Guidance for Superfund*, *Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997), *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (EPA, 2001b), and *USEPA Region 4 Ecological Risk Assessment Supplemental Guidance* (EPA, 2018b).

This BRA was based on site-specific data collected since 2018. Previous risk assessments at the CFFF included a 2014 Preliminary HHRA based on data collected at the facility between 2008 and 2013 and a 2019 Phase 2 Preliminary HHRA based on data collected in 2018. Human health risks for this updated evaluation were considered for both current and potential future exposure scenarios based on current chemical concentrations detected in environmental media. Media sampled included groundwater, soil, surface water, sediment, vegetation, and fish tissue. Samples were collected as part of this RI of the site as well as the ongoing radiological monitoring program. Concentrations of chemicals in the air due to soil particles (dust) and due to volatile chemicals entering indoor air from groundwater were estimated using simple models.

8.1 Human Health Risk Assessment

In the initial phase of the HHRA, maximum detected concentrations in potential exposure media were compared to conservative screening levels, and background levels if available. Chemicals that exceeded screening values and background values were identified as chemicals of potential concern (COPCs) for human health. The HHRA then calculated current and future cancer risks and noncancer hazards to human receptors from potentially complete exposure pathways for the COPCs identified in soil and surface water. Risk and hazard from groundwater consumption was not calculated because DHEC considers groundwater exceedances of drinking water standards to indicate a potentially significant impact. The chemicals with groundwater exceedances, all of which were within the central area of the site, were identified as COPCs and retained as chemicals of concern (COCs). In addition, risk was calculated for inhalation of chemicals in shallow groundwater that could enter indoor air as a result of vapor intrusion (VI). Most sediment was not evaluated in the HHRA because sediments in the water bodies on the site are covered by surface water, which prevents substantial human exposure. In the shallow ditch within the facility, sediment could be exposed during dry periods, so it was also evaluated as soil.

Receptors evaluated under both current and future conditions included a groundskeeper, ditch maintenance worker, construction worker, indoor worker, and fisher. Receptors evaluated under future conditions included adult, child, and adolescent residents, assumed to live on the site. No COCs were identified for any receptor based on the risk and hazard calculations.

8.2 Ecological Risk Assessment

In the initial phase of the ERA, maximum detected concentrations in exposure media (soil, surface water, sediment, vegetation, and fish tissue) were compared to conservative, ecological screening values to calculate hazard quotients. If the hazard quotient was greater than or equal to 1, the chemical was identified as a constituent of potential ecological concern (COPEC) for that medium and exposure area. The conservative, initial screening identified preliminary COPECs in surface water and sediment. No preliminary COPECs were identified in soil, vegetation, or fish tissue.

In surface water, the preliminary COPECs identified in Upper Sunset Lake, Lower Sunset Lake, Gator Pond, and facility ditches were one or more of the following inorganics: aluminum, fluoride, iron, manganese, nickel, and zinc. In sediment, the preliminary COPECs identified in Upper Sunset Lake, Lower Sunset Lake, Mill Creek, Gator Pond, and facility ditches were one or more of the following: acetone, benzaldehyde, polycyclic aromatic hydrocarbons, PCE, aluminum, barium, beryllium, calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, vanadium, and zinc.

The preliminary COPECs identified in the initial, conservative screening were further evaluated in the next phase, a refinement screening that used a generally less conservative approach to focus on those chemicals in each exposure area and medium that may have a greater potential to pose a risk to the ecological assessment endpoints at the site. The refined COPECs in surface water initially selected by the screening were iron in Upper Sunset Lake and iron, nickel, and zinc in the ditches within the facility. No refined COPECs were identified in sediment of any of the water bodies.

The refined COPECs in surface water initially selected by the refinement screening were then evaluated further using readily available lines of evidence. Bioaccumulative chemicals in sediment were also evaluated for their ability to pose risk to upper-trophic-level wildlife. This evaluation determined that the refined COPECs initially identified in surface water, and potentially bioaccumulative chemicals in sediment, do not have the potential to pose significant risk to ecological receptors. Accordingly, none of the chemicals in surface water or sediment at the CFFF were found to warrant retention as final COPECs, and further evaluation of ecological risk in the ERA was determined not to be needed.

9. Summary and Conclusions

9.1 Summary

From June 2019 through October 2021, the source, nature, and extent of impacts from historical operations of CFFF were assessed in soil, groundwater, surface water and sediment. During the RI,

- 91 soil and/or lithologic borings were completed;
- 103 soil samples were collected;
- a private water supply well survey was conducted within 1 mile of the property boundary;
- four private water supply wells were sampled;
- 120 groundwater samples were collected from temporary wells;
- 57 additional permanent monitoring wells were installed;
- permanent monitoring wells were sampled semi-annually, including 118 wells in October 2021;
- 12 surface water samples were collected;
- 172 sediment samples were collected;
- five aliquots of sediment and 13 soil samples were analyzed for grain size;
- six locations within CFFF's surface water bodies had pressure transducers installed on staff gages to continuously monitor surface water elevations;
- 13 monitoring wells and one piezometer had pressure transducers installed to continuously monitor groundwater elevations;
- 21 slug tests were conducted in 21 monitoring wells;
- bathymetric surveys of the Gator Pond, Upper Sunset Lake, and Lower Sunset Lake were performed; and
- the borings, new wells, staff gage locations and portions of the stormwater ditches were surveyed.

This data and historical facility information were used to determine the source, nature, and extent of COPCs, create a conceptual site model, and prepare a BRA.

9.1.1 Source, Nature, and Extent Assessment

Historical impacts at CFFF occur in five categories: 1) operations within the Chemical Area OU, 2) operations with the Western Storage Area OU, 3) operations within the CFFF's wastewater treatment system areas (Wastewater Treatment Area and West Lagoons Area OUs), 3) the 1971 rupture of WL I, and 4) discharge of groundwater impacted with site COPCs to surface water.

Soil samples collected in locations where Tc-99 could potentially have been released indicate that a vadose zone source for Tc-99 does not exist. Concentrations of CVOCs in soil are minimal (**Table 8**), occur only in the shallow subsurface (1-2 ft BLS) and will continue to attenuate. Because deeper (7-8 ft BLS) CVOC soil samples did not contain detectable concentrations of CVOCs in the highest areas of CVOC impact to groundwater and the highest areas of CVOCs in soil gas, a vadose source for leaching (source area) of CVOCs to groundwater does not exist within accessible areas. CFFF has discontinued use of PCE, so possible future impact has been eliminated. Soil beneath the Chemical Area OU will be removed during site decommissioning, regardless of the presence of CVOCs.

Groundwater at CFFF is impacted with CVOCs, nitrate, fluoride, U and Tc-99 above their respective MCLs (**Figures 23 through 31**). The groundwater plumes at CFFF are in the central portion of the site with the CVOC plumes having the largest footprint (**Figure 32**). Currently, there is approximately 2,100 ft from the farthest downgradient extent of the COPC plumes to the nearest property boundary.

The primary source of CVOC groundwater impact was in the Western Storage Area OU, but, as noted above, there is no remaining source within this OU. The SOLX area of the Chemical Area OU is a secondary source of CVOC impact to groundwater. Sources of impact of nitrate in groundwater are the Wastewater Treatment Area OU and WL II. Fluoride source areas are the Wastewater Treatment Area OU and the plant area (Chemical Area OU) north of monitoring well W-77. Sources for groundwater impact with U include areas of known impact beneath the plant building in the Chemical Area OU (2008/2011 wastewater line breaches, SOLX) and the plant area north of monitoring well W-77. The Wastewater Treatment Area OU and/or chemical operations involving uranium in the area north of W-77 (including the Chemical Area OU) are potential source areas for Tc-99 impacts to groundwater, however; current site operations do not have the potential to introduce significant quantities of Tc-99 into the environment. Attempting to relate current Tc-99 groundwater conditions to a specific historic event would be speculative (Westinghouse, 2020b).

Surface water within the Gator Pond is impacted with fluoride above its MCL and nitrate below its MCL from discharge of impacted groundwater (**Figure 33**). Surface water in the deeply incised portion of the Eastern Ditch is impacted with PCE above its MCL and TCE and nitrate below their MCL by the discharge of impacted groundwater (**Figure 33**).

Sediment in the Gator Pond is impacted with nitrate, fluoride, and Tc-99 (**Figure 34**) due to impacted groundwater discharging through the sediment into the Gator Pond. Sediment in the remaining areas of the pond is subsequently impacted by COPCs settling out from surface water (Tc-99) and adsorption of COPCs (fluoride and nitrate) from surface water onto sediment. Sediment in the southern portion of the Middle Ditch (**Figure 34**) and in Sunset Lakes is impacted with nitrate, fluoride, U, and minimally with Tc-99 (**Figures 35 through 37**) from the discharge (ditches only) of impacted groundwater and/or historical facility operations. Similar to sediment in the Gator Pond, COPCs migrating in surface water in the Eastern Ditch can adsorb to sediment in Sunset Lakes.

9.1.2 Conceptual Site Model

The shallow subsurface of CFFF consists of overbank deposits underlain by a coarsening downward sand comprising the surficial aquifer both above and below the bluff, thereby forming one continuous surficial aquifer with differing ages of deposition. These sediments were deposited by the Congaree River which is currently located approximately 3 miles southwest of the site. The Black Creek Aquifer confining clay underlies the coarsening downwards sands across the entire site.

Groundwater beneath the site generally flows to the south southwest with components of flow to the west, south, and southeast. Groundwater near WL II flows both north and south in the lower zone of the surficial aquifer as a result of a hydraulic barrier created by a ridge in the confining clay and lower than typical permeability of the aquifer sands. Historical releases that occurred in the operational areas of CFFF impacted groundwater, but the vadose zone sources of these impacts are either so depleted that they no longer can impact groundwater or are in inaccessible areas of the site (e.g. beneath the plant building). Inaccessible, potential vadose zone sources for groundwater impact will be removed during the decommissioning of CFFF. These groundwater impacts are confined to the surficial aquifer only.

The Gator Pond and Mill Creek deflects the migration of COPCs in groundwater. The Gator Pond receives discharge of impacted groundwater in the northeastern portion of the pond with the remainder of the pond recharging the water table with surface water due to its excavation into the permeable subsurface sands. The near constant head in the Gator Pond causes most of the groundwater flowing in its vicinity to migrate around it to the east or the west due to groundwater mounding.

Mill Creek is lined with a low permeability clayey silt that acts as an aquitard to the migration between surface water and groundwater. Impoundment of Mill Creek has resulted in the surface water elevation being consistently above that of the water table upstream of the Lower Sunset Lake Dike. The surface water that does seep through the aquitard causes minimal groundwater mounding beneath Mill Creek (Upper and Lower Sunset Lakes) that locally deflects groundwater migration to the east.

Below the Lower Sunset Lake Dike, Mill Creek is not impounded. The aquitard lining Mill Creek would inhibit, if not prevent, discharge of groundwater to Mill Creek if/when the water table elevation is higher than surface water and vice versa. Because the canal was excavated, the surface water in the canal is in direct contact with the water table. Groundwater discharges to the canal when its elevation is higher than the surface water in the canal and vice versa.

The hydraulic gradient in the floodplain is much lower than the hydraulic gradient above the bluff. This inhibits the overall rate of groundwater migration and increases the deflection effect of COPC migration in the area north of Lower Sunset Lake.

Discharge of groundwater to the deeply incised, westernmost portion of the Eastern Ditch causes groundwater in the upper zone of the surficial aquifer to migrate more westerly than the lower zone of the surficial aquifer. Groundwater in this area is impacted with CVOCs and nitrate. Surface water in this portion of the Eastern Ditch contains PCE above its MCL and TCE and nitrate below their respective MCLs.

Conditions within the floodplain beneath Upper and Lower Sunset Lakes are ideal for naturally occurring, reductive dechlorination of CVOCs. In less than 1,200 linear ft, as portions of the main PCE plume flows beneath these surface water bodies, PCE is dechlorinated as demonstrated by the detection and subsequent decrease of the daughter compound vinyl chloride to below detection limits in wells downgradient of the lakes.

Impacted groundwater will remain within the property boundary as a result of:

- the slow groundwater flow velocity in the floodplain,
- the groundwater fate and transport properties of the COPCs such as diffusion, adsorption, and advection,
- the natural breakdown of CVOCs in the floodplain, and
- the distance to the closest property boundary.

Sediment in the Middle Ditch and Sunset Lakes are impacted with fluoride, nitrate, U, and minimally with Tc-99 by historical operations (e.g. the 1971 rupture of WL I). The low flow, low energy swamp in Sunset Lakes combined with the cohesive properties of the clayey silt sediment, and the deposition of additional clayey silt sediment over time on top of the impacted sediment will prevent migration of impacted sediment.

A visual, 3-dimensional CSM using data collected during previous investigations and during the RI was developed. The CSM evolves through site investigation and remediation life cycles. At different stages in the investigation and remedy analysis, CSMs serve different purposes. CFFF has completed the assessment of the source, nature, and extent of COPCs. The purpose of the investigation CSM is to support the decision process, leading to interim remedial action if necessary (based on the data assessed in this report, there are no interim remedial actions at CFFF), remedial investigation, feasibility analysis, and selection of a site remedy. Incorporation of the data collected during the RI into the CSM reshaped the CSM into a more effective decision-making tool. Selected outputs of the current CSM, known as Rev. 4, are contained in **Appendix Y**.

9.1.3 Baseline Risk Assessment

The Baseline Risk Assessment indicates that historical impacts of various media do not represent a current risk to human health or the environment. Future risk associated with the highly conservative residential-use scenario will be addressed during facility decommissioning.

9.2 Conclusions

Over 50 years of operations at CFFF have resulted in limited impacts to various media. The source, nature and extent of these impacts have been well defined by the RI, remain within the facility property boundary and are anticipated to remain within the property boundary. The impacts to groundwater are attenuating through various natural processes documented in **Section 6.3**. The BRA indicates that the impacts pose no risk to human health or the environment.

9.3 Recommendations

The following are recommendations based on the data collected during the RI:

- a groundwater fate and transport model should be developed to predict when the COPCs in groundwater will attenuate and/or remain in a steady state condition, and
- a feasibility study should be conducted to determine the most appropriate methods to remediate the identified impacts as necessary.

Preparation of the groundwater fate and transport model is part of the feasibility study and will be used to assess which remedial options are appropriate for CFFF.

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Tables

Table 1 - Monitoring Well Construction Details
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Well Number	Northing	Easting	Date Installed	Ground Surface Elevation (ft msl)	Top of Casing Elevation (ft msl)	Casing Stickup (ft)	Well Diameter (in)	Casing Type	Total Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Classification
W-RW-1	745689.8390	2024255.5150	4/1/1995	136.00	136.95	0.95	4.0	Steel	32.17	10	22-32	Surficial - Lower Zone
W-RW2	745325.1547	2023458.2190	3/10/1995	136.98	139.93	2.95	4.0	Steel	28.40	10	18.5-28.5	Surficial - Lower Zone
W-3A	744340.2273	2023926.2926	6/11/1985	117.64	120.08	2.44	2.0	PVC	82.86	10	73-83	Black Creek
W-4R	744339.0788	2023932.0410	7/23/2021	117.27	119.82	2.55	2.0	PVC	14.55	10	4.5-14.5	Surficial - Upper Zone
W-6	744963.2941	2024109.6154	5/15/1980	136.96	136.46	-0.50	2.0	PVC	27.80	5	23-28	Surficial - Lower Zone
W-7A	744907.4275	2023872.2237	2/19/1992	132.94	135.06	2.12	2.0	PVC	17.95	5	13-18	Surficial - Upper Zone
W-10	744897.8502	2023659.8964	5/14/1980	136.89	136.81	-0.08	2.0	PVC	22.31	5	17.5-22.5	Surficial - Upper Zone
W-11	744743.0468	2023914.5566	5/14/1980	138.45	140.76	2.31	2.0	PVC	24.97	3	22-25	Surficial - Upper Zone
W-13R	744648.7070	2024279.2522	10/8/2010	136.38	136.13	-0.25	2.0	PVC	20.53	5	15.5-20.5	Surficial - Upper Zone
W-14	744603.1956	2024478.6507	5/4/1988	136.22	137.83	1.61	2.0	PVC	28.91	5	24-29	Surficial - Upper Zone
W-15	744663.4226	2023716.7929	5/15/1980	126.67	127.90	1.23	2.0	PVC	20.71	5	15.5-20.5	Surficial - Upper Zone
W-16	744602.3196	2024060.2560	5/15/1980	125.50	125.96	0.46	2.0	PVC	14.15	3	11-14	Surficial - Upper Zone
W-17	745055.2186	2023785.3818	5/30/1980	137.57	139.27	1.70	2.0	PVC	27.97	5	23-28	Surficial - Lower Zone
W-18R	745012.6889	2023939.2527	Unknown	137.15	136.71	-0.44	2.0	PVC	27.60	5	22.5-27.5	Surficial - Lower Zone
W-19B	746172.6764	2022552.9543	3/17/1995	140.58	142.85	2.27	4.0	PVC	40.67	10	30.5-40.5	Surficial - Lower Zone
W-20	743739.6310	2022975.3834	7/10/1980	113.27	116.16	2.89	2.0	PVC	15.61	5	10.5-15.5	Surficial - Upper Zone
W-22	744960.9243	2024116.3963	7/12/1980	137.08	136.51	-0.57	2.0	PVC	15.10	5	10-15	Surficial - Upper Zone
W-23R	744674.7363	2024851.2620	7/22/2011	137.45	140.47	3.02	2.0	PVC	20.93	5	16-21	Surficial - Upper Zone
W-24	746742.5552	2027344.7554	7/9/1980	139.83	141.94	2.11	2.0	PVC	14.99	5	10-15	Surficial - Upper Zone
W-25	742114.3330	2022728.9859	7/9/1980	114.98	115.88	0.90	2.0	PVC	27.37	5	22.5-27.5	Surficial - Upper Zone
W-26	744855.2926	2023417.6899	7/11/1980	140.59	142.21	1.62	2.0	PVC	30.65	5	25.5-30.5	Surficial - Upper Zone
W-27	744383.9028	2023708.2286	7/13/1980	120.22	121.87	1.65	2.0	PVC	14.77	5	10-15	Surficial - Upper Zone
W-28	745121.7794	2024317.4127	7/13/1980	136.98	138.88	1.90	2.0	PVC	15.30	5	10-15	Surficial - Upper Zone
W-29	745182.7704	2024101.6410	7/12/1980	136.96	138.61	1.65	2.0	PVC	13.96	5	9-14	Surficial - Upper Zone
W-30	745095.1563	2024150.8369	7/11/1980	136.87	138.81	1.94	2.0	PVC	14.83	5	10-15	Surficial - Upper Zone
W-32	744742.1011	2023919.8088	7/15/1980	138.33	140.34	2.01	2.0	PVC	21.89	5	17-22	Surficial - Upper Zone
W-33	745402.9946	2023548.6640	7/15/1980	138.06	139.33	1.27	2.0	PVC	19.86	5	15-20	Surficial - Lower Zone
W-35	745716.6972	2024227.9328	2/18/1992	136.59	139.07	2.48	2.0	PVC	20.38	5	15.5-20.5	Surficial - Upper Zone
W-36	746084.8252	2024573.1745	2/19/1992	134.16	136.29	2.13	2.0	PVC	19.80	5	15-20	Surficial - Upper Zone
W-37	745407.3901	2024230.7318	2/11/1992	136.58	139.04	2.46	2.0	PVC	20.41	5	15.5-20.5	Surficial - Upper Zone
W-38	745250.3065	2024192.9679	2/18/1992	136.71	136.51	-0.20	2.0	PVC	20.15	5	15-20	Surficial - Upper Zone
W-39	745587.4130	2023656.6724	1/27/1994	139.08	141.15	2.07	2.0	PVC	23.04	10	13-23	Surficial - Upper Zone
W-40	745646.5324	2024112.4795	7/18/1984	136.42	139.26	2.84	2.0	PVC	14.38	10	4.5-14.5	Surficial - Upper Zone
W-41R	745372.8885	2023252.5925	Unknown	131.02	133.81	2.79	2.0	PVC	24.34	10	14.5-24.5	Surficial - Upper Zone
W-42	745072.3463	2023203.3177	1/27/1994	137.83	140.96	3.13	2.0	PVC	29.89	10	20-30	Surficial - Upper Zone
W-43	745904.3053	2023600.1186	1/27/1994	138.09	141.33	3.24	2.0	PVC	21.01	10	11-21	Surficial - Upper Zone

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W-44	745579.8931	2022950.1077	2/1/1994	131.93	134.86	2.93	2.0	PVC	27.04	10	17-27	Surficial - Lower Zone
W-45	745644.0322	2024296.0965	7/18/1984	137.20	140.02	2.82	2.0	PVC	15.38	10	5.5-15.5	Surficial - Upper Zone
W-46	745154.5936	2023494.4570	3/27/1995	132.39	134.74	2.35	4.0	PVC	25.85	10	16-26	Surficial - Lower Zone
W-47	744633.7657	2023515.8706	3/31/1995	140.70	141.90	1.20	4.0	PVC	45.60	10	34.5-44.5	Surficial - Lower Zone
W-48	744913.2226	2023290.4438	3/30/1995	139.74	142.56	2.82	4.0	PVC	41.68	10	31.5-41.5	Surficial - Lower Zone
W-49	745073.2286	2023192.6302	3/15/1995	137.82	140.25	2.43	2.0	PVC	117.77	10	108-118	Black Creek
W-50	745637.2219	2024107.3993	3/21/1995	136.79	139.58	2.79	2.0	PVC	125.01	10	115-125	Black Creek
W-51	745583.8582	2024270.8300	9/19/2018	136.67	136.51	-0.16	2.0	PVC	14.71	5	9.5-14.5	Surficial - Upper Zone
W-52	745542.3624	2024260.1657	9/19/2018	136.71	136.19	-0.52	2.0	PVC	15.52	5	10.5-15.5	Surficial - Upper Zone
W-53	745495.9968	2024247.5619	9/19/2018	136.83	136.54	-0.29	2.0	PVC	15.75	5	11-16	Surficial - Upper Zone
W-54	745442.5511	2024229.9796	9/19/2018	136.79	136.52	-0.27	2.0	PVC	15.82	5	11-16	Surficial - Upper Zone
W-55	745397.6509	2024214.0049	9/20/2018	136.90	136.63	-0.27	2.0	PVC	15.24	5	10-15	Surficial - Upper Zone
W-56	745351.3097	2024203.7460	9/20/2018	136.83	136.68	-0.15	2.0	PVC	15.13	5	10-15	Surficial - Upper Zone
W-57	745307.4270	2024190.7853	9/20/2018	136.90	136.73	-0.17	2.0	PVC	15.12	5	10-15	Surficial - Upper Zone
W-58	745254.0864	2024176.3347	9/18/2018	136.85	136.37	-0.48	2.0	PVC	15.47	5	10.5-15.5	Surficial - Upper Zone
W-59	745219.3681	2024165.8802	9/18/2018	136.10	136.42	0.32	2.0	PVC	14.65	5	9.5-14.5	Surficial - Upper Zone
W-60	745835.5835	2023286.8131	10/8/2018	137.25	140.20	2.95	2.0	PVC	37.87	5	33-38	Surficial - Lower Zone
W-61	745829.2570	2023288.2599	10/9/2018	137.34	140.60	3.26	2.0	PVC	23.50	10	13.5-23.5	Surficial - Upper Zone
W-62	745485.4613	2022726.0792	10/9/2018	125.63	128.38	2.75	2.0	PVC	24.85	5	20-25	Surficial - Lower Zone
W-63	745098.1342	2023019.4184	10/10/2018	138.78	141.02	2.24	2.0	PVC	41.90	5	37-42	Surficial - Lower Zone
W-64	744643.8030	2023511.3331	10/10/2018	140.15	142.75	2.60	2.0	PVC	31.60	10	21.5-31.5	Surficial - Upper Zone
W-65	745693.7040	2024027.4543	10/12/2018	138.17	140.95	2.78	2.0	PVC	31.69	5	26.5-31.5	Surficial - Lower Zone
W-66	745687.8186	2024027.1699	10/12/2018	138.01	140.91	2.90	2.0	PVC	22.35	10	12.5-22.5	Surficial - Upper Zone
W-67	744459.5852	2024485.7938	10/15/2018	132.60	135.26	2.66	2.0	PVC	31.81	10	22-32	Surficial - Upper Zone
W-68	745329.2457	2022496.2174	11/1/2018	113.40	116.53	3.13	2.0	PVC	18.14	5	13-18	Surficial - Lower Zone
W-69	745726.9177	2026064.2900	6/11/2019	137.67	140.64	2.97	2.0	PVC	18.08	10	8-18	Surficial - Upper Zone
W-70	745719.2209	2026062.8740	6/20/2019	138.02	141.00	2.98	2.0	PVC	48.92	5	44-49	Surficial - Lower Zone
W-71	745716.6462	2026052.3340	9/19/2019	137.96	140.72	2.77	2.0	PVC	102.83	10	93-103	Black Creek
W-72	745450.2503	2024162.6920	6/30/2019	136.81	136.29	-0.53	2.0	PVC	15.01	10	5-15	Surficial - Upper Zone
W-73	745339.3056	2024166.2500	6/30/2019	136.85	136.45	-0.40	2.0	PVC	16.00	10	6-16	Surficial - Upper Zone
W-74	745325.1257	2024067.1720	9/17/2019	136.64	139.93	3.29	2.0	PVC	30.60	5	25.5-30.5	Surficial - Lower Zone
W-75	745317.2335	2024064.7580	9/17/2019	136.60	139.85	3.25	2.0	PVC	15.33	10	5.5-15.5	Surficial - Upper Zone
W-76	745181.1851	2024223.5230	6/29/2019	137.04	136.85	-0.19	2.0	PVC	15.14	10	5-15	Surficial - Upper Zone
W-77	745158.9297	2024346.1090	9/18/2019	136.85	136.53	-0.32	2.0	PVC	15.62	10	5.5-15.5	Surficial - Upper Zone
W-78	745117.7529	2024371.0300	9/19/2019	136.75	136.31	-0.44	2.0	PVC	15.57	10	5.5-15.5	Surficial - Upper Zone
W-79	745200.3957	2024450.2660	6/29/2019	136.49	136.12	-0.38	2.0	PVC	15.67	10	5.5-15.5	Surficial - Upper Zone

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W-80	745024.3899	2024414.6850	6/29/2019	136.34	135.87	-0.47	2.0	PVC	15.75	10	5.5-15.5	Surficial - Upper Zone
W-81	744938.6049	2024469.8490	6/29/2019	136.81	136.43	-0.39	2.0	PVC	15.69	10	5.5-15.5	Surficial - Upper Zone
W-82	744895.9297	2024594.1720	6/29/2019	136.57	136.23	-0.34	2.0	PVC	15.62	10	5.5-15.5	Surficial - Upper Zone
W-83	744975.0629	2024667.4890	6/29/2019	136.22	135.81	-0.41	2.0	PVC	26.43	10	16.5-26.5	Surficial - Upper Zone
W-84	745177.2489	2024721.4980	6/30/2019	136.66	135.99	-0.67	2.0	PVC	20.97	10	11-21	Surficial - Upper Zone
W-85	745079.7122	2025107.6820	6/11/2019	135.74	138.69	2.95	2.0	PVC	44.82	5	40-45	Surficial - Lower Zone
W-86	745082.2852	2025100.8040	6/11/2019	135.68	138.77	3.09	2.0	PVC	35.08	10	25-35	Surficial - Upper Zone
W-87	745952.7641	2024385.8120	6/30/2019	136.66	136.39	-0.27	2.0	PVC	33.15	5	28-33	Surficial - Lower Zone
W-88	746574.7739	2022883.9580	6/17/2019	140.06	143.10	3.04	2.0	PVC	41.38	5	36.5-41.5	Surficial - Lower Zone
W-89	746583.3384	2022888.2490	6/13/2019	140.12	142.82	2.70	2.0	PVC	25.53	10	15.5-25.5	Surficial - Upper Zone
W-90	745981.1215	2022011.5510	6/13/2019	140.23	143.33	3.10	2.0	PVC	39.99	5	35-40	Surficial - Lower Zone
W-91	745976.3596	2022016.7650	6/13/2019	139.57	142.81	3.24	2.0	PVC	25.07	10	15-25	Surficial - Upper Zone
W-92	744382.4699	2023714.9210	6/12/2019	120.11	123.33	3.22	2.0	PVC	33.78	5	29-34	Surficial - Lower Zone
W-93	745162.2579	2024346.8430	9/18/2019	136.87	136.49	-0.38	2.0	PVC	35.36	5	30.5-35.5	Surficial - Lower Zone
W-94	744728.0254	2021983.5560	9/17/2019	115.28	118.04	2.76	2.0	PVC	29.48	5	24.5-29.5	Surficial - Lower Zone
W-95	744375.6603	2022553.4620	9/17/2019	113.53	116.40	2.86	2.0	PVC	33.43	5	28.5-33.5	Surficial - Lower Zone
W-96	743746.7835	2024643.8120	9/17/2019	113.65	116.46	2.81	2.0	PVC	29.96	5	25-30	Surficial - Upper Zone
W-97	744244.0503	2024547.7590	9/17/2019	113.92	116.93	3.01	2.0	PVC	18.94	5	14-19	Surficial - Upper Zone
W-98	745190.4186	2022894.5358	1/29/2021	135.52	138.65	3.13	2.0	PVC	26.72	10	17-27	Surficial - Upper Zone
W-99	745123.5105	2023640.5364	1/27/2021	129.78	133.84	4.06	2.0	PVC	19.77	5	16-21	Surficial - Lower Zone
W-100	745126.2199	2023636.3622	1/28/2021	129.47	133.47	4.00	2.0	PVC	11.07	5	7-12	Surficial - Upper Zone
W-102	745090.1200	2024124.4415	12/9/2020	137.08	136.86	-0.22	2.0	PVC	33.72	5	28.5-33.5	Surficial - Lower Zone
W-103	744466.6874	2024483.1317	1/27/2021	132.56	134.87	2.32	2.0	PVC	39.41	5	34.5-39.5	Surficial - Lower Zone
W-104	744154.7155	2024875.5065	1/25/2021	115.45	118.48	3.03	2.0	PVC	17.37	10	7.5-17.5	Surficial - Upper Zone
W-105	743843.4667	2024138.0034	1/26/2021	114.80	117.57	2.77	2.0	PVC	24.13	10	14-24	Surficial - Upper Zone
W-106	744431.5527	2023371.3176	2/15/2021	115.68	118.69	3.01	2.0	PVC	29.66	5	24.5-29.5	Surficial - Lower Zone
W-107	744034.1147	2023252.1811	1/25/2021	112.27	115.23	2.96	2.0	PVC	34.39	5	29-34	Surficial - Lower Zone
W-108	743611.3486	2023295.2256	1/28/2021	111.93	115.41	3.49	2.0	PVC	32.35	5	27-32	Surficial - Lower Zone
W-109	743731.8238	2022981.0635	1/28/2021	112.81	115.68	2.87	2.0	PVC	32.15	5	27-32	Surficial - Lower Zone
W-110	744051.9526	2022508.2574	1/27/2021	113.21	116.42	3.21	2.0	PVC	33.69	5	29-34	Surficial - Lower Zone
W-111	744378.2719	2022564.9340	1/26/2021	113.68	116.92	3.24	2.0	PVC	81.16	5	76-81	Surficial - Lower Zone
W-112	744101.6181	2022027.5127	1/27/2021	112.93	116.07	3.14	2.0	PVC	33.76	5	29-34	Surficial - Lower Zone
W-113	746811.1979	2024004.2673	7/28/2021	135.66	138.55	2.89	2.0	PVC	36.16	5	31-36	Surficial - Lower Zone
W-114	746806.0447	2024001.4779	7/29/2021	135.54	138.75	3.21	2.0	PVC	20.34	10	10-20	Surficial - Upper Zone
W-115	746784.3022	2023435.7961	7/27/2021	139.06	141.71	2.66	2.0	PVC	45.69	5	40.5-45.5	Surficial - Lower Zone
W-116	746778.9455	2023433.2473	7/26/2021	138.99	141.91	2.92	2.0	PVC	20.25	10	10-20	Surficial - Upper Zone

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W-117	746432.6567	2023237.7007	7/27/2021	140.82	143.76	2.94	2.0	PVC	43.79	5	39-44	Surficial - Lower Zone
W-118	746437.2354	2023241.0797	7/28/2021	140.78	143.74	2.96	2.0	PVC	29.49	10	19.5-29.5	Surficial - Upper Zone
W-119	746515.7592	2023805.6944	7/23/2021	139.48	142.24	2.75	2.0	PVC	30.25	5	25-30	Surficial - Upper Zone
W-120	745967.1436	2024014.3529	7/29/2021	139.26	142.34	3.08	2.0	PVC	33.80	5	29-34	Surficial - Lower Zone
W-121	745966.7263	2024008.0883	7/29/2021	139.12	142.24	3.11	2.0	PVC	22.12	10	12-22	Surficial - Upper Zone
W-122	746087.7639	2024559.8114	7/20/2021	134.29	136.84	2.55	2.0	PVC	30.60	5	25-30	Surficial - Lower Zone
W-123	744647.8048	2024283.6868	7/20/2021	136.30	136.05	-0.25	2.0	PVC	34.23	5	29-34	Surficial - Lower Zone
W-124	744153.4184	2024882.8990	7/22/2021	115.26	117.73	2.47	2.0	PVC	30.91	5	26-31	Surficial - Lower Zone
W-125	743837.3108	2024142.2790	7/21/2021	114.65	117.84	3.19	2.0	PVC	45.01	5	40-45	Surficial - Lower Zone
W-126	743747.3364	2024650.4112	7/22/2021	113.53	115.89	2.36	2.0	PVC	42.48	5	37.5-42.5	Surficial - Lower Zone
PZ-1	743745.6668	2024637.1258	7/21/2021	113.54	116.27	2.74	2.0	PVC	16.75	10	7-17	Surficial - Upper Zone
Gator SG	744600.5136	2023820.4020	7/16/2019	NS	120.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Canal SG	743544.9360	2019700.8031	3/26/2021	NS	110.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Entrance SG	745852.1977	2020536.5766	3/26/2021	NS	112.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Upper SG	744292.2317	2023220.4190	7/16/2019	NS	112.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Upper 2 SG	745845.6181	2020600.6309	4/20/2021	NS	112.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower SG	743333.8536	2024092.0010	7/16/2019	NS	112.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Creek SG	743263.2548	2024076.8640	7/16/2019	NS	109.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
ft = feet
in = inches
ft msl = feet above mean sea level
ft bgs = feet below ground surface
NS - not surveyed
N/A - not applicable
SG - staff gauge
Top of casing and ground surface elevations surveyed by AECOM during November 2018, November 2019, April 2021 and August 2021.
Horizontal coordinates are referenced to the State Plane Coordinate System and the North American Datum of 1983 (NAD 83).
Vertical locations are referenced to the North American Vertical Datum of 1988 (NAVD 88).

Environmental Media	Sample Location	Sample Depth (Feet BLS)	Site Location	Figure	Rationale	Analyses
Soil	SS-1	0-1, 1-3, 3-5, 5-7	Adjacent to calcium fluoride storage pad	6	Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-2	0-1, 1-3, 3-5, 5-7	Adjacent to calcium fluoride storage pad		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-3	0-1, 1-3, 3-5, 5-7	Southern Storage Area		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-4	0-1, 1-3, 3-5, 5-7	Southern Storage Area		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-5	0-1, 1-3, 3-5, 5-7	Southern Storage Area		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-6	0-1, 1-3, 3-5, 5-7	Southern Storage Area		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-7	0-1, 1-3, 3-5, 5-7	Adjacent to the uranium hexafluoride cylinder recertification building		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-8	0-1, 1-3, 3-5, 5-7	Adjacent to the uranium hexafluoride cylinder recertification building		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-9	0-1, 1-3, 3-5, 5-7	Adjacent to the uranium hexafluoride cylinder recertification building		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-10	0-1, 1-3, 3-5, 5-7	Adjacent to the uranium hexafluoride cylinder recertification building		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-11	0-1, 1-3, 3-5, 5-7	Vicinity of uranyl nitrate bulk storage dike outer wall		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-12	0-1, 1-3, 3-5, 5-7	Vicinity of uranyl nitrate bulk storage dike outer wall		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-13	0-1, 1-3, 3-5, 5-7	Vicinity of uranyl nitrate bulk storage dike outer wall		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-14	0-1, 1-3, 3-5, 5-7	Southern end of uranyl nitrate offloading area		Potential source evaluation based upon facility knowledge of where Tc-99 may have been historically released	Tc-99
	SS-17	3-4, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-18	2-3, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-19	6-7, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-20	1-2, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-21	1-2, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-22	6-7, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-23	6-7, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-24	3-4, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-25	5-6, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-26	3-4, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-27	1-2, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-28	1-2, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	SS-29	4-5, 7-8	Western Storage Area		Potential CVOC source evaluation based upon soil gas survey results	CVOCs
	L-28	0-2, 2-5	West of the operational area	7	Assessment of near-surface soil properties	Grain size
	L-31	0-3, 3-5	South of Upper Sunset Lake		Assessment of near-surface soil properties	Grain size
	L-35	0-3, 3-5	South of Upper Sunset Lake		Assessment of near-surface soil properties	Grain size
	L-42	0-2	North of Lower Sunset Lake		Assessment of near-surface soil properties	Grain size
	L-45	0-1, 1-2, 2-5	Northern Storage Area		Assessment of near-surface soil properties	Grain size
	L-58	0-2	West of the operational area		Assessment of near-surface soil properties	Grain size
	L-59	0-2	West of the operational area		Assessment of near-surface soil properties	Grain size
	W-101	0-2	Southern Storage Area		Assessment of near-surface soil properties	Grain size

Environmental Media	Sample Location	Sample Depth (Feet BLS)	Site Location	Figure	Rationale	Analyses
Groundwater	L-1	10-15, 28-33, 48-53, 63-68, 78-83	Floodplain	7	Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-2	NA	Upper Sunset Lake Dike		Assess the lithology of the floodplain	NA
	L-3	NA	Upper Sunset Lake Dike		Assess the lithology of the floodplain	NA
	L-4	NA	Upper Sunset Lake Dike		Assess the lithology of the floodplain	NA
	L-5	NA	Floodplain		Assess the lithology of the floodplain	NA
	L-6	NA	Floodplain		Assess the lithology of the floodplain	NA
	L-7	NA	Floodplain		Assess the lithology of the floodplain	NA
	L-8	8-13, 17-22, 25-30, 41-46	Floodplain		Assess the surficial aquifer north of Lower Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-9	10-15, 23-28, 32-37	Floodplain		Assess the surficial aquifer north of Lower Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-10	9-14, 18-23, 28-33	Floodplain		Assess the surficial aquifer north of Lower Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-11	NA	West Lagoons Area		Assess the depth to the Black Creek confining clay to understand if W-39 is screened in the upper or lower zone of the surficial aquifer	CVOCs, Nitrate, Flouride
	L-12	NA	West of the operational area		Assess the lithology of the area between the operational area and the western portion of the site	CVOCs, Nitrate, Flouride
	L-13	NA	West of the operational area		Assess the lithology of the area between the operational area and the western portion of the site	CVOCs, Nitrate, Flouride
	L-14	NA	West of the operational area		Assess lithology between the plant and the western portion of the site to attempt to identify a preferential flow path for CVOC impact in monitoring well W-19B	CVOCs, Nitrate, Flouride
	L-15	NA	West of the operational area		Assess lithology between the plant and the western portion of the site to attempt to identify a preferential flow path for CVOC impact in monitoring well W-19B	CVOCs, Nitrate, Flouride
	L-16	NA	West of the operational area		Assess lithology between the plant and the western portion of the site to attempt to identify a preferential flow path for CVOC impact in monitoring well W-19B	CVOCs, Nitrate, Flouride
	L-17	15-20, 25-30	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-18	15-20, 24-29	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-19	7-12, 21-26	Floodplain		Assess the surficial aquifer north of Lower Sunset Lake for COPC migration	CVOCs, Nitrate, Flouride
	L-20	12-16, 20-28	On the bluff south of the operational area		Groundwater COPC delineation east of well W-67	CVOCs, nitrate, total and dissolved Tc-99
	L-21	28-32	Western Storage Area		Assess the extent of CVOC impact upgradient of monitoring well W-87	CVOCs
	L-22	8-12, 26-30	Western Storage Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-23	12-16, 20-24	West Lagoons Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-24	11-15, 25-29	West Lagoons Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-25	21.5-25.5, 38-42	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-26	25-29, 39-43	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-27	23-27, 30-34, 39-43	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-28	18-22, 27-31, 36-40	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-29	13-17, 26-30	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-30	12-16, 22-26, 29-34	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-31	13-17, 22-26, 30-34	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-32	8-12, 19-23, 31-35	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-33	13-17, 24-28	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-34	14-18, 26-30	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs
	L-35	11-15, 21-25, 30-34	Floodplain		Assess the surficial aquifer south of Upper Sunset Lake for COPC migration	CVOCs, nitrate, flouride, total and dissolved Tc-99
	L-36	18-22, 27.5-31.5	Floodplain		Assess the surficial aquifer south of Lower Sunset Lake for COPC migration	CVOCs, nitrate, flouride, total and dissolved Tc-99
	L-37	17-21,26-30	Upper Sunset Lake Dike		Assess the groundwater quality beneath Upper and Lower Sunset Lakes	CVOCs, nitrate, flouride, total and dissolved Tc-99
	L-38	17-21, 26-30	Upper Sunset Lake Dike		Assess the groundwater quality beneath Upper and Lower Sunset Lakes	CVOCs, nitrate, flouride, total and dissolved Tc-99
	L-39	31-35	Southern Storage Area		Delineate the eastern extent of Tc-99 impact in the lower zone of the surficial aquifer	CVOCs, total and dissolved Tc-99
	L-40	33-37	Southern Storage Area		Delineate the eastern extent of Tc-99 impact in the lower zone of the surficial aquifer	CVOCs, total and dissolved Tc-99
	L-41	31-35	Chemical Area		Delineate the eastern extent of Tc-99 impact in the lower zone of the surficial aquifer	CVOCs, total and dissolved Tc-99
	L-42	24-28, 36-40	Floodplain		Delineate fluoride in the floodplain downgradient of boring L-19 and upgradient of Lower Sunset Lake	Flouride, total and dissolved Tc-99
	L-43	29.5-33.5	Wastewater Treatment Area		Delineate the upgradient extent of Tc-99 impact in the lower zone of the surficial aquifer	Total and dissolved Tc-99
	L-44	27-31	Western Storage Area		Delineate CVOC impact upgradient of monitoring well W-93	CVOCs
	L-45	11-15, 20-24, 29-33	Northern Storage Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-46	14-18, 22-26, 31-35	Northern Storage Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-47	16-20, 29-29	North of the West Lagoons Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-48	16-20, 30-34, 40.5-44.5	Northern Storage Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-49	15-19, 29-33, 37.5-41.5	North of the West Lagoons Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-50	20-24, 46-50	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-51	21-25, 41-45	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-52	18-22, 30-34, 39-43	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-53	18-22, 30-34, 44.5-48.5	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-54	24-28	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-55	18-22, 31-35, 40-44	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-56	22-26, 33-37, 41-45	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-57	26-30, 42-46	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-58	23-27, 31-35, 40-44	West of the operational area		Assess the extent of CVOC impact in the western portion of the site	CVOCs
	L-59	16-20, 31-35, 46-50	West of the operational area		Assess the preferential flow path between the plant and the western portion of the site	CVOCs
	L-60	16-20, 26-30, 36-40	West of the operational area		Assess the upgradient extent of CVOC impact	CVOCs
	L-61	15-19, 25-29, 35-39	North of the Northern Storage Area		Assess the upgradient extent of CVOC impact	CVOCs
	L-62	26-30	Northern Storage Area		Assess the extent of CVOC impact upgradient of monitoring well W-87	CVOCs

Environmental Media	Sample Location	Sample Depth (Feet BLS)	Site Location	Figure	Rationale	Analyses
Groundwater	W-69	See Table 1 for screened interval	Northeast of the operational area	3	Background concentrations in the surficial aquifer	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-70	See Table 1 for screened interval	Northeast of the operational area		Background concentrations in the surficial aquifer	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-71	See Table 1 for screened interval	Northeast of the operational area		Background concentrations in the Black Creek Aquifer	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-72	See Table 1 for screened interval	West of the plant building		Assess the horizontal extent of U impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-73	See Table 1 for screened interval	West of the plant building		Assess the horizontal extent of U impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-74	See Table 1 for screened interval	West of the plant building		Assess the vertical extent of U impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-75	See Table 1 for screened interval	West of the plant building		Assess the horizontal extent of U impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-76	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-77	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-78	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-79	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-80	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-81	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-82	See Table 1 for screened interval	South of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-83	See Table 1 for screened interval	East of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-84	See Table 1 for screened interval	East of the plant building		Sentinel well around the plant building	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-85	See Table 1 for screened interval	East of the plant building		Assess groundwater quality in an area without existing monitorng wells	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-86	See Table 1 for screened interval	East of the plant building		Assess groundwater quality in an area without existing monitorng wells	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-87	See Table 1 for screened interval	Northwest cornern of the plant building		Assess the extent of CVOCs upgradient of known impact in W-65	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-88	See Table 1 for screened interval	Western portion of the site		Assess the horizontal extent of CVOCs upgradient of known impact in W-19B	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-89	See Table 1 for screened interval	Western portion of the site		Assess the vertical extent of CVOCs upgradient of known impact in W-19B	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-90	See Table 1 for screened interval	Western portion of the site		Assess the horizontal extent of CVOCs side gradient of known impact in W-19B	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-91	See Table 1 for screened interval	Western portion of the site		Assess the vertical extent of CVOCs side gradient of known impact in W-19B	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-92	See Table 1 for screened interval	South of the Gator Pond		Assess the vertical extent of COPC impacts near the Gator Pond	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-93	See Table 1 for screened interval	South of the plant building		Assess the vertical extent of COPC impacts near the plant building and wastewater lagoons.	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-94	See Table 1 for screened interval	Floodplain		Assess the downgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-95	See Table 1 for screened interval	Floodplain		Assess the downgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-96	See Table 1 for screened interval	Floodplain		Assess the downgradient extent of COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-97	See Table 1 for screened interval	Floodplain		Assess the downgradient extent of COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-98	See Table 1 for screened interval	South of Denley Cemetery		Assess the downgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-99	See Table 1 for screened interval	West of the Sanitary Lagoon		Assess groundwater quality near the Sanitary Lagoon	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-100	See Table 1 for screened interval	West of the Sanitary Lagoon		Assess groundwater quality near the Sanitary Lagoon	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-102	See Table 1 for screened interval	Between the East and North Lagoons		Assess the upgradient extent of Tc-99 impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-103	See Table 1 for screened interval	Top of the bluff, south of the operational area		Assess the vertical, downgradient extent of CVOCs of known impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-104	See Table 1 for screened interval	Floodplain		Assess the horizontal, sidegradient extent of known COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-105	See Table 1 for screened interval	Floodplain		Assess the horizontal, downgradient extent of known COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-106	See Table 1 for screened interval	Upper Sunset Lake Dike		Assess groundwater quality beneath Sunset Lakes	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-107	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Lower Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-108	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Lower Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-109	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Lower Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-110	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Upper Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-111	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Upper Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-112	See Table 1 for screened interval	Floodplain		Assess groundwater quality south of Upper Sunset Lake	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-113	See Table 1 for screened interval	North of the operational area		Assess the vertical, upgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-114	See Table 1 for screened interval	North of the operational area		Assess the horizontal, upgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-115	See Table 1 for screened interval	West of the operational area		Assess the vertical, upgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-116	See Table 1 for screened interval	West of the operational area		Assess the horizontal, upgradient extent of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-117	See Table 1 for screened interval	West of the operational area		Longterm monitoring of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-118	See Table 1 for screened interval	West of the operational area		Longterm monitoring of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-119	See Table 1 for screened interval	West of the operational area		Longterm monitoring of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-120	See Table 1 for screened interval	West of the operational area		Longterm monitoring of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-121	See Table 1 for screened interval	West of the operational area		Longterm monitoring of CVOC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-122	See Table 1 for screened interval	North of the plant building		Assess the vertical extent of CVOCs upgradient of known impact in W-87	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-123	See Table 1 for screened interval	South of the operational area		Assess the vertical extent of CVOC and Tc-99 impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-124	See Table 1 for screened interval	Floodplain		Assess the vertical, sidegradient extent of known COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-125	See Table 1 for screened interval	Floodplain		Assess the horizontal, downgradient extent of known COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	W-126	See Table 1 for screened interval	Floodplain		Assess the horizontal, downgradient extent of known COPC impact	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	MW-4R	See Table 1 for screened interval	South of the Gator Pond		Replacement well for monitoring well W-4	VOCs, fluoride, nitrate, ammonia, isotopic U, Tc-99, gross alpha, gross beta
	PZ-1	See Table 1 for screened interval	Floodplain		Screened in the uppermost sand to assist in the groundwater - surface water evaluation	NA

Table 2 - Remedial Investigation Sample Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Environmental Media	Sample Location	Sample Depth (Feet BLS)	Site Location	Figure	Rationale	Analyses
Surface Water	SW-11	NA	Eastern Ditch	9	Assess background stormwater quality upstream of the facility	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-12	NA	Eastern Ditch		Assess background stormwater quality upstream of the facility	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-13	NA	Eastern Ditch		Asssess surface water quality upstream of the operational area	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-14	NA	Eastern Ditch		Asssess surface water quality downstream of the operational area	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-16	NA	Middle Ditch		Asssess surface water quality within the Middle Ditch upstream of the Eastern Ditch	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-17	NA	Eastern Ditch		Asssess surface water quality within the deeply incised portion of the Eastern Ditch	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-18	NA	Eastern Ditch		Asssess surface water quality within the Eastern Ditch before it empties into Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-19	NA	Upper Sunset Lake		Asssess surface water quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-20	NA	Upper Sunset Lake		Asssess surface water quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-21	NA	Lower Sunset Lake		Asssess surface water quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-22	NA	Lower Sunset Lake		Asssess surface water quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SW-23	NA	Gator Pond		Asssess surface water quality within the Gator Pond	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
Sediment	SED-11	0-0.5	Eastern Ditch	9	Assess background sediment quality upstream of the facility	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-12	0-0.5	Eastern Ditch		Assess background sediment quality upstream of the facility	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-13	0-0.5	Eastern Ditch		Asssess sediment quality upstream of the operational area	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-14	0-0.5	Eastern Ditch		Asssess sediment quality downstream of the operational area	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-15	0-0.5	Middle Ditch		Asssess sediment quality within the Middle Ditch	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-16	0-0.5, 0-0.5, 0.5-1	Middle Ditch		Asssess sediment quality within the Middle Ditch	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-17	0-0.5, 0-0.5, 0.5-1	Eastern Ditch		Asssess sediment quality within the deeply incised portion of the Eastern Ditch	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-18	0-0.5	Eastern Ditch		Asssess sediment quality within the Eastern Ditch before it empties into Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-19	0-0.5, 0-0.5, 0.5-1, 1-1.5	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-20	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-21	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-22	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-23	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Gator Pond		Asssess sediment quality within the Gator Pond	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-24	0-0.5, 0-0.5, 0.5-1, 1-1.5	Gator Pond		Asssess sediment quality within the Gator Pond	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-25	0-0.5	Sanitary Lagoon		Asssess sludge quality within the Sanitary Lagoon	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, isotopic U, and Tc-99
	SED-26	0-0.5	Sanitary Lagoon		Asssess sludge quality within the Sanitary Lagoon	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, isotopic U, and Tc-99
	SED-27	0-0.5	East Lagoon		Asssess sludge quality within the East Lagoon	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, isotopic U, and Tc-99
	SED-28	0-0.5	East Lagoon		Asssess sludge quality within the East Lagoon	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, isotopic U, and Tc-99
	SED-29	0-0.5, 0-0.5, 0.5-1, 1-1.5	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-30	0-0.5, 0.5-1, 1-1.33	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-31	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-32	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-33	0-0.5, 0.5-1, 1-1.33	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-34	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-35	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-36	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-37	0-0.5, 0.5-1	Mill Creek below the Lower Sunset Lake Dike		Asssess sediment quality within Mill Creek downstream of the Lower Sunset Lake Dike	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99
	SED-38	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-39	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-40	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-41	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-42	0-0.5, 0-0.5, 0.5-1, 1-2, 2-3	Lower Sunset Lake		Asssess sediment quality within Lower Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-43	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-44	0-0.5, 0-0.5, 0.5-1, 1-1.5	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-45	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-46	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-47	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-48	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-49	0-0.5, 0-0.5, 0.5-1	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-50	0-0.5, 0-0.5, 0.5-1, 1-2	Upper Sunset Lake		Asssess sediment quality within Upper Sunset Lake	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-51	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-52	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-53	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-54	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-55	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-56	0-0.5, 0.5-1	Between the Canal and the Entrance Dike		Asssess background sediment quality within Mill Creek	Ammonia, fluoride, nitrate, TAL metals, TCL SVOCs, TCL VOCs, isotopic U, and Tc-99*
	SED-57	0-0.5, 0.5-1, 1-1.5	Mill Creek upstream of the Canal		Asssess background U concentrations within Mill Creek	Isotopic U
	SED-58	0-0.5, 0.5-1	Mill Creek upstream of the Canal		Asssess background U concentrations within Mill Creek	Isotopic U
	SED-59	0-0.5, 0.5-1	Mill Creek upstream of the Canal		Asssess background U concentrations within Mill Creek	Isotopic U
	SED-60	0-0.5, 0.5-1	Middle Ditch		Assess COPC impact to the Middle Ditch in the vicinity of SED-16	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99
	SED-61	0-0.5, 0.5-1, 1-1.5	Middle Ditch		Assess COPC impact to the Middle Ditch in the vicinity of SED-16	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99
	SED-62	0-0.5, 0.5-1	Gator Pond		Assess COPC impact in the Gator Pond	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99
	SED-63	0-0.5, 0.5-1	Gator Pond		Assess COPC impact in the Gator Pond	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99
	SED-64	0-0.5, 0.5-1	Gator Pond		Assess COPC impact in the Gator Pond	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99
	SED-65	0-0.5, 0.5-1	Gator Pond		Assess COPC impact in the Gator Pond	Fluoride, nitrate, CVOCs, isotopic U, and Tc-99

Environmental Media	Sample Location	Sample Depth (Feet BLS)	Site Location	Figure	Rationale	Analyses
Sediment (continued)	SED-66	0-0.5, 0.5-1, 1-2	Upper Sunset Lake	9	Assess COPC impact near the Lower Sunset Lake Dike	Fluoride, nitrate, TCL VOCs, isotopic U, and Tc-99
	SED-67	0-0.5, 0.5-1, 1-2	Upper Sunset Lake		Assess COPC impact near the Lower Sunset Lake Dike	Fluoride, nitrate, TCL VOCs, isotopic U, and Tc-99
	SED-68	0-0.5, 0.5-1, 1-2	Upper Sunset Lake		Assess COPC impact near the Lower Sunset Lake Dike	Fluoride, nitrate, TCL VOCs, isotopic U, and Tc-99
	B-1**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-2**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-3**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-4**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-5**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-6**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-7**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	B-8**	0-0.5, 0.5-1	Upper Sunset Lake		Assess radiological impact to Upper Sunset Lake in the vicinity of SED-44	Isotopic U, Tc-99
	SED-16	0-1	Middle Ditch		Assess grain size distribution in sediment	Grain size
	SED-20	0-1	Upper Sunset Lake		Assess grain size distribution in sediment	Grain size
	SED-21	1-2	Lower Sunset Lake		Assess grain size distribution in sediment	Grain size
	SED-40	0-1	Lower Sunset Lake		Assess grain size distribution in sediment	Grain size
	SED-57	1-1.5	Mill Creek upstream of the Canal		Assess grain size distribution in sediment	Grain size

Notes:
BLS - below land surface
Tc-99 - technetium-99
CVOCs - chlorinated volatile organic compounds
NA - not applicable
TAL - target analyte list
TCL - target compund list
SVOCs - semivolatile organic compounds
VOCs - volatile organic compounds
U - uranium
* - Phase II sediment samples analyzed for fluoride, nitrate, CVOCs, isotopic U and Tc-99
** - B-1 through B-8 sediment sample locations shown on the Leidos Technical Basis Document in Appenidx H

Table 3 - Private Water Supply Well Survey Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Map ID	Address/Designation	Latitude	Longitude	Richland County Tax Map ID #
1	150 Hopkins Park Road	-	-	R21400-01-11
2	7028 Lower Richland Blvd	-	-	R21400-01-27
3	7040 Lower Richland Blvd	-	-	R21400-01-39
4	7048 Lower Richland Blvd	-	-	R21400-01-16
5	7064 Lower Richland Blvd	-	-	R21400-01-30
6	7071 Lower Richland Blvd	-	-	R21400-02-65
7	7072 Lower Richland Blvd	-	-	R21400-01-17
8	7131 Lower Richland Blvd	-	-	R21400-02-61
9	7152 Lower Richland Blvd	-	-	R21400-01-24
10	5943 Bluff Road	-	-	R21400-03-09
11	6001 Bluff Road	-	-	R21400-03-02
12	6041 Bluff Road	-	-	R21400-03-05
13	6045 Bluff Road	-	-	R21400-03-06
14	1012 Coley Road	-	-	R18705-01-05
15	1109 Coley Road	-	-	R18800-02-18B
16	1113 Coley Road	-	-	R18700-03-04
17	1122 Coley Road	-	-	R18705-01-08
18	1243 Coley Road	-	-	R18706-02-02
19	1249 Coley Road	-	-	R18706-02-03
20	1249 Coley Road	-	-	R18706-02-04
21	109 Nicie Byrd Way	-	-	R18800-02-19
22	117 Nicie Byrd Way	-	-	R18800-02-50
23	125 Nicie Byrd Way	-	-	R18800-02-49
24	133 Nicie Byrd Way	-	-	R18800-02-48
25	100 Pincushion Road	-	-	R18700-04-09
26	WSW-01	33.8892625	-80.93917313	R15900-01-06
27	IWSW-01	33.88717942	-80.92577294	R15900-01-06
28	IWSW-02	33.88875406	-80.92383756	R15900-01-06
29	WSW-02	33.85836279	-80.9297476	R18500-01-02
30	WSW-03	33.87559353	-80.94351638	R15700-01-01
31	WSW-04	33.84324651	-80.93413056	R15600-01-02

Table 4 - Groundwater Levels and Elevations
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Well/ Gage	Date	Screen Interval (ft BLS)	TOC Elevation (ft)	Depth To Water (ft BTOC)	Water Elevation (ft)
W-RW1	10/4/2021	22 - 32	136.95	8.73	128.22
W-RW2	10/4/2021	18.5 - 28.5	139.93	18.37	121.56
W-3A	10/4/2021	73 - 83	120.08	6.78	113.30
W-4R	10/4/2021	4.5 - 14.5	119.82	11.18	108.64
W-6	10/4/2021	23 - 28	136.46	10.33	126.13
W-7A	10/4/2021	13 - 18	135.06	11.57	123.49
W-10	10/4/2021	17.5 - 22.5	136.81	15.79	121.02
W-11	10/4/2021	22 - 25	140.76	18.23	122.53
W-13R	10/4/2021	15 - 20	136.13	12.40	123.73
W-14	10/4/2021	24 - 29	137.83	16.67	121.16
W-15	10/4/2021	15.5 - 20.5	127.90	11.93	115.97
W-16	10/4/2021	11 - 14	125.96	4.02	121.94
W-17	10/4/2021	23 - 28	139.27	14.12	125.15
W-18R	10/4/2021	22.5 - 27.5	136.71	14.07	122.64
W-19B	10/4/2021	30.5 - 40.5	142.85	24.62	118.23
W-20	10/4/2021	10.5 - 15.5	116.16	8.78	107.38
W-22	10/4/2021	10 - 15	136.51	10.80	125.71
W-23R	10/4/2021	16 - 21	140.47	18.61	121.86
W-24	10/4/2021	10 - 15	141.94	9.72	132.22
W-25	10/4/2021	22.5 - 27.5	115.88	9.56	106.32
W-26	10/4/2021	25.5 - 30.5	142.21	25.38	116.83
W-27	10/4/2021	10 - 15	121.87	10.40	111.47
W-28	10/4/2021	10 - 15	138.88	11.72	127.16
W-29	10/4/2021	9 - 14	138.61	11.49	127.12
W-30	10/4/2021	10 - 15	138.81	11.83	126.98
W-32	10/4/2021	17 - 22	140.34	18.80	121.54
W-33	10/4/2021	15 - 20	139.33	15.59	123.74
W-35	10/4/2021	15.5 - 20.5	139.07	10.87	128.20
W-36	10/4/2021	15 - 20	136.29	7.68	128.61
W-37	10/4/2021	15.5 - 20.5	139.04	11.11	127.93
W-38	10/4/2021	15 - 20	136.51	9.20	127.31
W-39	10/4/2021	13 - 23	141.15	15.74	125.41
W-40	10/4/2021	4.5 - 14.5	139.26	11.04	128.22
W-41R	10/4/2021	14.5 - 24.5	133.81	15.46	118.35
W-42	10/4/2021	20 - 30	140.96	25.37	115.59
W-43	10/4/2021	11 - 21	141.33	14.62	126.71
W-44	10/4/2021	17 - 27	134.86	17.99	116.87
W-45	10/4/2021	5.5 - 15.5	140.02	11.90	128.12
W-46	10/4/2021	16 - 26	134.74	13.73	121.01
W-47	10/4/2021	34.5 - 44.5	141.90	26.02	115.88
W-48	10/4/2021	31.5 - 41.5	142.56	26.26	116.30
W-49	10/4/2021	108 - 118	140.25	28.96	111.29
W-50	10/4/2021	115 - 125	139.58	23.37	116.21
W-51	10/4/2021	9.5 - 14.5	136.51	8.35	128.16
W-52	10/4/2021	10.5 - 15.5	136.19	8.32	127.87
W-53	10/4/2021	11 - 16	136.54	8.53	128.01
W-54	10/4/2021	11 - 16	136.52	8.62	127.90
W-55	10/4/2021	10 - 15	136.63	8.80	127.83
W-56	10/4/2021	10 - 15	136.68	8.77	127.91
W-57	10/4/2021	10 - 15	136.73	9.03	127.70
W-58	10/4/2021	10.5 - 15.5	136.37	9.18	127.19
W-59	10/4/2021	9.5 - 14.5	136.42	9.17	127.25
W-60	10/4/2021	33 - 38	140.20	21.55	118.65
W-61	10/4/2021	13.5 - 23.5	140.60	17.98	122.62
W-62	10/4/2021	20 - 25	128.38	13.00	115.38
W-63	10/4/2021	37 - 42	141.02	26.53	114.49
W-64	10/4/2021	21.5 - 31.5	142.75	26.26	116.49
W-65	10/4/2021	26.5 - 31.5	140.95	13.23	127.72
W-66	10/4/2021	12.5 - 22.5	140.91	12.89	128.02
W-67	10/4/2021	22 - 32	135.26	17.70	117.56
W-68	10/4/2021	13 - 18	116.53	6.67	109.86
W-69	10/4/2021	8 - 18	140.64	8.50	132.14
W-70	10/4/2021	44 - 49	141.00	12.55	128.45
W-71	10/4/2021	93 - 103	140.72	24.10	116.62
W-72	10/4/2021	5 - 15	136.29	8.40	127.89
W-73	10/4/2021	6 - 16	136.45	8.68	127.77
W-74	10/4/2021	25.5 - 30.5	139.93	12.62	127.31
W-75	10/4/2021	5.5 - 15.5	139.85	12.23	127.62
W-76	10/4/2021	5 - 15	136.85	9.53	127.32
W-77	10/4/2021	5.5 - 15.5	136.53	8.97	127.56
W-78	10/4/2021	5.5 - 15.5	136.31	10.13	126.18
W-79	10/4/2021	5.5 - 15.5	136.12	8.17	127.95
W-80	10/4/2021	5.5 - 15.5	135.87	9.47	126.40
W-81	10/4/2021	5.5 - 15.5	136.43	11.25	125.18
W-82	10/4/2021	5.5 - 15.5	136.23	11.80	124.43
W-83	10/4/2021	16.5 - 26.5	135.81	12.73	123.08

Table 4 - Groundwater Levels and Elevations
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Well/ Gage	Date	Screen Interval (ft BLS)	TOC Elevation (ft)	Depth To Water (ft BTOC)	Water Elevation (ft)
W-84	10/4/2021	11 - 21	135.99	6.25	129.74
W-85	10/4/2021	40 - 45	138.69	24.22	114.47
W-86	10/4/2021	25 - 35	138.77	19.12	119.65
W-87	10/4/2021	28 - 33	136.39	7.55	128.84
W-88	10/4/2021	36.5 - 41.5	143.10	22.61	120.49
W-89	10/4/2021	15.5 - 25.5	142.82	21.10	121.72
W-90	10/4/2021	35 - 40	143.33	26.64	116.69
W-91	10/4/2021	15 - 25	142.81	26.48	116.33
W-92	10/4/2021	29 - 34	123.33	16.05	107.28
W-93	10/4/2021	30.5 - 35.5	136.49	9.45	127.04
W-94	10/4/2021	24.5 - 29.5	118.04	10.13	107.91
W-95	10/4/2021	28.5 - 33.5	116.40	8.87	107.53
W-96	10/4/2021	25 - 30	116.46	9.40	107.06
W-97	10/4/2021	14 - 19	116.93	5.89	111.04
W-98	10/4/2021	17 - 27	138.65	24.33	114.32
W-99	10/4/2021	16 - 21	133.84	12.38	121.46
W-100	10/4/2021	7 - 12	133.47	10.55	122.92
W-102	10/4/2021	28.5 - 33.5	136.86	10.13	126.73
W-103	10/4/2021	34.5 - 39.5	134.87	18.46	116.41
W-104	10/4/2021	7.5 - 17.5	118.48	7.61	110.87
W-105	10/4/2021	14 - 24	117.57	10.51	107.06
W-106	10/4/2021	24.5 - 29.5	118.69	11.32	107.37
W-107	10/4/2021	29 - 34	115.23	7.97	107.26
W-108	10/4/2021	27 - 32	115.41	8.27	107.14
W-109	10/4/2021	27 - 32	115.68	8.47	107.21
W-110	10/4/2021	29 - 34	116.42	8.98	107.44
W-111	10/4/2021	76 - 81	116.92	6.10	110.82
W-112	10/4/2021	29 - 34	116.07	8.45	107.62
W-113	10/4/2021	31 - 36	138.55	10.54	128.01
W-114	10/4/2021	10 - 20	138.75	10.00	128.75
W-115	10/4/2021	40.5 - 45.5	141.71	17.89	123.82
W-116	10/4/2021	10 - 20	141.91	17.37	124.54
W-117	10/4/2021	39 - 44	143.76	21.89	121.87
W-118	10/4/2021	19.5 - 29.5	143.74	19.71	124.03
W-119	10/4/2021	25 - 30	142.24	15.28	126.96
W-120	10/4/2021	29 - 34	142.34	14.00	128.34
W-121	10/4/2021	12 - 22	142.24	14.03	128.21
W-122	10/4/2021	25 - 30	136.84	8.32	128.52
W-123	10/4/2021	29 - 34	136.05	13.82	122.23
W-124	10/4/2021	26 - 31	117.73	10.62	107.11
W-125	10/4/2021	40 - 45	117.84	10.79	107.05
W-126	10/4/2021	37.5 - 42.5	115.89	8.85	107.04
PZ-1	10/4/2021	7 - 17	116.27	8.99	107.28
Canal SG	10/4/2021	NA	110.01	1.73	107.74
Entrance SG	10/4/2021	NA	112.57	0.75	109.31
Upper 2 SG	10/4/2021	NA	112.56	0.90	109.47
Upper SG	10/4/2021	NA	112.41	1.06	109.47
Lower SG	10/4/2021	NA	112.39	0.89	109.28
Creek SG	10/4/2021	NA	109.05	NM	NM
Gator SG	10/4/2021	NA	120.31	1.46	117.77

Notes:
ft BLS - feet below land surface
ft - feet
ft BTOC - feet below top of casing
NA - not applicable
NM - not measured

Table 5 - Hydraulic Conductivity Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Well Number	Zone	Test Type	Hydraulic Conductivity (K)		Average Hydraulic Cond. (K)	
			cm/sec	ft/day	cm/sec	ft/day
W-RW1	Lower	Pump	4.51E-03	12.80	4.51E-03	12.80
W-RW2	Lower	Pump	1.76E-04	0.50	1.76E-04	0.50
W-6	Lower	Falling	2.15E-04	0.61	1.78E-04	0.51
		Rising	1.41E-04	0.4		
W-11	Lower	Falling	2.22E-05	0.06	2.08E-05	0.06
		Rising	1.94E-05	0.06		
W-13R	Upper	Falling	3.46E-03	9.80	3.51E-03	9.95
		Rising	3.56E-03	10.09		
W-15	Upper	Falling	1.96E-03	5.56	1.96E-03	5.55
		Rising	1.95E-03	5.53		
W-19B	Lower	Falling	3.05E-03	8.65	2.98E-03	8.44
		Rising	2.90E-03	8.23		
W-26	Upper	Falling	4.90E-04	1.39	4.90E-04	1.39
W-33	Lower	Rising	2.10E-04	0.60	2.10E-04	0.60
W-35	Upper	Falling	5.30E-03	15.03	5.30E-03	15.03
W-39	Upper	Rising	1.17E-03	3.33	1.08E-03	3.06
		Falling	9.80E-04	2.78		
W-41R	Upper	Rising	3.70E-03	10.49	3.70E-03	10.49
W-48	Lower	Falling	2.12E-04	0.60	1.97E-04	0.56
		Rising	1.83E-04	0.52		
W-60	Lower	Falling	4.71E-02	133.70	4.41E-02	125.20
		Rising	4.11E-02	116.70		
W-61	Upper	Falling	1.79E-03	5.09	1.81E-03	5.12
		Rising	1.82E-03	5.15		
W-65	Lower	Falling	8.78E-04	2.49	7.05E-04	2.00
		Rising	5.32E-04	1.51		
W-67	Upper	Falling	6.81E-04	1.93	6.24E-04	1.77
		Rising	5.68E-04	1.61		
W-68	Lower	Falling	1.64E-03	4.64	1.75E-03	4.96
		Rising	1.86E-03	5.28		
W-94	Lower	Falling	1.65E-03	4.67	1.87E-03	5.31
		Rising	2.09E-03	5.94		
W-95	Lower	Falling	2.11E-02	59.84	1.51E-02	42.95
		Rising	9.19E-03	26.05		
W-96	Upper	Falling	1.45E-02	41.19	2.07E-02	58.58
		Rising	2.68E-02	75.97		
W-97	Upper	Falling	2.75E-02	78.00	2.84E-02	80.45
		Rising	2.92E-02	82.89		
W-98	Upper	Falling	3.70E-04	1.05	3.67E-04	1.04
		Rising	3.63E-04	1.03		
W-103	Lower	Falling	4.31E-03	12.23	4.27E-03	12.10
		Rising	4.22E-03	11.97		
W-117	Lower	Falling	4.68E-03	13.27	3.66E-03	10.37
		Rising	2.63E-03	7.47		
W-118	Upper	Falling	2.21E-03	6.27	2.08E-03	5.91
		Rising	1.95E-03	5.54		
W-119	Upper	Falling	1.29E-02	36.52	8.47E-03	24.02
		Rising	4.06E-03	11.51		
W-120	Lower	Falling	1.54E-03	4.37	1.44E-03	4.08
		Rising	1.33E-03	3.78		
W-126	Lower	Falling	1.02E-02	28.91	8.48E-03	24.05
		Rising	6.76E-03	19.18		
				Average Conductivity	5.80E-03	16.44

Notes: cm/sec - centimeters per second
ft/day - feet per day

Table 6 - Summary of Horizontal Hydraulic Gradients
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Date	Zone	Location	Well ID	WL Elev (ft)	Well ID	WL Elev (ft)	distance (ft)	dWL (ft)	HG (ft/ft)
10/4/2021	Upper Surficial	Above the bluff	W-35	128.20	W-67	117.56	1283	10.64	0.00829
10/4/2021	Upper Surficial	Above the bluff	W-36	128.61	W-42	115.59	1704	13.02	0.00764
10/4/2021	Upper Surficial	Above the bluff	W-69	132.14	W-89	121.72	3289	10.42	0.00317
10/4/2021	Lower Surficial	Above the bluff	W-70	128.45	W-123	122.23	2077	6.22	0.00299
10/4/2021	Lower Surficial	Above the bluff	W-113	128.01	W-19B	118.23	1586	9.78	0.00617
10/4/2021	Lower Surficial	Above the bluff	W-115	123.82	W-62	115.38	1480	8.44	0.00570
10/4/2021	Lower Surficial	Above the bluff	W-122	128.52	W-11	122.53	1492	5.99	0.00401
10/4/2021	Upper Surficial	Near the bluff	W-16	121.94	W-4R	108.64	293	13.3	0.0454
10/4/2021	Upper Surficial	Near the bluff	W-32	121.54	W-27	111.47	418	10.07	0.0241
10/4/2021	Upper Surficial	Near the bluff	W-67	117.56	W-97	111.04	224	6.52	0.0291
10/4/2021	Lower Surficial	Near the bluff	W-11	122.53	W-92	107.28	412	15.25	0.0370
10/4/2021	Lower Surficial	Near the bluff	W-47	115.88	W-106	107.37	249	8.51	0.0342
10/4/2021	Lower Surficial	Near the bluff	W-62	115.38	W-68	109.86	278	5.52	0.0199
10/4/2021	Lower Surficial	Near the bluff	W-123	122.23	W-124	107.11	777	15.12	0.0195
10/4/2021	Upper Surficial	Below the bluff	W-20	107.38	W-25	106.32	1644	1.06	0.000645
10/4/2021	Upper Surficial	Below the bluff	W-105	107.06	W-25	106.32	2231	0.74	0.000332
10/4/2021	Lower Surficial	Below the bluff	W-94	107.91	W-112	107.62	628	0.29	0.000462
10/4/2021	Lower Surficial	Below the bluff	W-106	107.37	W-108	107.14	824	0.23	0.000279
10/4/2021	Lower Surficial	Below the bluff	W-124	107.11	W-126	107.04	468	0.07	0.000150

Notes: WL Elev - water level elevation
ft - feet
dWL - difference in water level elevation
HG - horizontal gradient

Table 7 - Summary of Vertical Hydraulic Gradients
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Surficial Aquifer

Well #	1						2						Gradient			
Well ID	Date	Zone	TOS (ft BGS)	MOS (ft BGS)	BOS (ft BGS)	WL Elev (ft)	Zone	Well ID	TOS (ft BGS)	MOS (ft BGS)	BOS (ft BGS)	WL Elev (ft)	dZ (ft)	dWL (ft)	VG (ft/ft)	Direction
W-13R	10/4/2021	Upper Surficial	15.5	18.00	20.5	123.73	Lower Surficial	W-123	29.00	31.50	34.00	122.23	13.5	-1.5	-0.111	Downward
W-20	4/1/2021	Upper Surficial	10.50	13.00	15.50	111.88	Lower Surficial	W-109	27.00	29.50	32.00	111.68	16.5	-0.2	-0.012	Downward
W-20	10/4/2021	Upper Surficial	10.50	13.00	15.50	107.38	Lower Surficial	W-109	27.00	29.50	32.00	107.21	16.5	-0.17	-0.010	Downward
W-22	10/14/201	Upper Surficial	10.00	12.50	15.00	124.83	Lower Surficial	W-6	23.00	25.50	28.00	125.24	13	0.41	0.032	Upward
W-22	4/6/2020	Upper Surficial	10.00	12.50	15.00	126.61	Lower Surficial	W-6	23.00	25.50	28.00	126.81	13	0.2	0.015	Upward
W-22	10/1/2020	Upper Surficial	10.00	12.50	15.00	126.33	Lower Surficial	W-6	23.00	25.50	28.00	126.48	13	0.15	0.012	Upward
W-22	4/1/2021	Upper Surficial	10.00	12.50	15.00	126.86	Lower Surficial	W-6	23.00	25.50	28.00	127.08	13	0.22	0.017	Upward
W-22	10/4/2021	Upper Surficial	10.00	12.50	15.00	125.71	Lower Surficial	W-6	23.00	25.50	28.00	126.13	13	0.42	0.032	Upward
W-27	10/14/201	Upper Surficial	10.00	12.50	15.00	110.59	Lower Surficial	W-92	29.00	31.50	34.00	105.56	19	-5.03	-0.265	Downward
W-27	4/6/2020	Upper Surficial	10.00	12.50	15.00	112.15	Lower Surficial	W-92	29.00	31.50	34.00	109.05	19	-3.1	-0.163	Downward
W-27	10/1/2020	Upper Surficial	10.00	12.50	15.00	111.90	Lower Surficial	W-92	29.00	31.50	34.00	108.43	19	-3.47	-0.183	Downward
W-27	4/1/2021	Upper Surficial	10.00	12.50	15.00	113.32	Lower Surficial	W-92	29.00	31.50	34.00	111.61	19	-1.71	-0.090	Downward
W-27	10/4/2021	Upper Surficial	10.00	12.50	15.00	111.47	Lower Surficial	W-92	29.00	31.50	34.00	107.28	19	-4.19	-0.221	Downward
W-30	4/1/2021	Upper Surficial	10.00	12.50	15.00	127.58	Lower Surficial	W-102	28.50	31.00	33.50	127.32	18.5	-0.26	-0.014	Downward
W-30	10/4/2021	Upper Surficial	10.00	12.50	15.00	126.98	Lower Surficial	W-102	28.50	31.00	33.50	126.73	18.5	-0.25	-0.014	Downward
W-32	10/14/201	Upper Surficial	17.00	19.50	22.00	120.75	Upper Surficial	W-11	22.00	23.50	25.00	121.74	4	0.99	0.247	Upward
W-32	4/6/2020	Upper Surficial	17.00	19.50	22.00	122.22	Upper Surficial	W-11	22.00	23.50	25.00	123.51	4	1.29	0.323	Upward
W-32	10/1/2020	Upper Surficial	17.00	19.50	22.00	121.78	Upper Surficial	W-11	22.00	23.50	25.00	123.88	4	2.1	0.525	Upward
W-32	4/1/2021	Upper Surficial	17.00	19.50	22.00	122.29	Upper Surficial	W-11	22.00	23.50	25.00	123.48	4	1.19	0.297	Upward
W-32	10/4/2021	Upper Surficial	17.00	19.50	22.00	121.54	Upper Surficial	W-11	22.00	23.50	25.00	122.53	4	0.99	0.247	Upward
W-36	10/4/2021	Upper Surficial	15.00	17.50	20.00	128.61	Lower Surficial	W-122	25.00	27.50	30.00	128.52	10	-0.09	-0.009	Downward
W-61	10/14/201	Upper Surficial	13.50	18.50	23.50	121.64	Lower Surficial	W-60	33.00	35.50	38.00	118.08	17	-3.56	-0.209	Downward
W-61	4/6/2020	Upper Surficial	13.50	18.50	23.50	124.01	Lower Surficial	W-60	33.00	35.50	38.00	119.43	17	-4.58	-0.269	Downward
W-61	10/1/2020	Upper Surficial	13.50	18.50	23.50	122.63	Lower Surficial	W-60	33.00	35.50	38.00	118.72	17	-3.91	-0.230	Downward
W-61	4/1/2021	Upper Surficial	13.50	18.50	23.50	124.27	Lower Surficial	W-60	33.00	35.50	38.00	119.58	17	-4.69	-0.276	Downward
W-61	10/4/2021	Upper Surficial	13.50	18.50	23.50	122.62	Lower Surficial	W-60	33.00	35.50	38.00	118.65	17	-3.97	-0.234	Downward
W-64	10/14/201	Upper Surficial	21.50	26.50	31.50	115.50	Lower Surficial	W-47	34.50	39.50	44.50	114.91	13	-0.59	-0.045	Downward
W-64	4/6/2020	Upper Surficial	21.50	26.50	31.50	117.54	Lower Surficial	W-47	34.50	39.50	44.50	116.89	13	-0.65	-0.050	Downward
W-64	10/1/2020	Upper Surficial	21.50	26.50	31.50	116.54	Lower Surficial	W-47	34.50	39.50	44.50	115.96	13	-0.58	-0.045	Downward
W-64	4/1/2021	Upper Surficial	21.50	26.50	31.50	117.69	Lower Surficial	W-47	34.50	39.50	44.50	117.15	13	-0.54	-0.042	Downward
W-64	10/4/2021	Upper Surficial	21.50	26.50	31.50	116.49	Lower Surficial	W-47	34.50	39.50	44.50	115.88	13	-0.61	-0.047	Downward
W-66	10/14/201	Upper Surficial	12.50	17.50	22.50	127.19	Lower Surficial	W-65	26.50	29.00	31.50	126.88	11.5	-0.31	-0.027	Downward
W-66	4/6/2020	Upper Surficial	12.50	17.50	22.50	129.16	Lower Surficial	W-65	26.50	29.00	31.50	128.80	11.5	-0.36	-0.031	Downward
W-66	10/1/2020	Upper Surficial	12.50	17.50	22.50	128.33	Lower Surficial	W-65	26.50	29.00	31.50	128.04	11.5	-0.29	-0.025	Downward
W-66	4/1/2021	Upper Surficial	12.50	17.50	22.50	129.09	Lower Surficial	W-65	26.50	29.00	31.50	128.95	11.5	-0.14	-0.012	Downward
W-66	10/4/2021	Upper Surficial	12.50	17.50	22.50	128.02	Lower Surficial	W-65	26.50	29.00	31.50	127.72	11.5	-0.3	-0.026	Downward
W-67	4/1/2021	Upper Surficial	22.00	27.00	32.00	119.81	Lower Surficial	W-103	34.50	37.00	39.50	118.67	10	-1.14	-0.114	Downward
W-67	10/4/2021	Upper Surficial	22.00	27.00	32.00	117.56	Lower Surficial	W-103	34.50	37.00	39.50	116.41	10	-1.15	-0.115	Downward
W-69	10/14/201	Upper Surficial	8.00	13.00	18.00	130.89	Lower Surficial	W-70	44.00	46.50	49.00	126.12	33.5	-4.77	-0.142	Downward
W-69	4/6/2020	Upper Surficial	8.00	13.00	18.00	133.10	Lower Surficial	W-70	44.00	46.50	49.00	130.54	33.5	-2.56	-0.076	Downward
W-69	10/1/2020	Upper Surficial	8.00	13.00	18.00	132.94	Lower Surficial	W-70	44.00	46.50	49.00	128.98	33.5	-3.96	-0.118	Downward
W-69	4/1/2021	Upper Surficial	8.00	13.00	18.00	133.90	Lower Surficial	W-70	44.00	46.50	49.00	130.96	33.5	-2.94	-0.088	Downward
W-69	10/4/2021	Upper Surficial	8.00	13.00	18.00	132.14	Lower Surficial	W-70	44.00	46.50	49.00	128.45	33.5	-3.69	-0.110	Downward
W-75	10/14/201	Upper Surficial	5.50	10.50	15.50	126.79	Lower Surficial	W-74	25.50	28.00	30.50	126.47	17.5	-0.32	-0.018	Downward
W-75	4/6/2020	Upper Surficial	5.50	10.50	15.50	128.45	Lower Surficial	W-74	25.50	28.00	30.50	128.05	17.5	-0.4	-0.023	Downward
W-75	10/1/2020	Upper Surficial	5.50	10.50	15.50	127.82	Lower Surficial	W-74	25.50	28.00	30.50	127.53	17.5	-0.29	-0.017	Downward
W-75	4/1/2021	Upper Surficial	5.50	10.50	15.50	128.55	Lower Surficial	W-74	25.50	28.00	30.50	128.19	17.5	-0.36	-0.021	Downward
W-75	10/4/2021	Upper Surficial	5.50	10.50	15.50	127.62	Lower Surficial	W-74	25.50	28.00	30.50	127.31	17.5	-0.31	-0.018	Downward

Table 7 - Summary of Vertical Hydraulic Gradients
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Surficial Aquifer

Well #	1						2						Gradient			
W-86	10/14/201	Upper Surficial	25.00	30.00	35.00	118.18	Lower Surficial	W-85	40.00	42.50	45.00	116.68	12.5	-1.5	-0.120	Downward
W-86	4/6/2020	Upper Surficial	25.00	30.00	35.00	121.01	Lower Surficial	W-85	40.00	42.50	45.00	119.84	12.5	-1.17	-0.094	Downward
W-86	10/1/2020	Upper Surficial	25.00	30.00	35.00	120.15	Lower Surficial	W-85	40.00	42.50	45.00	118.85	12.5	-1.3	-0.104	Downward
W-86	4/1/2021	Upper Surficial	25.00	30.00	35.00	121.53	Lower Surficial	W-85	40.00	42.50	45.00	120.38	12.5	-1.15	-0.092	Downward
W-86	10/4/2021	Upper Surficial	25.00	30.00	35.00	119.65	Lower Surficial	W-85	40.00	42.50	45.00	114.47	12.5	-5.18	-0.414	Downward
W-89	10/14/201	Upper Surficial	15.50	20.50	25.50	120.72	Lower Surficial	W-88	36.50	39.00	41.50	119.68	18.5	-1.04	-0.056	Downward
W-89	4/6/2020	Upper Surficial	15.50	20.50	25.50	122.78	Lower Surficial	W-88	36.50	39.00	41.50	121.68	18.5	-1.1	-0.059	Downward
W-89	10/1/2020	Upper Surficial	15.50	20.50	25.50	121.53	Lower Surficial	W-88	36.50	39.00	41.50	120.53	18.5	-1	-0.054	Downward
W-89	4/1/2021	Upper Surficial	15.50	20.50	25.50	122.91	Lower Surficial	W-88	36.50	39.00	41.50	121.82	18.5	-1.09	-0.059	Downward
W-89	10/4/2021	Upper Surficial	15.50	20.50	25.50	121.72	Lower Surficial	W-88	36.50	39.00	41.50	120.49	18.5	-1.23	-0.066	Downward
W-91	10/14/201	Upper Surficial	15.00	20.00	25.00	115.25	Lower Surficial	W-90	35.00	37.50	40.00	115.95	17.5	0.7	0.040	Upward
W-91	4/6/2020	Upper Surficial	15.00	20.00	25.00	117.11	Lower Surficial	W-90	35.00	37.50	40.00	117.49	17.5	0.38	0.022	Upward
W-91	10/1/2020	Upper Surficial	15.00	20.00	25.00	116.38	Lower Surficial	W-90	35.00	37.50	40.00	116.76	17.5	0.38	0.022	Upward
W-91	4/1/2021	Upper Surficial	15.00	20.00	25.00	117.36	Lower Surficial	W-90	35.00	37.50	40.00	117.76	17.5	0.4	0.023	Upward
W-91	10/4/2021	Upper Surficial	15.00	20.00	25.00	116.33	Lower Surficial	W-90	35.00	37.50	40.00	116.69	17.5	0.36	0.021	Upward
W-95	4/1/2021	Lower Surficial	28.50	31.00	33.50	111.86	Lower Surficial	W-111	76.00	78.50	81.00	114.63	47.5	2.77	0.058	Upward
W-95	10/4/2021	Lower Surficial	28.50	31.00	33.50	107.53	Lower Surficial	W-111	76.00	78.50	81.00	110.82	47.5	3.29	0.069	Upward
W-104	10/4/2021	Upper Surficial	7.50	12.50	17.50	110.87	Lower Surficial	W-124	26.00	28.50	31.00	107.11	16	-3.76	-0.235	Downward
W-105	10/4/2021	Upper Surficial	14.00	19.00	24.00	107.06	Lower Surficial	W-125	40.00	42.50	45.00	107.05	23.5	-0.01	0.000	Downward
W-114	10/4/2021	Upper Surficial	10.00	15.00	20.00	128.75	Lower Surficial	W-113	31.00	33.50	36.00	128.01	18.5	-0.74	-0.040	Downward
W-116	10/4/2021	Upper Surficial	10.00	15.00	20.00	124.54	Lower Surficial	W-115	40.50	43.00	45.50	123.82	28	-0.72	-0.026	Downward
W-118	10/4/2021	Upper Surficial	19.50	24.50	29.50	124.03	Lower Surficial	W-117	39.00	41.50	44.00	121.87	17	-2.16	-0.127	Downward
W-121	10/4/2021	Upper Surficial	12.00	17.00	22.00	128.21	Lower Surficial	W-120	29.00	31.50	34.00	128.34	14.5	0.13	0.009	Downward
W-96	10/4/2021	Upper Surficial	25.00	27.50	30.00	107.06	Lower Surficial	W-126	37.50	40.00	42.50	107.04	12.5	-0.02	-0.002	Downward

Surficial Aquifer to Black Creek Aquifer

Well #	1						2						Gradient			
Well ID	Date	Zone	TOS (ft BGS)	MOS (ft BGS)	BOS (ft BGS)	WL Elev (ft)	Zone	Well ID	TOS (ft BGS)	MOS (ft BGS)	BOS (ft BGS)	WL Elev (ft)	dZ (ft)	dWL (ft)	VG (ft/ft)	Direction
W-4R	10/4/2021	Upper Surficial	4.50	9.50	14.50	108.64	Black Creek	W-3A	73.00	78.00	83.00	113.30	68.5	4.66	0.068	Upward
W-40	10/14/201	Upper Surficial	4.50	9.50	14.50	127.31	Black Creek	W-50	115.00	120.00	125.00	114.31	110.5	-13	-0.118	Downward
W-40	4/6/2020	Upper Surficial	4.50	9.50	14.50	129.26	Black Creek	W-50	115.00	120.00	125.00	118.06	110.5	-11.2	-0.101	Downward
W-40	10/1/2020	Upper Surficial	4.50	9.50	14.50	128.46	Black Creek	W-50	115.00	120.00	125.00	116.55	110.5	-11.91	-0.108	Downward
W-40	4/1/2021	Upper Surficial	4.50	9.50	14.50	128.44	Black Creek	W-50	115.00	120.00	125.00	119.20	110.5	-9.24	-0.084	Downward
W-40	10/4/2021	Upper Surficial	4.50	9.50	14.50	128.22	Black Creek	W-50	115.00	120.00	125.00	116.21	110.5	-12.01	-0.109	Downward
W-42	10/14/201	Upper Surficial	20.00	25.00	30.00	114.64	Black Creek	W-49	108.00	113.00	118.00	109.18	88	-5.46	-0.062	Downward
W-42	4/6/2020	Upper Surficial	20.00	25.00	30.00	116.41	Black Creek	W-49	108.00	113.00	118.00	113.10	88	-3.31	-0.038	Downward
W-42	10/1/2020	Upper Surficial	20.00	25.00	30.00	115.90	Black Creek	W-49	108.00	113.00	118.00	111.96	88	-3.94	-0.045	Downward
W-42	4/1/2021	Upper Surficial	20.00	25.00	30.00	116.63	Black Creek	W-49	108.00	113.00	118.00	114.96	88	-1.67	-0.019	Downward
W-42	10/4/2021	Upper Surficial	20.00	25.00	30.00	115.59	Black Creek	W-49	108.00	113.00	118.00	111.29	88	-4.3	-0.049	Downward
W-69	10/14/201	Upper Surficial	8.00	13.00	18.00	130.89	Black Creek	W-71	93.00	98.00	103.00	114.74	85	-16.15	-0.190	Downward
W-69	4/6/2020	Upper Surficial	8.00	13.00	18.00	133.10	Black Creek	W-71	93.00	98.00	103.00	118.45	85	-14.65	-0.172	Downward
W-69	10/1/2020	Upper Surficial	8.00	13.00	18.00	132.94	Black Creek	W-71	93.00	98.00	103.00	116.93	85	-16.01	-0.188	Downward
W-69	4/1/2021	Upper Surficial	8.00	13.00	18.00	133.90	Black Creek	W-71	93.00	98.00	103.00	119.55	85	-14.35	-0.169	Downward
W-69	10/4/2021	Upper Surficial	8.00	13.00	18.00	132.14	Black Creek	W-71	93.00	98.00	103.00	116.62	85	-15.52	-0.183	Downward

Notes: TOS - top of screen
MOS - middle of screen
BOS - bottom of screen
ft bgs - feet below ground surface
WL Elev - water level elevation
ft - feet
dZ - difference in depth of the middle of the well screens
dWL - difference in water level elevation
VG - vertical gradient

Table 8 - Soil Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Technetium-99	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	Tetrachloroethene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl chloride
			Unit	pCi/g	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
			Residential Use Screening Level	19							
			Industrial Use Screening Level	89,400							
Location	Type	Depth	Date								
SS-1	N	0 - 1 ft	8/15/2019	0.171 #	NA	NA	NA	NA	NA	NA	NA
SS-1	N	1 - 3 ft	8/15/2019	4.39 #	NA	NA	NA	NA	NA	NA	NA
SS-1	N	3 - 5 ft	8/15/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-1	N	5 - 7 ft	8/15/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-2	N	0 - 1 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-2	N	1 - 3 ft	8/14/2019	9.60 #	NA	NA	NA	NA	NA	NA	NA
SS-2	N	3 - 5 ft	8/14/2019	4.78 #	NA	NA	NA	NA	NA	NA	NA
SS-2	N	5 - 7 ft	8/14/2019	4.02 #	NA	NA	NA	NA	NA	NA	NA
SS-3	N	0 - 1 ft	8/14/2019	12.9 #	NA	NA	NA	NA	NA	NA	NA
SS-3	N	1 - 3 ft	8/14/2019	4.83 #	NA	NA	NA	NA	NA	NA	NA
SS-3	N	3 - 5 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-3	N	5 - 7 ft	8/14/2019	3.12 #	NA	NA	NA	NA	NA	NA	NA
SS-3	FD	5 - 7 ft	8/14/2019	1.35 #	NA	NA	NA	NA	NA	NA	NA
SS-4	N	0 - 1 ft	8/14/2019	2.35 #	NA	NA	NA	NA	NA	NA	NA
SS-4	N	1 - 3 ft	8/14/2019	16.1 #	NA	NA	NA	NA	NA	NA	NA
SS-4	N	3 - 5 ft	8/14/2019	7.72 #	NA	NA	NA	NA	NA	NA	NA
SS-4	N	5 - 7 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-5	N	0 - 1 ft	8/14/2019	0.637 #	NA	NA	NA	NA	NA	NA	NA
SS-5	N	1 - 3 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-5	N	3 - 5 ft	8/14/2019	4.46 #	NA	NA	NA	NA	NA	NA	NA
SS-5	N	5 - 7 ft	8/14/2019	0.843 #	NA	NA	NA	NA	NA	NA	NA
SS-6	N	0 - 1 ft	8/14/2019	7.58 #	NA	NA	NA	NA	NA	NA	NA
SS-6	N	1 - 3 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-6	N	3 - 5 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-6	N	5 - 7 ft	8/14/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-7	N	0 - 1 ft	8/13/2019	8.60 #	NA	NA	NA	NA	NA	NA	NA
SS-7	N	1 - 3 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-7	N	3 - 5 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-7	N	5 - 7 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-8	N	0 - 1 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-8	N	1 - 3 ft	8/13/2019	5.52 #	NA	NA	NA	NA	NA	NA	NA
SS-8	N	3 - 5 ft	8/13/2019	1.09 #	NA	NA	NA	NA	NA	NA	NA
SS-8	N	5 - 7 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-9	N	0 - 1 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-9	N	1 - 3 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-9	N	3 - 5 ft	8/13/2019	0.572 #	NA	NA	NA	NA	NA	NA	NA
SS-9	N	5 - 7 ft	8/13/2019	18.1 #	NA	NA	NA	NA	NA	NA	NA
SS-10	N	0 - 1 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-10	N	1 - 3 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-10	N	3 - 5 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-10	N	5 - 7 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-11	N	0 - 1 ft	8/12/2019	9.64 #	NA	NA	NA	NA	NA	NA	NA
SS-11	N	1 - 3 ft	8/12/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-11	N	3 - 5 ft	8/12/2019	14.3 #	NA	NA	NA	NA	NA	NA	NA
SS-11	N	5 - 7 ft	8/12/2019	17.3 #	NA	NA	NA	NA	NA	NA	NA
SS-12	N	0 - 1 ft	8/12/2019	8.88 #	NA	NA	NA	NA	NA	NA	NA
SS-12	N	1 - 3 ft	8/12/2019	8.02 #	NA	NA	NA	NA	NA	NA	NA
SS-12	N	3 - 5 ft	8/12/2019	10.0 #	NA	NA	NA	NA	NA	NA	NA
SS-12	N	5 - 7 ft	8/12/2019	6.76 #	NA	NA	NA	NA	NA	NA	NA
SS-13	N	0 - 1 ft	8/12/2019	5.42 #	NA	NA	NA	NA	NA	NA	NA
SS-13	N	1 - 3 ft	8/12/2019	11.0 #	NA	NA	NA	NA	NA	NA	NA
SS-13	N	3 - 5 ft	8/12/2019	2.05 #	NA	NA	NA	NA	NA	NA	NA
SS-13	N	5 - 7 ft	8/12/2019	3.31 #	NA	NA	NA	NA	NA	NA	NA
SS-13	FD	5 - 7 ft	8/12/2019	21.6 #	NA	NA	NA	NA	NA	NA	NA

Table 8 - Soil Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Technetium-99	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	Tetrachloroethene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl chloride
			Unit	pCi/g	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Residential Use Screening Level				19							
Industrial Use Screening Level				89,400							
Location	Type	Depth	Date								
SS-14	N	0 - 1 ft	8/13/2019	4.80 #	NA	NA	NA	NA	NA	NA	NA
SS-14	N	1 - 3 ft	8/13/2019	1.57 #	NA	NA	NA	NA	NA	NA	NA
SS-14	N	3 - 5 ft	8/13/2019	4.99 #	NA	NA	NA	NA	NA	NA	NA
SS-14	N	5 - 7 ft	8/13/2019	0 ##	NA	NA	NA	NA	NA	NA	NA
SS-14	FD	5 - 7 ft	8/13/2019	9.42 #	NA	NA	NA	NA	NA	NA	NA
SS-17	N	3 - 4 ft	5/29/2021	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
SS-17	N	7 - 8 ft	5/29/2021	NA	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
SS-18	N	2 - 3 ft	5/29/2021	NA	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4
SS-18	N	7 - 8 ft	5/29/2021	NA	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1
SS-19	N	6 - 7 ft	5/29/2021	NA	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4
SS-19	N	8 - 8 ft	5/29/2021	NA	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
SS-20	N	1 - 2 ft	5/29/2021	NA	< 4.3	< 4.3	< 4.3	21	< 4.3	17	< 4.3
SS-20	N	7 - 8 ft	5/29/2021	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
SS-21	N	1 - 2 ft	5/29/2021	NA	< 4.6	< 4.6	< 4.6	5.8	< 4.6	< 4.6	< 4.6
SS-21	N	7 - 8 ft	5/29/2021	NA	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1
SS-22	N	6 - 7 ft	5/29/2021	NA	< 5.2	< 5.2	< 5.2	< 5.2	< 5.2	< 5.2	< 5.2
SS-22	N	7 - 8 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-22	FD	7 - 8 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-23	N	6 - 7 ft	5/29/2021	NA	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
SS-23	N	7 - 8 ft	5/29/2021	NA	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
SS-24	N	3 - 4 ft	5/29/2021	NA	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
SS-24	N	7 - 8 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-25	N	5 - 6 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-25	N	7 - 8 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-26	N	3 - 4 ft	5/29/2021	NA	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
SS-26	N	7 - 8 ft	5/29/2021	NA	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
SS-27	N	1 - 2 ft	5/29/2021	NA	< 4.3	< 4.3	11	< 4.3	< 4.3	8.1	< 4.3
SS-27	N	7 - 8 ft	5/29/2021	NA	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
SS-27	FD	7 - 8 ft	5/29/2021	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
SS-28	N	1 - 2 ft	5/29/2021	NA	< 4.7	< 4.7	< 4.7	9.3	< 4.7	12	< 4.7
SS-28	N	7 - 8 ft	5/29/2021	NA	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
SS-29	N	4 - 5 ft	5/29/2021	NA	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4
SS-29	N	7 - 8 ft	5/29/2021	NA	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4

Notes:
pCi/g - picocuires per gram
ug/kg - micrograms per kilogram
Detected concentrations in shaded cells exceed their RUSL
N - normal sample
FD - field duplicate sample
Bold concentrations indicate detections
NA - not analyzed
- value is below minimum detectable activity
- value shown as zero reported by analytical laboratory as a negative number

Table 9 - Vertical Groundwater Profiling Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

				Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Technetium-99
				MCL	5	5	70	2	10	4	900
				Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	pCi/L
Well	Depth	Date	Type	Total or Dissolved							
L-1	10 - 15 ft	8/14/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-1	28 - 33 ft	8/14/2019	N	T	< 1.0	< 1.0	3.8	2.7	NA	NA	NA
L-1	48 - 53 ft	8/14/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-1	63 - 68 ft	8/15/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-1	78 - 83 ft	8/15/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-1	78 - 83 ft	8/15/2019	FD	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-8	8 - 13 ft	8/20/2019	N	T	NA*	NA*	NA*	NA*	0.081	0.26	NA
L-8	17 - 22 ft	8/21/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	< 0.10	NA
L-8	25 - 30 ft	8/21/2019	N	T	2.2	2.1	< 1.0	< 1.0	< 0.020	< 0.10	NA
L-8	41 - 46 ft	8/21/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.14	NA
L-9	10 - 15 ft	8/21/2019	N	T	6.5	3.0	< 1.0	< 1.0	5.4	0.48	NA
L-9	23 - 28 ft	8/21/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	< 0.10	NA
L-9	23 - 28 ft	8/21/2019	FD	T	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	< 0.10	NA
L-9	32 - 37 ft	8/21/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	< 0.10	NA
L-10	9 - 14 ft	8/19/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 0.10	NA
L-10	18 - 23 ft	8/20/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	0.18	< 0.10	NA
L-10	28 - 33 ft	8/20/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	0.19	< 0.10	NA
L-17	15 - 20 ft	8/16/2019	N	T	< 1.0	< 1.0	6.2	< 1.0	NA	NA	NA
L-17	25 - 30 ft	8/16/2019	N	T	< 1.0	< 1.0	5.4	< 1.0	NA	NA	NA
L-18	15 - 20 ft	8/19/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-18	24 - 29 ft	8/19/2019	N	T	< 1.0	< 1.0	1.2	1.1	NA	NA	NA
L-19	7 - 12 ft	8/20/2019	N	T	< 1.0	< 1.0	1.0	< 1.0	0.092	7.8	NA
L-19	21 - 26 ft	8/20/2019	N	T	< 1.0	< 1.0	< 1.0	< 1.0	0.10	0.16	NA
L-20	12 - 16 ft	11/23/2020	N	T	< 1	< 1	< 1	< 1	11	NA	3.89 #
L-20	12 - 16 ft	11/23/2020	N	D	NA	NA	NA	NA	NA	NA	1.53 #
L-20	24 - 28 ft	11/23/2020	N	T	< 1	< 1	< 1	< 1	2.4	NA	1.30 #
L-20	24 - 28 ft	11/23/2020	N	D	NA	NA	NA	NA	NA	NA	1.33 #
L-21	28 - 32 ft	11/18/2020	N	T	4.7	< 1	< 1	< 1	NA	NA	NA
L-22	8 - 12 ft	11/19/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-22	8 - 12 ft	11/19/2020	FD	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-22	26 - 30 ft	11/18/2020	N	T	150	96	< 1	< 1	NA	NA	NA
L-23	12 - 16 ft	11/20/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-23	20 - 24 ft	11/19/2020	N	T	89	2.8	< 1	< 1	NA	NA	NA
L-23	31 - 35 ft	11/19/2020	N	T	360	83	4.5	< 1	NA	NA	NA
L-24	11 - 15 ft	11/20/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-24	25 - 29 ft	11/23/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-25	21.5 - 25.5 ft	12/8/2020	N	T	2.2	< 1	< 1	< 1	NA	NA	NA
L-25	38 - 42 ft	12/9/2020	N	T	48	2	< 1	< 1	NA	NA	NA
L-26	25 - 29 ft	12/9/2020	N	T	31	2	< 1	< 1	NA	NA	NA
L-26	39 - 43 ft	12/9/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-27	23 - 27 ft	12/29/2020	N	T	24	3.8	< 1	< 1	NA	NA	NA
L-27	30 - 34 ft	12/29/2020	N	T	27	4.1	< 1	< 1	NA	NA	NA
L-27	39 - 43 ft	12/30/2020	N	T	13	< 1	< 1	< 1	NA	NA	NA
L-28	18 - 22 ft	12/30/2020	N	T	22	< 1	< 1	< 1	NA	NA	NA
L-28	27 - 31 ft	12/30/2020	N	T	10	< 1	< 1	< 1	NA	NA	NA
L-28	36 - 40 ft	12/30/2020	N	T	22	< 1	< 1	< 1	NA	NA	NA
L-29	13 - 17 ft	12/4/2020	N	T	< 1.0	< 1.0	1.0	5.8	NA	NA	NA
L-29	26 - 30 ft	12/4/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-30	12 - 16 ft	12/8/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-30	22 - 26 ft	12/8/2020	N	T	< 1	< 1	5	< 1	NA	NA	NA
L-30	29 - 34 ft	12/9/2020	N	T	< 1	< 1	3.5	1.8	NA	NA	NA
L-31	13 - 17 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-31	22 - 26 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-31	30 - 34 ft	12/4/2020	N	T	< 1.0	< 1.0	4.7	1.7	NA	NA	NA
L-32	8 - 12 ft	12/2/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA

Table 9 - Vertical Groundwater Profiling Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

				Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Technetium-99
				MCL	5	5	70	2	10	4	900
				Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	pCi/L
L-32	19 - 23 ft	12/2/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-32	31 - 35 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-33	13 - 17 ft	12/1/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-33	24 - 28 ft	12/2/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-34	14 - 18 ft	12/4/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-34	26 - 30 ft	12/4/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-35	11 - 15 ft	12/4/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	0.12	0.039 J	0.879 #
L-35	11 - 15 ft	12/4/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-35	21 - 25 ft	12/4/2020	N	T	< 1.0	< 1.0	3.1	< 1.0	0.15	0.02 J	0 ##
L-35	21 - 25 ft	12/4/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-35	30 - 34 ft	12/4/2020	N	T	< 1.0	< 1.0	1.6	< 1.0	0.08	0.036 J	0 ##
L-35	30 - 34 ft	12/4/2020	N	D	NA	NA	NA	NA	NA	NA	0.404 #
L-36	18 - 22 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	< 1.0	0.025	0.1	0.285 #
L-36	18 - 22 ft	12/3/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-36	27.5 - 31.5 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	3.6	0.12	0.052 J	0.145 #
L-36	27.5 - 31.5 ft	12/3/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-36	27.5 - 31.5 ft	12/3/2020	FD	T	< 1.0	< 1.0	< 1.0	3.0	0.12	0.055 J	0.981 #
L-36	27.5 - 31.5 ft	12/3/2020	FD	D	NA	NA	NA	NA	NA	NA	0 ##
L-36	37 - 41 ft	12/3/2020	N	T	< 1.0	< 1.0	< 1.0	2.1	0.14	0.072 J	0.511 #
L-36	37 - 41 ft	12/3/2020	N	D	NA	NA	NA	NA	NA	NA	0.201 #
L-37	17 - 21 ft	12/8/2020	N	T	< 1	< 1	< 1	< 1	0.13	0.078 J	0 ##
L-37	17 - 21 ft	12/8/2020	N	D	NA	NA	NA	NA	NA	NA	0.924 #
L-37	26 - 30 ft	12/8/2020	N	T	< 1	< 1	< 1	2.3	0.13	0.108	0 ##
L-37	26 - 30 ft	12/8/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-38	17 - 21 ft	12/8/2020	N	T	< 1	< 1	< 1	< 1	0.13	0.133	0 ##
L-38	17 - 21 ft	12/8/2020	N	D	NA	NA	NA	NA	NA	NA	0.00375 #
L-38	26 - 30 ft	12/8/2020	N	T	34	< 1	< 1	< 1	0.14	0.155	0.165 #
L-38	26 - 30 ft	12/8/2020	N	D	NA	NA	NA	NA	NA	NA	0.286 #
L-39	31 - 35 ft	11/16/2020	N	T	10	5.9	1.8	< 1	NA	NA	10.9
L-39	31 - 35 ft	11/16/2020	N	D	NA	NA	NA	NA	NA	NA	9.98
L-40	33 - 37 ft	11/17/2020	N	T	< 1	1.1	< 1	< 1	NA	NA	0 ##
L-40	33 - 37 ft	11/17/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-41	31 - 35 ft	12/4/2020	N	D	NA	NA	NA	NA	NA	NA	0 ##
L-41	31 - 35 ft	12/7/2020	N	T	< 1	2.1	< 1	< 1	NA	NA	0 ##
L-42	24 - 28 ft	11/24/2020	N	T	NA	NA	NA	NA	NA	0.094 J	1.96 #
L-42	24 - 28 ft	11/24/2020	N	D	NA	NA	NA	NA	NA	NA	0.343 #
L-42	36 - 40 ft	11/24/2020	N	T	NA	NA	NA	NA	NA	0.373	3.38 #
L-42	36 - 40 ft	11/24/2020	N	D	NA	NA	NA	NA	NA	NA	4.55 #
L-43	29.5 - 33.5 ft	12/9/2020	N	T	NA	NA	NA	NA	NA	NA	39.4
L-43	29.5 - 33.5 ft	12/9/2020	N	D	NA	NA	NA	NA	NA	NA	31.1
L-44	27 - 31 ft	12/7/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-45	11 - 15 ft	5/17/2021	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-45	20 - 24 ft	5/17/2021	N	T	3.2	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-45	29 - 33 ft	12/28/2020	N	T	2.6	11	< 1	< 1	NA	NA	NA
L-46	14 - 18 ft	5/14/2021	N	T	52	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-46	22 - 26 ft	5/17/2021	N	T	66	5.0	< 1.0	< 1.0	NA	NA	NA
L-46	31 - 35 ft	12/28/2020	N	T	26	8.6	< 1	< 1	NA	NA	NA
L-46	31 - 35 ft	12/28/2020	FD	T	27	8.9	< 1	< 1	NA	NA	NA
L-47	16 - 20 ft	5/13/2021	N	T	< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-47	25 - 29 ft	12/30/2020	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-48	16 - 20 ft	3/17/2021	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-48	30 - 34 ft	3/17/2021	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-48	40.5 - 44.5 ft	3/17/2021	N	T	< 1	< 1	< 1	< 1	NA	NA	NA
L-49	15 - 19 ft	3/11/2021	N	T	79	1.3	< 1	< 1	NA	NA	NA
L-49	29 - 33 ft	3/11/2021	N	T	210	8.8	< 5	< 5	NA	NA	NA
L-49	29 - 33 ft	3/11/2021	FD	T	230	8	< 5	< 5	NA	NA	NA

Table 9 - Vertical Groundwater Profiling Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

					Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Technetium-99
					MCL	5	5	70	2	10	4	900
					Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	pCi/L
L-49	37.5 - 41.5 ft	3/11/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-50	20 - 24 ft	2/19/2021	N	T		22	< 1	< 1	< 1	NA	NA	NA
L-50	46 - 50 ft	2/19/2021	N	T		9	< 1	< 1	< 1	NA	NA	NA
L-50	46 - 50 ft	2/19/2021	FD	T		8.7	< 1	< 1	< 1	NA	NA	NA
L-51	21 - 25 ft	2/22/2021	N	T		87	2.2	< 1	< 1	NA	NA	NA
L-51	41 - 45 ft	2/22/2021	N	T		110	1.8	< 1	< 1	NA	NA	NA
L-52	18 - 22 ft	3/12/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-52	30 - 34 ft	3/15/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-52	39 - 43 ft	3/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-53	18 - 22 ft	3/12/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-53	30 - 34 ft	3/12/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-53	44.5 - 48.5 ft	3/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-54	24 - 28 ft	3/16/2021	N	T		69	1.2	< 1	< 1	NA	NA	NA
L-55	18 - 22 ft	3/15/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-55	31 - 35 ft	3/15/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-55	40 - 44 ft	3/15/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-56	22 - 26 ft	2/17/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-56	33 - 37 ft	2/17/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-56	41 - 45 ft	2/17/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-57	26 - 30 ft	2/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-57	42 - 46 ft	2/17/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-58	23 - 27 ft	2/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-58	31 - 35 ft	2/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-58	40 - 44 ft	2/16/2021	N	T		< 1	< 1	< 1	< 1	NA	NA	NA
L-59	16 - 20 ft	5/10/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-59	31 - 35 ft	5/10/2021	N	T		1.2	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-59	46 - 50 ft	5/10/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-60	16 - 20 ft	5/11/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-60	26 - 30 ft	5/11/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-60	36 - 40 ft	5/11/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-61	15 - 19 ft	5/13/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-61	25 - 29 ft	5/13/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-61	25 - 29 ft	5/13/2021	FD	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-61	35 - 39 ft	5/13/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA
L-62	26 - 30 ft	5/14/2021	N	T		< 1.0	< 1.0	< 1.0	< 1.0	NA	NA	NA

Notes:
MCL - Maximum Contaminant Level
Concentrations in orange shaded cells exceed their MCL
Bold concentrations indicate detections
J - Result below reporting limit
NA - not analyzed
NA* - mistakenly not analyzed by the analytical laboratory
- value is below minimum detectable concentration
- value shown as zero reported by analytical laboratory as a negative number
pCi/L - picocuries per liter
ug/L - micrograms per liter
mg/L - milligrams per liter
N - Normal sample
FD - Field duplicate sample

Table 10 - Groundwater Analytical Results Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

		Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Total Uranium Isotopes	Technetium-99
		MCL	5	5	70	2	10	4	30	900
		Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	pCi/L
Well	Date	Type								
W-RW1	10/14/2021	N	**2.3**	< 1.0	< 1.0	< 1.0	**2.0**	**0.037 J**	< 0.200	0.0163 #
W-RW2	10/21/2021	N	**150**	**9.5**	< 1.0	< 1.0	**16**	**0.125**	**0.0739 J**	**6.40**
W-3A	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.015 J**	**0.0700 J**	0 ##
W-4R	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.154**	< 0.200	0.442 #
W-6	10/8/2021	N	**18**	**2.8**	**3.0**	< 1.0	**210**	**0.233**	**0.321**	**2500**
W-7A	10/5/2021	N	**1.3**	< 1.0	< 1.0	< 1.0	**320**	**7.18**	**0.558**	**193**
W-10	10/5/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**22**	**4.09**	**0.138 J**	**98.2**
W-11	10/5/2021	N	**15**	**2.4**	**2.1**	< 1.0	**23**	**0.037 J**	**0.0947 J**	**1230**
W-13R	10/5/2021	N	**27**	**2.5**	< 1.0	< 1.0	**18**	**10.8**	**0.158 J**	**126**
W-14	10/18/2021	N	**2.8**	**1.1**	< 1.0	< 1.0	**0.39**	**0.067 J**	**0.221**	0.299 #
W-15	10/19/2021	N	**10**	**1.9**	**1.1**	< 1.0	**39**	**2.12**	< 0.200	**221**
W-16	10/19/2021	N	**3.1**	**1.1**	< 1.0	< 1.0	**2.0**	**7.35**	**0.0770 J**	**7.37**
W-17	10/12/2021	N	**6.1**	**1.3**	**1.2**	< 1.0	**17**	**1.9**	**0.122 J**	**719**
W-18R	10/8/2021	N	**1.9**	< 1.0	< 1.0	< 1.0	**550**	**6.76**	**2.72**	**143**
W-19B	10/20/2021	N	**89**	**1.6**	< 1.0	< 1.0	**3.7**	**0.015 J**	< 0.200	1.70 #
W-20	10/26/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.042**	**0.042 J**	< 0.200	0 ##
W-22	10/8/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**72**	**5.61**	**0.807**	**31.1**
W-23R	10/18/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.67**	**0.029 J**	< 0.200	0 ##
W-24	10/21/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.025 J**	< 0.200	0 ##
W-25	10/26/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.10**	**0.091 J**	< 0.200	0 ##
W-26	10/19/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.4**	**1.44**	< 0.200	**5.60**
W-27	10/22/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**2.52**	**0.0985 J**	3.49 #
W-28	10/6/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**5.9**	**8.11**	**2.08**	2.14 #
W-29	10/8/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**10**	**4.57**	**1.05**	**8.95**
W-30	10/8/2021	N	**1.8**	**1.5**	< 1.0	< 1.0	**57**	**14.3**	**9.03**	**48.9**
W-32	10/5/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**94**	**5.01**	**0.153 J**	**231**
W-33	10/14/2021	N	**340**	**36**	**5.0**	< 1.0	**18**	**0.084 J**	< 0.200	3.64 #
W-35	10/14/2021	N	**1.9**	< 1.0	< 1.0	< 1.0	**4.2**	**0.026 J**	< 0.200	0.125 #
W-36	10/13/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.35**	**0.014 J**	< 0.200	0 ##
W-37	10/11/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.3**	**0.038 J**	< 0.200	0.0860 #
W-38	10/7/2021	N	< 1.0	**4.0**	< 1.0	< 1.0	**2.6**	**0.501**	**0.120 J**	1.04 #
W-39	10/18/2021	N	**250**	**3.7**	**8.5**	< 1.0	**57**	**0.027 J**	< 0.200	**10.4**
W-40	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**4.1**	**0.141**	< 0.200	0.0523 #
W-41R	10/21/2021	N	**160**	**8.5**	**4.2**	< 1.0	**46**	**0.017 J**	< 0.200	**13.5**
W-42	10/20/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.6**	**1.27**	< 0.200	2.31 #
W-43	10/18/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**7.4**	**0.023 J**	< 0.200	**39.9**
W-44	10/18/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.7**	**0.015 J**	< 0.200	0.648 #
W-45	10/14/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.24**	**0.386**	**0.473**	1.47 #
W-46	10/21/2021	N	**2.9**	< 1.0	< 1.0	< 1.0	**7.7**	**0.03 J**	< 0.200	**51.3**
W-47	10/19/2021	N	**1.3**	< 1.0	< 1.0	< 1.0	**33**	**3.97**	**0.0704 J**	**37.9**
W-48	10/19/2021	N	**16**	**4.8**	**2.0**	< 1.0	**5.5**	**0.31**	< 0.200	**14.9**
W-49	10/20/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.01 J**	**0.0826 J**	0 ##
W-50	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.016 J**	**0.180 J**	0.173 #
W-51	10/13/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.11**	**0.224**	< 0.200	0 ##
W-52	10/13/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.68**	**1.54**	**0.0922 J**	0 ##
W-53	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.33**	**0.063 J**	< 0.200	0 ##
W-54	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.0**	**0.137**	< 0.200	0 ##
W-55	10/11/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.8**	**0.048 J**	**121**	0.449 #
W-56	10/11/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.0**	**0.297**	**143**	0.222 #
W-57	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.5**	**0.107**	**0.0988 J**	**15.0**
W-58	10/11/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.2**	**0.083 J**	**0.998**	0.985 #
W-59	10/11/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**20**	**2.9**	**9.95**	**7.63**
W-60	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.055**	**0.027 J**	< 0.200	1.43 #
W-61	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.3**	**0.024 J**	< 0.200	0 ##
W-62	10/19/2021	N	**28**	< 1.0	< 1.0	< 1.0	**4.1**	**0.019 J**	< 0.200	0 ##

Table 10 - Groundwater Analytical Results Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

		Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Total Uranium Isotopes	Technetium-99
		MCL	5	5	70	2	10	4	30	900
		Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	pCi/L
Well	Date	Type								
W-63	10/19/2021	N	**1.8**	**1.4**	< 1.0	< 1.0	**4.1**	**0.071 J**	**1.55**	**13.6**
W-64	10/19/2021	N	**1.1**	< 1.0	< 1.0	< 1.0	**35**	**3.64**	**0.0877 J**	**72.9**
W-65	10/18/2021	N	**340**	**41**	**13**	< 5.0	**1.6**	**0.138**	< 0.200	0.363 #
W-66	10/18/2021	N	**270**	**4.9**	**8.6**	< 1.0	**1.3**	**0.031 J**	< 0.200	1.10 #
W-66	10/18/2021	FD	**270**	**4.7**	**8.0**	< 1.0	**1.3**	**0.033 J**	< 0.200	0 ##
W-67	10/18/2021	N	**41**	**7.4**	**1.3**	< 1.0	**14**	**0.023 J**	< 0.200	**69.8**
W-68	10/19/2021	N	**55**	**1.0**	< 1.0	< 1.0	**2.8**	**0.027 J**	< 0.200	0.0281 #
W-69	10/21/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.35**	**0.075 J**	< 0.200	0 ##
W-70	10/21/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.6**	**0.017 J**	< 0.200	0.570 #
W-71	10/21/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.031 J**	**0.0939 J**	0.0199 #
W-71	10/21/2021	FD	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.086 J**	**0.0898 J**	0.395 #
W-72	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.4**	**0.406**	**0.266**	0 ##
W-73	10/8/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.3**	**0.056 J**	**0.133 J**	2.26 #
W-74	10/12/2021	N	**11**	**3.2**	**1.3**	< 1.0	**5.5**	**0.017 J**	< 0.200	0.0903 #
W-74	10/12/2021	FD	**12**	**3.1**	**1.3**	< 1.0	**5.5**	**0.021 J**	< 0.200	0 ##
W-75	10/12/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.21**	**0.116**	< 0.200	0.236 #
W-76	10/7/2021	N	< 1.0	**26**	< 1.0	< 1.0	**13**	**2.66**	**3.23**	0.0261 #
W-77	10/6/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**4.9**	**14.8**	**133**	2.50 #
W-78	10/6/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.8**	**13.6**	**0.186 J**	0 ##
W-79	10/6/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.9**	**0.978**	< 0.200	0 ##
W-80	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**9.2**	**0.282**	**0.106 J**	1.17 #
W-81	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.8**	**0.056 J**	**1.42**	0.279 #
W-81	10/7/2021	FD	< 1.0	< 1.0	< 1.0	< 1.0	**4.1**	**0.053 J**	**1.36**	1.20 #
W-82	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.8**	**0.064 J**	< 0.200	1.72 #
W-83	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.85**	**0.115**	< 0.200	1.28 #
W-84	10/7/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.091**	**0.092 J**	< 0.200	1.48 #
W-85	10/22/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.152**	**0.0781 J**	0 ##
W-86	10/22/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.377**	< 0.200	0 ##
W-87	10/13/2021	N	**34**	**6.6**	< 1.0	< 1.0	**0.19**	**0.117**	**0.445**	1.05 #
W-88	10/21/2021	N	**2.4**	< 1.0	< 1.0	< 1.0	**3.5**	**0.034 J**	< 0.200	1.74 #
W-89	10/21/2021	N	**1.2**	< 1.0	< 1.0	< 1.0	**2.2**	**0.067 J**	< 0.200	0.544 #
W-90	10/20/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.8**	**0.013 J**	< 0.200	0.185 #
W-91	10/20/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.2**	**0.014 J**	< 0.200	0.352 #
W-92	10/22/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.12**	< 0.200	2.76 #
W-93	10/6/2021	N	**32**	**4.0**	< 1.0	< 1.0	**4.9**	**0.036 J**	< 0.200	0 ##
W-94	10/26/2021	N	< 1.0	< 1.0	**5.8**	< 1.0	**0.089**	**0.049 J**	< 0.200	0 ##
W-95	10/26/2021	N	< 1.0	< 1.0	**2.4**	**4.2**	**0.076**	**0.233**	< 0.200	0 ##
W-96	10/25/2021	N	**1.3**	**2.0**	< 1.0	< 1.0	< 0.020	**0.092 J**	< 0.200	0 ##
W-97	10/25/2021	N	**5.6**	**1.7**	< 1.0	< 1.0	**4.5**	**0.481**	< 0.200	**14.7**
W-97	10/25/2021	FD	**5.9**	**1.7**	< 1.0	< 1.0	**4.2**	**0.451**	< 0.200	**15.9**
W-98	10/19/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**11**	**0.019 J**	< 0.200	**6.30**
W-99	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**7.8**	**2.96**	**0.243**	**57.7**
W-100	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**7.6**	**1.91**	**0.180 J**	**18.0**
W-102	10/8/2021	N	**48**	**6.4**	**5.1**	< 1.0	**95**	**3.74**	**1.81**	**119**
W-103	10/18/2021	N	**24**	**5.2**	< 1.0	< 1.0	**10**	**0.032 J**	< 0.200	**40.2**
W-104	10/25/2021	N	**3.1**	**1.9**	< 1.0	< 1.0	**6.4**	**0.064 J**	< 0.200	1.71 #
W-105	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.089**	**0.376**	< 0.200	0.544 #
W-106	10/18/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.084**	**0.154**	< 0.200	2.54 #
W-107	10/26/2021	N	< 1.0	< 1.0	< 1.0	**3.7**	**0.089**	**0.082 J**	< 0.200	0 ##
W-108	10/25/2021	N	< 1.0	< 1.0	**1.5**	< 1.0	< 0.020	**0.098 J**	< 0.200	0 ##
W-108	10/25/2021	FD	< 1.0	< 1.0	**1.6**	**1.0**	< 0.020	**0.087 J**	< 0.200	0 ##
W-109	10/26/2021	N	< 1.0	< 1.0	**1.5**	< 1.0	< 0.020	**0.051 J**	< 0.200	0 ##
W-110	10/26/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.032 J**	**0.0693 J**	0 ##
W-111	10/26/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.012 J**	**0.136 J**	0 ##
W-112	10/26/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.077**	**0.076 J**	**0.137 J**	0 ##

Table 10 - Groundwater Analytical Results Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

		Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Total Uranium Isotopes	Technetium-99
		MCL	5	5	70	2	10	4	30	900
		Units	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	pCi/L
Well	Date	Type								
W-113	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**2.2**	**0.181**	< 0.200	1.01 #
W-114	10/15/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**1.1**	**0.247**	< 0.200	0.900 #
W-115	10/14/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**3.4**	**0.026 J**	< 0.200	0.0562 #
W-116	10/14/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**5.9**	**0.025 J**	< 0.200	0.927 #
W-117	10/14/2021	N	**2.2**	< 1.0	< 1.0	< 1.0	**2.4**	**0.029 J**	< 0.200	0 ##
W-118	10/14/2021	N	**85**	**2.1**	< 1.0	< 1.0	**3.9**	**0.047 J**	< 0.200	1.61 #
W-119	10/18/2021	N	**74**	**2.3**	< 1.0	< 1.0	**1.5**	**0.016 J**	< 0.200	0 ##
W-120	10/15/2021	N	**340**	**17**	**1.3**	< 1.0	**4.5**	**0.083 J**	**0.623**	1.01 #
W-121	10/15/2021	N	**82**	**2.4**	< 1.0	< 1.0	**2.5**	**0.057 J**	< 0.200	1.62 #
W-122	10/13/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.056 J**	< 0.200	0.494 #
W-123	10/5/2021	N	**23**	**7.7**	**1.9**	< 1.0	**120**	**8.13**	**1.61**	**424**
W-124	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	**0.056 J**	< 0.200	0 ##
W-125	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.073**	**0.257**	< 0.200	1.15 #
W-126	10/25/2021	N	< 1.0	< 1.0	< 1.0	< 1.0	**0.060**	**0.251**	< 0.200	0 ##

Notes:
MCL - Maximum Contaminant Level
Concentrations in orange shaded cells exceed their MCL
pCi/L - picocuries per liter
ug/L - micrograms per liter
mg/L - milligrams per liter
N - Normal sample
FD - Field duplicate sample
Bold concentrations indicate detections
J - Result below reporting limit
NA - not analyzed
- value is below minimum detectable concentration
- value shown as zero reported by analytical laboratory as a negative number

Table 11 - Private Well Groundwater Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Well	WSW-01	WSW-02	WSW-03	WSW-04
			Date	10/15/2019	10/22/2019	10/24/2019	10/24/2019
Group	Analyte	MCL	Units				
Radiological	Alpha particles	15**	pCi/L	< 5.00	< 5.00	3.63	7.11
Radiological	Beta particles	50**	pCi/L	< 5.00	8.80	< 5.00	< 5.00
Radiological	Technetium-99	900	pCi/L	< 50.0	< 50.0	< 50.0	< 50.0
Radiological	Uranium-233/234		pCi/L	< 0.500	< 0.500	< 0.500	< 0.500
Radiological	Uranium-235/236		pCi/L	< 0.500	< 0.500	< 0.500	< 0.500
Radiological	Uranium-238		pCi/L	< 0.500	< 0.500	0.788	0.342
Radiological	Uranium-234		ug/L	< 0.050	< 0.050	< 0.050	< 0.050
Radiological	Uranium-235		ug/L	< 0.070	< 0.070	< 0.070	< 0.070
Radiological	Uranium-238		ug/L	0.272	< 0.200	0.776	0.482
Radiological	Total Uranium Isotopes	30	ug/L	0.272	< 0.200	0.776	0.482
Chemical	Fluoride	4	mg/L	0.023	0.103	0.013	0.013
Chemical	Nitrate as N	10	mg/L	0.020	< 0.020	< 0.020	0.067
Chemical	Ammonia as N		ug/L	0.0639	0.0273	0.0655	0.0166
Metals	Aluminum		ug/L	< 200	< 200	< 200	78.3 J
Metals	Antimony	6	ug/L	< 20.0	5.89 J	< 20.0	< 20.0
Metals	Arsenic	10	ug/L	< 30.0	< 30.0	< 30.0	< 30.0
Metals	Barium	2000	ug/L	3.87 J	27.1	2.78 J	7.43
Metals	Beryllium	4	ug/L	< 5.00	1.26 J	< 5.00	< 5.00
Metals	Cadmium	5	ug/L	< 5.00	< 5.00	< 5.00	< 5.00
Metals	Calcium		ug/L	380	1990	330	288
Metals	Chromium	100	ug/L	< 10.0	< 10.0	< 10.0	< 10.0
Metals	Cobalt		ug/L	1.99 J	< 5.00	4.45 J	3.66 J
Metals	Copper	1300	ug/L	< 20.0	26.3	22.2	33.2
Metals	Iron		ug/L	< 100	7050	< 100	< 100
Metals	Lead	15	ug/L	< 20.0	3.91 J	5.63 J	5.14 J
Metals	Magnesium		ug/L	184 J	970	157 J	190 J
Metals	Manganese		ug/L	3.99 J	106	3.95 J	4.84 J
Metals	Mercury	2	ug/L	< 0.200	< 0.200	< 0.200	< 0.200
Metals	Nickel		ug/L	2.09 J	1.74 J	5.23	5.64
Metals	Potassium		ug/L	687	1020	582	879
Metals	Selenium	50	ug/L	< 30.0	< 30.0	< 30.0	< 30.0
Metals	Silver		ug/L	< 5.00	< 5.00	< 5.00	< 5.00
Metals	Sodium		ug/L	1620	5130	1740	1140
Metals	Thallium	2	ug/L	< 20.0	< 20.0	< 20.0	< 20.0
Metals	Vanadium		ug/L	< 5.00	< 5.00	< 5.00	< 5.00
Metals	Zinc		ug/L	5.83 J	13.4 J	37	116
SVOCs	1,1'-Biphenyl		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2,4,5-Trichlorophenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2,4,6-Trichlorophenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2,4-Dichlorophenol		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	2,4-Dimethylphenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2,4-Dinitrophenol		ug/L	< 20	< 20	< 20	< 20
SVOCs	2,4-Dinitrotoluene		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	2,6-Dinitrotoluene		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	2-Chloronaphthalene		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2-Chlorophenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2-Methylnaphthalene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	2-Methylphenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	2-Nitroaniline		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	2-Nitrophenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	3,3'-Dichlorobenzidine		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	3-Nitroaniline		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	4,6-Dinitro-2-methylphenol		ug/L	< 20	< 20	< 20	< 20
SVOCs	4-Bromophenyl phenyl ether		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	4-Chloro-3-methylphenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	4-Chloroaniline		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	4-Chlorophenyl phenyl ether		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	4-Methylphenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	4-Nitroaniline		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	4-Nitrophenol		ug/L	< 20	< 20	< 20	< 20
SVOCs	Acenaphthene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Acenaphthylene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Acetophenone		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Anthracene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Atrazine	3	ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Benz(a)anthracene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Benzaldehyde		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	Benzo(a)pyrene	0.2	ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Benzo(b)fluoranthene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Benzo(g,h,i)perylene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Benzo(k)fluoranthene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Bis(2-chloroethoxy)methane		ug/L	< 4.0	< 4.0	< 4.0	< 4.0

Table 11 - Private Well Groundwater Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Well	WSW-01	WSW-02	WSW-03	WSW-04
			Date	10/15/2019	10/22/2019	10/24/2019	10/24/2019
Group	Analyte	MCL	Units				
SVOCs	Bis(2-chloroethyl)ether		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Bis(2-chloroisopropyl)ether		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Bis(2-ethylhexyl)phthalate	6	ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Butyl benzyl phthalate		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Caprolactam		ug/L	< 8.0	< 8.0	< 8.0	< 8.0
SVOCs	Carbazole		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Chrysene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Di-n-butyl phthalate		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Di-n-octyl phthalate		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Dibenz(a,h)anthracene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Dibenzofuran		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Diethyl phthalate		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Dimethyl phthalate		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Fluoranthene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Fluorene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Hexachlorobenzene	1	ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Hexachlorobutadiene		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Hexachlorocyclopentadiene	50	ug/L	< 20	< 20	< 20	< 20
SVOCs	Hexachloroethane		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Indeno(1,2,3-cd)pyrene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Isophorone		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	N-Nitrosodi-n-propylamine		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	N-Nitrosodiphenylamine		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Naphthalene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Nitrobenzene		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Pentachlorophenol	1	ug/L	< 20	< 20	< 20	< 20
SVOCs	Phenanthrene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
SVOCs	Phenol		ug/L	< 4.0	< 4.0	< 4.0	< 4.0
SVOCs	Pyrene		ug/L	< 0.80	< 0.80	< 0.80	< 0.80
VOCs	(1-Methylethyl)-Benzene		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1,1-Trichloroethane	200	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1,2,2-Tetrachloroethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1,2-Trichlor-1,2,2-trifluoroethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1,2-Trichloroethane	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1-Dichloroethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,1-Dichloroethene	7	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2,4-Trichlorobenzene	70	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2-Dibromo-3-chloropropane	0.2	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2-Dibromoethane	0.05	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2-Dichlorobenzene	600	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2-Dichloroethane	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,2-Dichloropropane	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,3-Dichlorobenzene		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	1,4-Dichlorobenzene	75	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	2-Butanone		ug/L	< 10	< 10	< 10	< 10
VOCs	2-Hexanone		ug/L	< 10	< 10	< 10	< 10
VOCs	4-Methyl-2-pentanone		ug/L	< 10	< 10	< 10	< 10
VOCs	Acetone		ug/L	< 20	< 20	< 20	< 20
VOCs	Benzene	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Bromodichloromethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Bromoform		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Bromomethane		ug/L	< 2.0	< 2.0	< 2.0	< 2.0
VOCs	Carbon disulfide		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Carbon tetrachloride	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Chlorobenzene	100	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Chloroethane		ug/L	< 2.0	< 2.0	< 2.0	< 2.0
VOCs	Chloroform		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Chloromethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	cis-1,2-Dichloroethene	70	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	cis-1,3-Dichloropropene		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Cyclohexane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Dibromochloromethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Dichlorodifluoromethane		ug/L	< 2.0	< 2.0	< 2.0	< 2.0
VOCs	Ethylbenzene	700	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Methyl acetate		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Methyl tert-butyl ether		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Methylcyclohexane		ug/L	< 5.0	< 5.0	< 5.0	< 5.0
VOCs	Methylene chloride	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Styrene	100	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Tetrachloroethene	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Toluene	1000	ug/L	< 1.0	< 1.0	< 1.0	< 1.0

Table 11 - Private Well Groundwater Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Well	WSW-01	WSW-02	WSW-03	WSW-04
			Date	10/15/2019	10/22/2019	10/24/2019	10/24/2019
Group	Analyte	MCL	Units				
VOCs	trans-1,2-Dichloroethene	100	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	trans-1,3-Dichloropropene		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Trichloroethene	5	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Trichlorofluoromethane		ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Vinyl chloride	2	ug/L	< 1.0	< 1.0	< 1.0	< 1.0
VOCs	Xylenes, Total	10000	ug/L	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
MCL - Maximum Contaminant Level
** - site-specific action level
pCi/L - picocuries per liter
ug/L - micrograms per liter
mg/L - milligrams per liter
SVOCs - semivolatile organic compounds
VOCs - volatile organic compounds
Bold concentrations indicate detections
J - Result below reporting limit

Table 12 - Summary of Surface Water Analytical Results
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

		Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Total Uranium Isotopes	Technetium-99
		Unit	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	pCi/L
		CFFF-MCL	5	5	70	2	10	4	30	900
Location	Type	Date								
SW-11	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.146	0.365	0 ##
SW-12	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.296	< 0.2	0 ##
SW-13	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.226	0.134	0 ##
SW-14	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	0.63	0.234	0.297	3.73 #
SW-16	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	0.48	1.69	1.78	0 ##
SW-17	N	7/18/2019	16	1.0	< 1.0	< 1.0	3.8	0.460	0.246	0 ##
SW-17	FD	7/18/2019	16	1.0	< 1.0	< 1.0	3.8	0.471	0.229	0 ##
SW-18	N	7/16/2019	14	< 1.0	< 1.0	< 1.0	5.7	0.309	0.304	1.29 #
SW-19	N	7/17/2019	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.154	0.524	0 ##
SW-20	N	7/16/2019	< 1.0	< 1.0	< 1.0	< 1.0	< 0.020	0.494	1.14	0 ##
SW-21	N	7/15/2019	< 1	< 1	< 1	< 1	< 0.02	0.433	0.160	NA
SW-21	N	7/17/2019	NA	NA	NA	NA	NA	NA	NA	0 ##
SW-22	N	7/15/2019	< 1	< 1	< 1	< 1	< 0.02	0.432	0.199	NA
SW-22	N	7/17/2019	NA	NA	NA	NA	NA	NA	NA	0 ##
SW-23	N	7/16/2019	< 1.0	< 1.0	< 1.0	< 1.0	7.3	4.94	0.0673	13.6 #

Notes:
MCL - Maximum Contaminant Level
Concentrations in shaded cells exceed their MCL
Bold concentrations indicate detections
NA - not analyzed
- value is below minimum detectable concentration
- value shown as zero reported by analytical laboratory as a negative number
pCi/L - picocuries per liter
ug/L - micrograms per liter
mg/L - milligrams per liter
N - normal sample
FD - field duplicate sample
Surface water sample SW-15 was not collected because the stormwater ditch was dry

Table 13 - Summary of Background Concentrations for Surface Water and Sediment
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

	Surface Water	Sediment	
Constituent	Stormwater Ditches	Stormwater Ditches	Mill Creek
Ammonia	0.77 mg/L	1283 mg/kg	825 mg/kg
Nitrate	0.02 mg/L	0.57 mg/L	0.91 mg/L
Fluoride	0.442 mg/L	3.61 mg/L	2.73 mg/L
Total Uranium Isotopes	0.465 ug/L	NC	NC
Uranium 233/234	0.05 ug/L	2.07 pCi/g	3.64 pCi/g
Uranium 235/236	0.07 ug/L	0.285 pCi/g	0.250 pCi/g
Uranium 238	0.465 ug/L	1.91 pCi/g	3.26 pCi/g
2-Butanone	10 ug/L	193 µg/kg	34 µg/kg
Acetone	20 ug/L	142 µg/kg	251 ug/kg

Notes: Background concentrations above are two-times the mean concentration from background samples
Surface water and sediment background locations for the stormwater ditches are SW-11/SW-12 and SED-11/SED-12, respectively
Sediment background locations for non-radiological constituents in Mill Creek are SED-51 through SED-56
Sediment background locations for uranium isotopes in Mill Creek are SED-51 through SED-59
mg/L - milligrams per liter
mg/kg - milligrams per kilogram
ug/L - micrograms per liter
µg/kg - micrograms per kilogram
pCi/g - picocuries per gram
NC - not calculated

Table 14 - Sediment Analytical Results Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Uranium-233/234	Uranium-235/236	Uranium-238	Technetium-99
			Unit	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g
			RUSL							13	8	14	19
			IUSL							3310	39	179	89400
Location	Depth	Type	Date										
SED-11	0 - 6 in	N	7/17/2019	< 6.3	< 6.3	< 6.3	< 6.3	0.33	1.35 J	1.14	0.00159 #	0.742	0 ##
SED-12	0 - 6 in	N	7/17/2019	< 5.6	< 5.6	< 5.6	< 5.6	0.24	2.26 J	0.925	0.0647 #	1.17	0 ##
SED-13	0 - 6 in	N	7/17/2019	< 6.1	< 6.1	< 6.1	< 6.1	0.2	1.45 J	1.67	0.156 #	1.33	0 ##
SED-14	0 - 6 in	N	7/17/2019	< 4.4	< 4.4	< 4.4	< 4.4	< 0.2	< 1.21	1.42	0.0250 #	0.389	0.0243 #
SED-15	0 - 6 in	N	7/16/2019	< 3.8	< 3.8	< 3.8	< 3.8	< 0.20	2.09	2.58	0.181	2.05	5.62 #
SED-16	0 - 6 in	N	7/17/2019	< 4.1	< 4.1	< 4.1	< 4.1	2.7	8.73	14.9	0.678	2.77	4.94 #
SED-16	0 - 6 in	N	11/18/2020	< 5.3	< 5.3	< 5.3	< 5.3	1	15.5	67.2	3.31	12.1	0.614 #
SED-16	6 - 12 in	N	11/18/2020	< 5	< 5	< 5	< 5	0.38	10.3	63.7	3.18	11.8	2.62
SED-16	12 - 24 in	N	11/18/2020	< 4.9	< 4.9	< 4.9	< 4.9	< 0.24	3.78	6.03	0.480	1.99	3.71
SED-17	0 - 6 in	N	7/18/2019	5.5	< 4.8	< 4.8	< 4.8	2.1	0.908 J	0.658	0.0235 #	0.302	7.50 #
SED-17	0 - 6 in	FD	7/18/2019	< 4.8	< 4.8	< 4.8	< 4.8	0.95	0.814 J	1.07	0.104 #	0.354	0 ##
SED-18	0 - 6 in	N	7/16/2019	< 4.5	< 4.5	< 4.5	< 4.5	< 0.20	< 1.22	0.219	0.0173 #	0.298	0 ##
SED-19	0 - 6 in	N	7/17/2019	< 5.2	< 5.2	< 5.2	< 5.2	1.2	3.51	32.5	2.30	8.18	6.28 #
SED-19	0 - 6 in	N	12/2/2020	< 74	< 74	< 74	< 74	4.2	59.7	19.1	1.02	5.15	0.208 #
SED-19	6 - 12 in	N	12/2/2020	< 60	< 60	< 60	< 60	3.7	28.5	27.0	1.22	6.42	1.12
SED-19	12 - 18 in	N	12/2/2020	< 26	< 26	< 26	< 26	2.1	3.98	2.05	0.0675 #	1.51	0 ##
SED-19	12 - 18 in	FD	12/2/2020	< 24	< 24	< 24	< 24	1.8	NA	NA	NA	NA	NA
SED-20	0 - 6 in	N	7/16/2019	< 6.5	< 6.5	< 6.5	< 6.5	< 0.20	15.7	62.5	3.12	14.9	0 ##
SED-20	0 - 6 in	N	11/19/2020	< 8.2	< 8.2	< 8.2	< 8.2	0.56	6.63	1.72	0.0212 #	1.67	0.638 #
SED-20	6 - 12 in	N	11/19/2020	< 7.4	< 7.4	< 7.4	< 7.4	0.41	4.93	2.13	0.0940 #	1.50	0.265 #
SED-20	12 - 24 in	N	11/19/2020	< 7	< 7	< 7	< 7	0.45	4.01	1.43	0.145	1.89	0.208 #
SED-20	24 - 36 in	N	11/19/2020	< 6.4	< 6.4	< 6.4	< 6.4	0.34	8.50	1.49	0.0841 #	1.40	0.700 #
SED-21	0 - 6 in	N	7/15/2019	< 6.2	< 6.2	< 6.2	< 6.2	< 0.2	2.17 J	1.86	0.104 #	1.96	4.12 #
SED-21	0 - 6 in	N	11/10/2020	< 54	< 54	< 54	< 54	3.7	13.2	13.2	0.393	3.79	1.17
SED-21	6 - 12 in	N	11/10/2020	< 19	< 19	< 19	< 19	1.1	8.86	2.19	0.131 #	1.51	0.528 #
SED-21	12 - 24 in	N	11/10/2020	< 8.9	< 8.9	< 8.9	< 8.9	1.1	4.73	1.56	0.0344 #	1.07	0.225 #
SED-21	24 - 36 in	N	11/10/2020	< 15	< 15	< 15	< 15	< 0.6	4.45	1.75	0 ##	0.970	0.0586 #
SED-22	0 - 6 in	N	7/15/2019	< 6.1	< 6.1	< 6.1	< 6.1	< 0.2	4.64	117	4.98	28.0	0 ##
SED-22	0 - 6 in	N	11/9/2020	< 34	< 34	< 34	< 34	0.6	9.90	6.21	0.257	2.24	0.304 #
SED-22	6 - 12 in	N	11/9/2020	< 15	< 15	< 15	< 15	< 0.48	6.95	1.97	0.192 #	0.971	0.0333 #
SED-22	12 - 24 in	N	11/9/2020	< 5.6	< 5.6	< 5.6	< 5.6	< 0.28	1.79	1.09	0.0350 #	0.838	0 ##
SED-22	24 - 36 in	N	11/9/2020	< 7	< 7	< 7	< 7	< 0.27	3.02	1.81	0.225 #	1.08	0 ##
SED-23	0 - 6 in	N	7/16/2019	< 7.1	< 7.1	< 7.1	< 7.1	< 0.20	38.1	1.35	0.00261 #	1.69	50.8
SED-23	0 - 6 in	N	11/16/2020	< 25	< 25	< 25	< 25	1.6	89.6	1.36	0.0994 #	1.36	144
SED-23	6 - 12 in	N	11/16/2020	< 9.9	< 9.9	< 9.9	< 9.9	< 0.42	55.3	1.19	0.0658 #	1.29	30.6
SED-23	12 - 24 in	N	11/16/2020	< 5.3	< 5.3	< 5.3	< 5.3	< 0.26	41.6	1.06	0.0187 #	1.19	1.40
SED-23	24 - 36 in	N	11/16/2020	< 5.2	< 5.2	< 5.2	< 5.2	< 0.26	48.5	1.11	0.0379 #	0.736	0.785
SED-24	0 - 6 in	N	7/16/2019	< 4.2	< 4.2	< 4.2	< 4.2	0.20	49.2	1.14	0.0608 #	0.944	35.8
SED-24	0 - 6 in	N	11/16/2020	< 58	< 58	< 58	< 58	4.8	152	3.12	0.160 #	2.13	118
SED-24	6 - 12 in	N	11/16/2020	< 6.5	< 6.5	< 6.5	< 6.5	6.3	135	2.63	0.153 #	1.67	158
SED-24	12 - 18 in	N	11/16/2020	< 9.9	< 9.9	< 9.9	< 9.9	< 0.36	62.7	1.57	0.217	1.47	33.3
SED-25	0 - 6 in	N	7/18/2019	NA	NA	NA	NA	0.27	53.3	907	41.1	149	8.55 #
SED-26	0 - 6 in	N	7/18/2019	NA	NA	NA	NA	1.4	4.61	222	11.0	46.9	1.68 #
SED-27	0 - 6 in	N	7/18/2019	NA	NA	NA	NA	0.30	171	225	11.9	37.4	0 ##
SED-28	0 - 6 in	N	7/18/2019	NA	NA	NA	NA	< 0.20	39.3	254	12.4	44.6	5.75 #
SED-29	0 - 6 in	N	11/20/2019	< 5.1	< 5.1	< 5.1	< 5.1	< 0.50	1.14 J	6.23	0.313	2.51	0 ##
SED-29	6 - 12 in	N	11/20/2019	< 4.5	< 4.5	< 4.5	< 4.5	< 0.50	2.56	1.81	0.208	1.55	0 ##
SED-29	12 - 16 in	N	11/20/2019	< 6.0	< 6.0	< 6.0	< 6.0	NA	2.61	1.23	0.175	1.16	0 ##
SED-30	0 - 6 in	N	11/21/2019	< 5.3	< 5.3	< 5.3	< 5.3	< 0.50	2.26	5.71	0.191	2.51	2.43 #
SED-30	6 - 12 in	N	11/21/2019	< 6.1	< 6.1	< 6.1	< 6.1	< 0.50	3.43	1.41	0.0337 #	1.28	0 ##
SED-31	0 - 6 in	N	11/21/2019	< 4.0	< 4.0	< 4.0	< 4.0	< 0.50	3.13	2.81	0.0669 #	1.75	0.959 #
SED-31	6 - 12 in	N	11/21/2019	< 4.2	< 4.2	< 4.2	< 4.2	< 0.50	3.07	2.96	0.110 #	1.69	0 ##
SED-32	0 - 6 in	N	11/21/2019	< 5.9	< 5.9	< 5.9	< 5.9	1.1	3.88	3.71	0.0970 #	2.00	5.06 #
SED-32	6 - 12 in	N	11/21/2019	< 5.4	< 5.4	< 5.4	< 5.4	< 0.50	4.21	10.0	0.469	3.28	0 ##

Table 14 - Sediment Analytical Results Summary
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Uranium-233/234	Uranium-235/236	Uranium-238	Technetium-99
			Unit	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g
			RUSL							13	8	14	19
			IUSL							3310	39	179	89400
Location	Depth	Type	Date										
SED-33	0 - 6 in	N	11/21/2019	< 5.0	< 5.0	< 5.0	< 5.0	< 0.50	1.57 J	5.06	0.394	2.52	0 ##
SED-33	6 - 12 in	N	11/21/2019	< 5.6	< 5.6	< 5.6	< 5.6	< 0.50	1.56	1.27	0.0959 #	1.56	0 ##
SED-33	12 - 16 in	N	11/21/2019	NA	NA	NA	NA	NA	6.63	1.06	0.0461 #	1.09	0 ##
SED-34	0 - 6 in	N	11/21/2019	< 5.9	< 5.9	< 5.9	< 5.9	0.62	2.20	3.13	0.131 #	1.81	0 ##
SED-34	6 - 12 in	N	11/21/2019	< 5.2	< 5.2	< 5.2	< 5.2	< 0.50	4.26	2.93	0.0487 #	1.73	0 ##
SED-35	0 - 6 in	N	11/22/2019	< 4.4	< 4.4	< 4.4	< 4.4	< 0.50	2.09	2.26	0.179	1.59	0 ##
SED-35	6 - 12 in	N	11/22/2019	< 4.3	< 4.3	< 4.3	< 4.3	< 0.50	4.29	1.59	0.0433 #	1.66	0 ##
SED-36	0 - 6 in	N	11/22/2019	< 4.4	< 4.4	< 4.4	< 4.4	< 0.50	< 1.44	4.40	0.210	2.38	0 ##
SED-36	6 - 12 in	N	11/22/2019	< 5.0	< 5.0	< 5.0	< 5.0	0.55	< 1.32	1.50	0.0881	1.05	0 ##
SED-37	0 - 6 in	N	11/22/2019	< 4.9	< 4.9	< 4.9	< 4.9	< 0.50	1.35 J	4.88	0.254	1.78	0 ##
SED-37	6 - 12 in	N	11/22/2019	< 4.5	< 4.5	< 4.5	< 4.5	< 0.50	1.60	2.04	0.149	1.62	0 ##
SED-37	6 - 12 in	FD	11/22/2019	< 4.4	< 4.4	< 4.4	< 4.4	< 0.50	0.858 J	2.33	0.0456 #	1.38	0 ##
SED-38	0 - 6 in	N	11/22/2019	< 6	< 6	< 6	< 6	0.66	5.17	3.26	0.204	1.68	16.5 #
SED-38	0 - 6 in	N	11/10/2020	< 18	< 18	< 18	< 18	0.95	5.56	60.9	3.12	17.0	2.13
SED-38	6 - 12 in	N	11/10/2020	< 22	< 22	< 22	< 22	< 0.68	5.91	4.19	0.276	2.52	0.116 #
SED-38	12 - 24 in	N	11/10/2020	< 41	< 41	< 41	< 41	< 0.57	4.27 J	3.01	0.188	1.71	0.174 #
SED-38	24 - 36 in	N	11/10/2020	< 8.6	< 8.6	< 8.6	< 8.6	< 0.33	3.55	1.74	0.0835 #	1.60	0.128 #
SED-38	24 - 36 in	FD	11/10/2020	< 9.8	< 9.8	< 9.8	< 9.8	< 0.37	3.90	1.66	0.0261 #	1.25	0.144 #
SED-39	0 - 6 in	N	11/22/2019	< 4.9	< 4.9	< 4.9	< 4.9	< 0.5	1.90	1.86	0.0122 #	1.70	0 ##
SED-39	0 - 6 in	N	11/19/2020	< 8.7	< 8.7	< 8.7	< 8.7	< 0.36	2.60	2.22	0.0959	1.81	0.626 #
SED-39	6 - 12 in	N	11/19/2020	< 10	< 10	< 10	< 10	< 0.35	2.41 J	2.37	0.0929 #	1.85	0.732 #
SED-39	12 - 24 in	N	11/19/2020	< 7.1	< 7.1	< 7.1	< 7.1	0.44	< 1.43	1.58	0.243	1.63	0.536 #
SED-39	24 - 36 in	N	11/19/2020	< 6.2	< 6.2	< 6.2	< 6.2	< 0.3	3.75	1.86	0.181	1.96	0.281 #
SED-40	0 - 6 in	N	11/22/2019	< 5.3	< 5.3	< 5.3	< 5.3	< 0.50	1.65 J	1.90	0.131	1.24	0 ##
SED-40	0 - 6 in	N	11/19/2020	< 19	< 19	< 19	< 19	0.71	3.95	4.69	0.362	2.29	0.400 #
SED-40	6 - 12 in	N	11/19/2020	< 7.3	< 7.3	< 7.3	< 7.3	0.3	0.668 J	1.34	0.0449 #	1.43	0.199 #
SED-40	12 - 24 in	N	11/19/2020	< 6.6	< 6.6	< 6.6	< 6.6	< 0.29	2.09	1.17	0 ##	1.09	0.0850 #
SED-40	24 - 36 in	N	11/19/2020	< 5.5	< 5.5	< 5.5	< 5.5	< 0.26	1.42	1.36	0.0645 #	1.23	0.137 #
SED-41	0 - 6 in	N	11/25/2019	< 6.5	< 6.5	< 6.5	< 6.5	0.63	2.68 J	1.72	0.0394 #	1.41	0.995 #
SED-41	0 - 6 in	N	11/10/2020	< 74	< 74	< 74	< 74	3.4	14.6	17.0	0.789	3.38	1.12
SED-41	6 - 12 in	N	11/10/2020	< 30	< 30	< 30	< 30	1.6	5.18	1.84	0.0733 #	1.29	0.0380 #
SED-41	12 - 24 in	N	11/10/2020	< 12	< 12	< 12	< 12	0.55	2.10 J	2.14	0 ##	1.87	0.216 #
SED-41	24 - 36 in	N	11/10/2020	< 22	< 22	< 22	< 22	1	5.77	0.806	0.0600 #	0.925	0.185 #
SED-42	0 - 6 in	N	11/25/2019	< 6.8	< 6.8	< 6.8	< 6.8	0.83	5.15 J	6.12	0.285	2.23	5.94 #
SED-42	0 - 6 in	N	11/11/2020	< 61	< 61	< 61	< 61	3	26.5	31.1	1.18	7.57	1.21
SED-42	6 - 12 in	N	11/11/2020	< 49	< 49	< 49	< 49	3.3	7.98	4.34	0.248 #	1.68	0.137 #
SED-42	12 - 24 in	N	11/11/2020	< 21	< 21	< 21	< 21	< 0.63	2.21 J	3.19	0.135 #	1.50	0.0327 #
SED-42	24 - 36 in	N	11/11/2020	< 23	< 23	< 23	< 23	< 0.72	2.03 J	1.57	0.0342 #	1.58	0 ##
SED-43	0 - 6 in	N	11/25/2019	< 7.2	< 7.2	< 7.2	< 7.2	0.50	14.9	47.5	2.32	12.1	0 ##
SED-43	0 - 6 in	N	12/1/2020	< 41	< 41	< 41	< 41	1.9	2.67 J	5.13	0.211 #	1.87	0.226 #
SED-43	6 - 12 in	N	12/1/2020	< 56	< 56	< 56	< 56	4.9	9.10	16.0	0.873	4.50	0.00633 #
SED-44	0 - 6 in	N	11/25/2019	< 7.2	< 7.2	< 7.2	< 7.2	< 0.50	3.04 J	8.86	0.377	2.62	6.23 #
SED-44	0 - 6 in	N	12/1/2020	< 100	< 100	< 100	< 100	4.6	32.3	435	24.3	98.7	9.42
SED-44	6 - 12 in	N	12/1/2020	< 47	< 47	< 47	< 47	2.1	19.3	34.0	1.57	8.74	4.33
SED-44	12 - 18 in	N	12/1/2020	< 6.2	< 6.2	< 6.2	< 6.2	< 0.72	15.3	3.34	0.0293 #	2.70	0 ##
SED-45	0 - 6 in	N	11/25/2019	< 6.1	< 6.1	< 6.1	< 6.1	0.82	7.90	5.86	0.268	2.20	2.83 #
SED-45	0 - 6 in	N	12/2/2020	< 49	< 49	< 49	< 49	2.7	103	6.00	0.325	1.92	0 ##
SED-45	6 - 12 in	N	12/2/2020	< 28	< 28	< 28	< 28	1.4	< 3.96	2.95	0.0545 #	1.48	0 ##
SED-46	0 - 6 in	N	11/25/2019	< 6.5	< 6.5	< 6.5	< 6.5	0.62	3.41	4.02	0.179	2.15	0 ##
SED-46	0 - 6 in	N	12/2/2020	< 74	< 74	< 74	< 74	5	120	11.6	0.251 #	2.85	0 ##
SED-46	6 - 12 in	N	12/2/2020	< 36	< 36	< 36	< 36	1.8	20.6	10.4	0.419	3.55	0.110 #
SED-47	0 - 6 in	N	11/26/2019	< 6.9	< 6.9	< 6.9	< 6.9	0.59	6.02	3.18	0.232	1.46	0 ##
SED-47	0 - 6 in	N	12/3/2020	< 33	< 33	< 33	< 33	< 4.7	6.37	3.32	0.0528 #	1.95	0 ##
SED-47	6 - 12 in	N	12/3/2020	< 54	< 54	< 54	< 54	< 8.2	16.5	4.86	0.0999 #	2.41	0 ##

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Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Uranium-233/234	Uranium-235/236	Uranium-238	Technetium-99
			Unit	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g
			RUSL							13	8	14	19
			IUSL							3310	39	179	89400
Location	Depth	Type	Date										
SED-48	0 - 6 in	N	11/26/2019	< 5.3	< 5.3	< 5.3	< 5.3	**0.63**	**2.94**	**2.57**	0.0910 #	**1.98**	0 ##
SED-48	0 - 6 in	N	12/3/2020	< 35	< 35	< 35	< 35	< 6.4	**1.86 J**	**2.49**	0.154 #	**2.24**	0 ##
SED-48	0 - 6 in	FD	11/26/2019	< 5.2	< 5.2	< 5.2	< 5.2	**0.70**	**3.46**	**2.43**	0.0144 #	**1.62**	0 ##
SED-48	6 - 12 in	N	12/3/2020	< 7.7	< 7.7	< 7.7	< 7.7	< 1.7	**3.09**	**2.11**	**0.169**	**1.77**	0 ##
SED-48	12 - 18 in	N	12/3/2020	< 7.1	< 7.1	< 7.1	< 7.1	< 1.5	**1.88**	**1.63**	**0.205**	**1.85**	0 ##
SED-49	0 - 6 in	N	11/26/2019	< 7.1	< 7.1	< 7.1	< 7.1	**0.58**	**5.44**	**4.59**	**0.215**	**2.11**	0 ##
SED-49	0 - 6 in	N	12/3/2020	< 40	< 40	< 40	< 40	< 5.6	**9.14**	**5.10**	**0.142**	**2.25**	0 ##
SED-49	6 - 12 in	N	12/3/2020	< 16	< 16	< 16	< 16	< 2.8	**5.78**	**2.85**	0.0436 #	**2.04**	0 ##
SED-50	0 - 6 in	N	11/26/2019	< 6.3	< 6.3	< 6.3	< 6.3	**0.53**	**4.67**	**3.64**	0.104 #	**1.86**	0.910 #
SED-50	0 - 6 in	N	12/3/2020	< 46	< 46	< 46	< 46	< 6.7	**7.00**	**6.83**	**0.351**	**2.65**	0 ##
SED-50	6 - 12 in	N	12/3/2020	< 21	< 21	< 21	< 21	**6.1**	**2.92**	**2.33**	0.152 #	**1.83**	0 ##
SED-50	12 - 24 in	N	12/3/2020	< 25	< 25	< 25	< 25	< 3.8	**2.51 J**	**1.00**	**0.139**	**0.808**	0 ##
SED-51	0 - 6 in	N	11/27/2019	< 6.6	< 6.6	< 6.6	< 6.6	**0.72**	**2.77 J**	**2.10**	0.178 #	**1.42**	0 ##
SED-51	6 - 12 in	N	11/27/2019	< 6.7	< 6.7	< 6.7	< 6.7	**0.51**	**2.96**	**1.27**	0.0695 #	**1.15**	4.89 #
SED-52	0 - 6 in	N	11/27/2019	< 6.2	< 6.2	< 6.2	< 6.2	< 0.50	**1.48 J**	**1.77**	0.308 #	**1.72**	0 ##
SED-52	6 - 12 in	N	11/27/2019	< 6.4	< 6.4	< 6.4	< 6.4	**0.61**	**1.69 J**	**1.88**	0.0494 #	**1.45**	0 ##
SED-53	0 - 6 in	N	11/27/2019	< 5.4	< 5.4	< 5.4	< 5.4	< 0.50	**0.838 J**	**2.15**	**0.194**	**1.45**	0 ##
SED-53	6 - 12 in	N	11/27/2019	< 5.2	< 5.2	< 5.2	< 5.2	< 0.50	**0.607 J**	**2.06**	0.0708 #	**2.34**	0 ##
SED-54	0 - 6 in	N	12/2/2019	< 6.6	< 6.6	< 6.6	< 6.6	**0.63**	**1.93 J**	**1.78**	0.119 #	**1.36**	1.51 #
SED-54	6 - 12 in	N	12/2/2019	< 6.3	< 6.3	< 6.3	< 6.3	**0.68**	**1.01 J**	**1.48**	0.120 #	**1.87**	0 ##
SED-55	0 - 6 in	N	12/2/2019	< 4.9	< 4.9	< 4.9	< 4.9	< 0.50	< 1.88	**2.05**	0 ##	**1.74**	6.19 #
SED-55	6 - 12 in	N	12/2/2019	< 4.9	< 4.9	< 4.9	< 4.9	< 0.50	< 1.76	**1.62**	**0.155**	**1.62**	0 ##
SED-56	0 - 6 in	N	12/2/2019	< 5.2	< 5.2	< 5.2	< 5.2	**0.52**	< 1.89	**2.02**	**0.214**	**1.40**	2.53 #
SED-56	0 - 6 in	FD	12/2/2019	< 4.8	< 4.8	< 4.8	< 4.8	**0.74**	< 1.96	**2.82**	0.115 #	**2.11**	0 ##
SED-56	6 - 12 in	N	12/2/2019	< 3.5	< 3.5	< 3.5	< 3.5	< 0.50	**0.690 J**	**1.89**	0.0276 #	**1.72**	0 ##
SED-57	0 - 6 in	N	12/4/2020	NA	NA	NA	NA	NA	NA	**2.22**	0.110 #	**1.82**	NA
SED-57	6 - 12 in	N	12/4/2020	NA	NA	NA	NA	NA	NA	**1.63**	0.101 #	**1.74**	NA
SED-57	12 - 18 in	N	12/4/2020	NA	NA	NA	NA	NA	NA	**1.49**	0 #	**2.05**	NA
SED-58	0 - 6 in	N	12/4/2020	NA	NA	NA	NA	NA	NA	**1.21**	0.0516 #	**1.37**	NA
SED-58	6 - 12 in	N	12/4/2020	NA	NA	NA	NA	NA	NA	**1.38**	0.0321 #	**1.15**	NA
SED-59	0 - 6 in	N	12/3/2020	NA	NA	NA	NA	NA	NA	**2.09**	0.0517 #	**1.88**	NA
SED-59	6 - 12 in	N	12/3/2020	NA	NA	NA	NA	NA	NA	**1.52**	0.0494 #	**1.27**	NA
SED-60	0 - 6 in	N	11/18/2020	< 4.9	< 4.9	< 4.9	< 4.9	**0.27**	**19.2**	**39.7**	**2.19**	**7.42**	0.433 #
SED-60	6 - 12 in	N	11/18/2020	< 5.1	< 5.1	< 5.1	< 5.1	**0.29**	**14.1**	**44.4**	**1.81**	**8.17**	0.483 #
SED-61	0 - 6 in	N	11/18/2020	< 5.6	< 5.6	< 5.6	< 5.6	**0.93**	**3.47**	**4.29**	0.244 #	**0.818**	**1.20**
SED-61	0 - 6 in	FD	11/18/2020	< 5.7	< 5.7	< 5.7	< 5.7	**0.85**	**3.04**	**15.1**	**0.789**	**3.50**	**1.12**
SED-61	6 - 12 in	N	11/18/2020	< 5	< 5	< 5	< 5	**0.5**	**5.29**	**9.17**	**0.267**	**2.79**	**7.96**
SED-61	12 - 18 in	N	11/18/2020	< 4.4	< 4.4	< 4.4	< 4.4	**0.38**	**15.2**	**3.86**	**0.186**	**1.95**	**8.28**
SED-62	0 - 6 in	N	11/17/2020	< 8.9	< 8.9	< 8.9	< 8.9	**0.51**	**45.7**	**1.21**	0.167 #	**1.73**	**22.9**
SED-62	6 - 12 in	N	11/17/2020	< 5	< 5	< 5	< 5	< 0.26	**43.5**	**1.57**	0.0659 #	**2.00**	**2.89**
SED-62	6 - 12 in	FD	11/17/2020	< 5.1	< 5.1	< 5.1	< 5.1	< 0.26	**34.4**	**1.60**	0.0636 #	**1.35**	**2.98**
SED-62	12 - 24 in	N	11/17/2020	< 5.2	< 5.2	< 5.2	< 5.2	< 0.26	**39.0**	**1.84**	0 ##	**1.12**	**1.08**
SED-63	0 - 6 in	N	11/17/2020	< 5.6	< 5.6	< 5.6	< 5.6	< 0.28	**37.7**	**0.853**	0.148 #	**0.875**	**25.0**
SED-63	6 - 12 in	N	11/17/2020	< 5	< 5	< 5	< 5	< 0.26	**24.9**	**0.760**	0.0985 #	**0.649**	**2.63**
SED-64	0 - 6 in	N	11/17/2020	< 6.6	< 6.6	< 6.6	< 6.6	**0.29**	**49.4**	**1.30**	0.0856 #	**1.18**	**85.8**
SED-64	6 - 12 in	N	11/17/2020	< 4.8	< 4.8	< 4.8	< 4.8	< 0.25	**33.7**	**1.11**	0.0301 #	**1.32**	**5.53**
SED-65	0 - 6 in	N	11/16/2020	< 5.4	< 5.4	< 5.4	< 5.4	**0.47**	**40.6**	**1.01**	0.113 #	**0.726**	**312**
SED-65	6 - 12 in	N	11/16/2020	< 4.6	< 4.6	< 4.6	< 4.6	< 0.26	**33.6**	**1.12**	0 ##	**0.791**	**8.41**
SED-66	0 - 6 in	N	3/9/2021	< 5.9	< 5.9	< 5.9	< 5.9	< 2.5	**20.9**	**14.5**	**0.637**	**4.19**	**2.16**
SED-66	6 - 12 in	N	3/9/2021	< 5.3	< 5.3	< 5.3	< 5.3	< 2.5	**10.4**	**4.75**	**0.265**	**2.46**	**0.770**
SED-66	12 - 24 in	N	3/9/2021	< 5.5	< 5.5	< 5.5	< 5.5	< 0.5	**4.21**	**1.52**	**0.156**	**1.19**	0.184 #
SED-67	0 - 6 in	N	3/8/2021	< 7.1	< 7.1	< 7.1	< 7.1	< 0.5	**30.4**	**14.8**	**0.743**	**4.41**	**1.83**
SED-67	6 - 12 in	N	3/8/2021	< 5.7	< 5.7	< 5.7	< 5.7	< 0.5	**10.5**	**2.78**	0.118 #	**1.39**	0.639 #
SED-67	12 - 24 in	N	3/8/2021	< 6.2	< 6.2	< 6.2	< 6.2	< 0.5	**9.43**	**2.57**	**0.155**	**1.60**	0.461 #

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Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

			Analyte	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Vinyl chloride	Nitrate as N	Fluoride	Uranium-233/234	Uranium-235/236	Uranium-238	Technetium-99
			Unit	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g
			RUSL							13	8	14	19
			IUSL							3310	39	179	89400
Location	Depth	Type	Date										
SED-68	0 - 6 in	N	3/8/2021	< 4.6	< 4.6	< 4.6	< 4.6	< 0.5	**4.43**	**1.02**	0.0106 #	**1.45**	0.0815 #
SED-68	6 - 12 in	N	3/8/2021	< 4.2	< 4.2	< 4.2	< 4.2	< 0.5	**4.46**	**1.26**	0.0732 #	**1.08**	0 ##
SED-68	12 - 24 in	N	3/8/2021	< 4.1	< 4.1	< 4.1	< 4.1	< 0.5	**4.53**	**1.23**	0.0471 #	**0.615**	0.0594 #
SED-68	12 - 24 in	FD	3/8/2021	< 4.2	< 4.2	< 4.2	< 4.2	< 0.5	**4.66**	**1.30**	0.0530 #	**0.955**	0.156 #
SED-B1	0 - 6 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**401**	**26.9**	**95.7**	**23.7**
SED-B1	6 - 12 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**3.15**	**0.315**	**2.01**	0.295 #
SED-B2	0 - 6 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**267**	**15.8**	**60.3**	**19.1**
SED-B2	6 - 12 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**5.45**	**0.405**	**2.30**	0.720 #
SED-B3	0 - 6 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**47.2**	**2.56**	**13.1**	**4.37**
SED-B3	6 - 12 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**90.6**	**4.75**	**22.1**	**5.34**
SED-B4	0 - 6 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**33.6**	**2.25**	**7.78**	**1.05**
SED-B4	6 - 12 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**10.4**	**0.384**	**3.49**	0.383 #
SED-B5	0 - 6 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**30.0**	**1.36**	**7.25**	0.565 #
SED-B5	6 - 12 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**4.43**	0.178 #	**2.29**	**1.40**
SED-B6	0 - 6 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**30.4**	**1.82**	**6.94**	**1.13**
SED-B6	6 - 12 in	N	3/10/2021	NA	NA	NA	NA	NA	NA	**7.98**	**0.447**	**2.89**	**1.36**
SED-B7	0 - 6 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**24.7**	**1.13**	**6.32**	**3.71**
SED-B7	6 - 12 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**5.49**	**0.275**	**3.16**	0.472 #
SED-B8	0 - 6 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**43.7**	**1.92**	**11.0**	**0.937**
SED-B8	6 - 12 in	N	3/9/2021	NA	NA	NA	NA	NA	NA	**37.6**	**1.92**	**8.65**	**1.40**

Notes:
RUSL - Residential Use Screening Level (NUREG 1757, Volume 2, Revision 1, Appendix H, September 2006)
IUSL - Industrial Use Screening Level (NUREG 1757, Volume 2, Revision 1, Appendix H, September 2006)
N - normal
FD - field duplicate
Concentrations in orange shaded cells exceed their RUSL
Concentrations in blue shaded cells exceed their IUSL
Bold concentrations indicate detections
NA - not analyzed
- value is below minimum detectable concentration
- value shown as zero reported by analytical laboratory as a negative number
pCi/g - picocuires per gram
ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
* - sludge sample collected from the Sanitary Lagoon
** - sludge sample collected from the East Lagoon

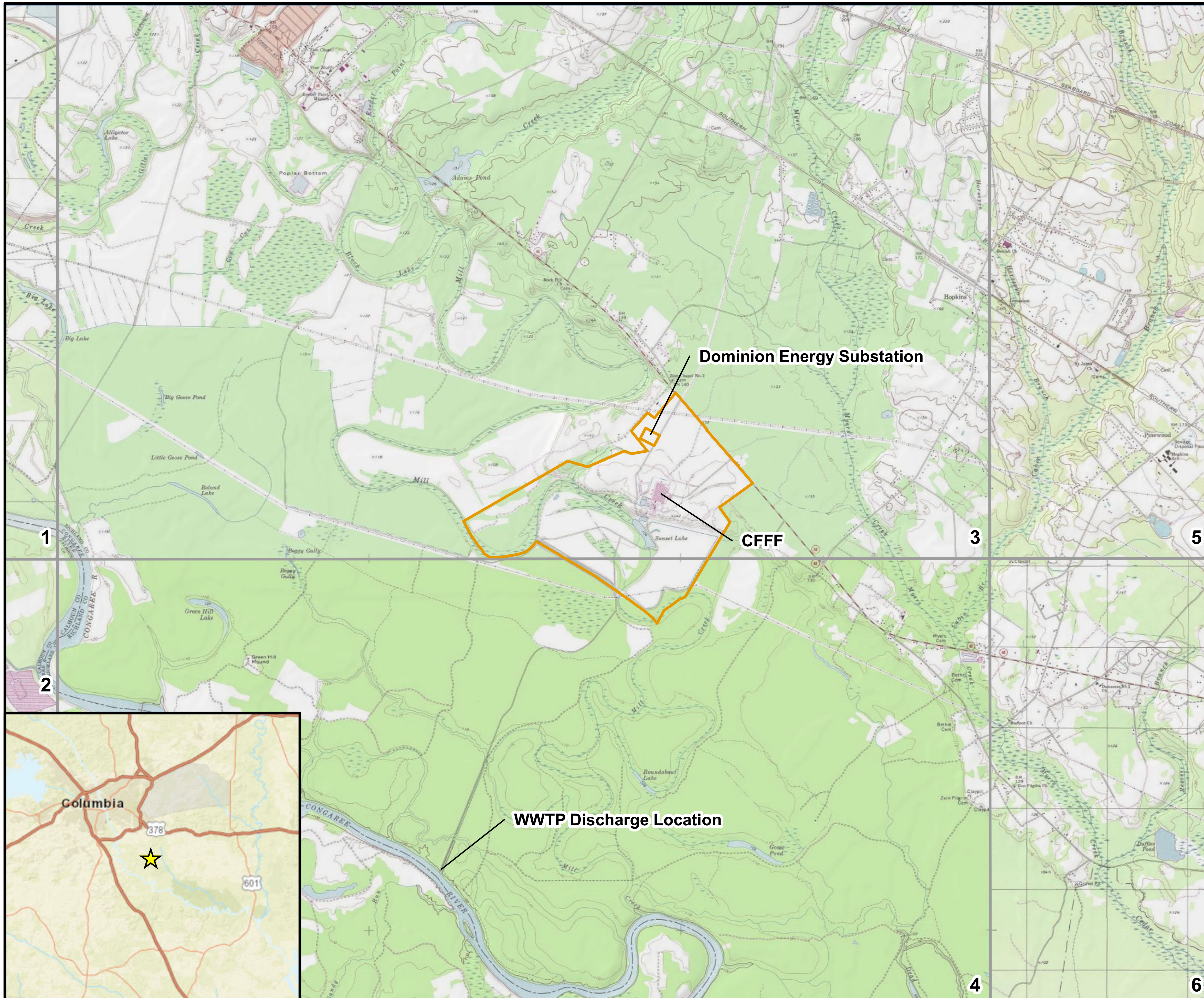
Table 15 - COPC Chemical Properties
Westinghouse Columbia Fuel Fabrication Facility, Hopkins, SC

Chemical Property/COPC	Density	Molecular Weight	Water Solubility	Henry's Law Constant	Partitioning Coefficient (K_d)	Carbon Partitioning Coefficient (K_{oc})	n-Octanol/Water Partition Coefficient (log K_{ow})	Vapor Pressure	Molecular Diffusion Coefficent
Units	g/cm^3	unitless	mg/L	atm-m3/mole	L/kg	L/kg	unitless	mm Hg	cm^2/s
Tetrachloroethene	1.62	165.83	206	1.77E-02	N/A	94.94	3.4	18.5	9.46E-06
Trichloroethene	1.46	131.39	1280	9.85E-03	N/A	60.7	2.42	69	1.02E-05
cis-1,2-Dichloroethene	1.28	96.944	6410	4.08E-03	N/A	39.6	1.86	200	1.13E-05
Vinyl Chloride	0.91	62.499	8800	2.78E-02	N/A	21.73	1.38	2980	1.20E-05
Nitrate (as nitrogen)	N/A	62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoride	N/A	38	1.69	N/A	N/A	N/A	N/A	N/A	N/A
Uranium	19.1	238.03	N/A	N/A	450	N/A	N/A	0	N/A
Technetium-99	11.5	98.91	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes: Source: EPA Regional Screening Level (RSL) Chemical-specific Parameters Supporting Table May 2022

g/cm^3 - grams per cubic centimeter
mg/l - milligrams per liter
atm-m3/mole - atmospheres per cubic meter per mole
L/kg - liters per kilogram
mm Hg - millimeters of mercury
cm2/s - centimeter squared per second
N/A - Not available

Figures



Legend

Locations

Property Line

Topographic Quadrangle Boundary

ID	Topographic Quadrangle Name
1	Southwest Columbia
2	Gaston
3	Fort Jackson South
4	Saylors Lake
5	Congaree
6	Gadsden

0 2,000 4,000 Feet

1:48,000

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Data Source: Esri/USGS

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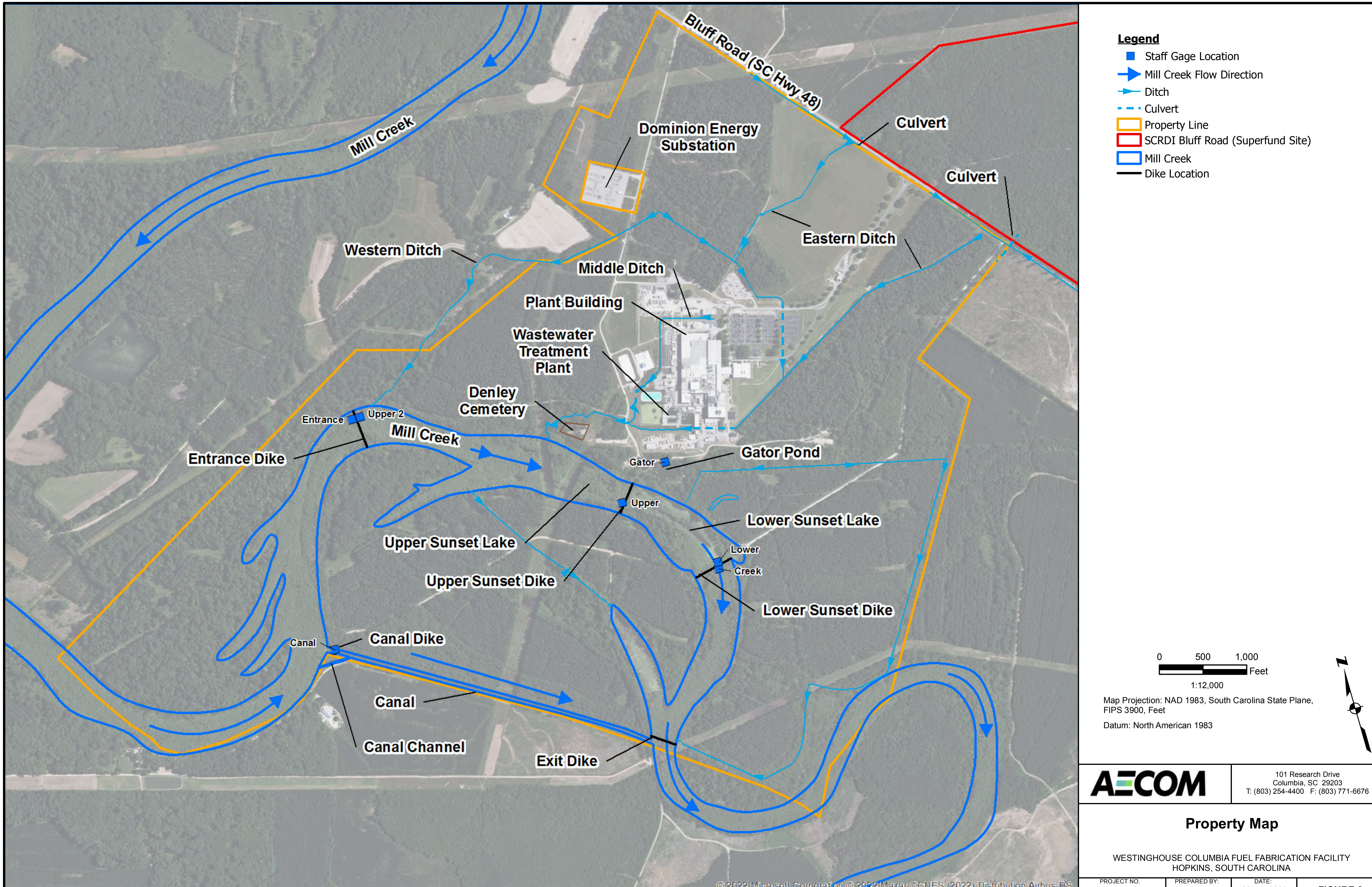
Site Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60641050	CCS	December 2021	FIGURE 1

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F1 Site Location Map.mxd



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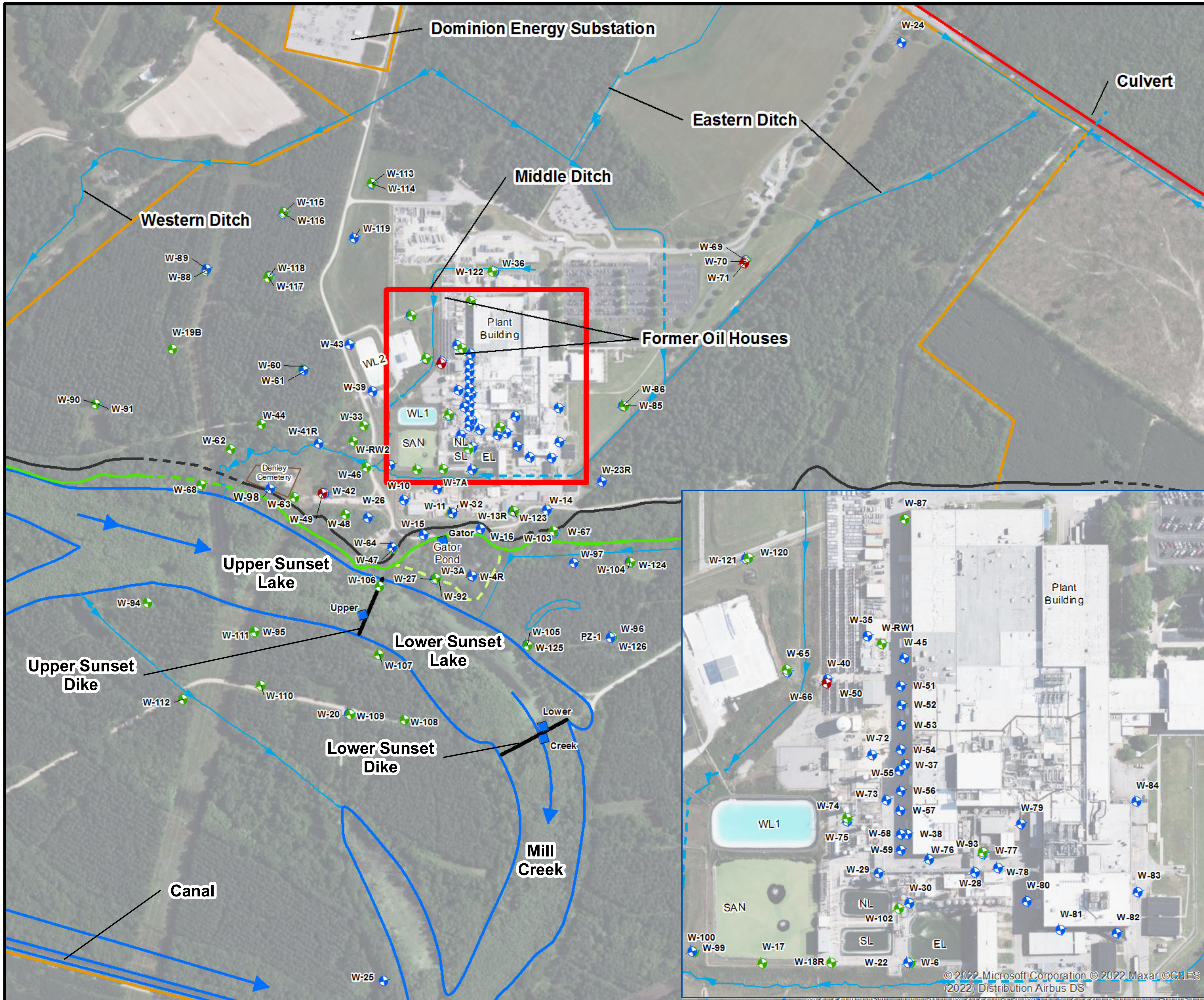
Property Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	March 2022	FIGURE 2

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F2 Property Map.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Staff Gage Location
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon I
WL2	West Lagoon II

0 300 600 Feet

1:7,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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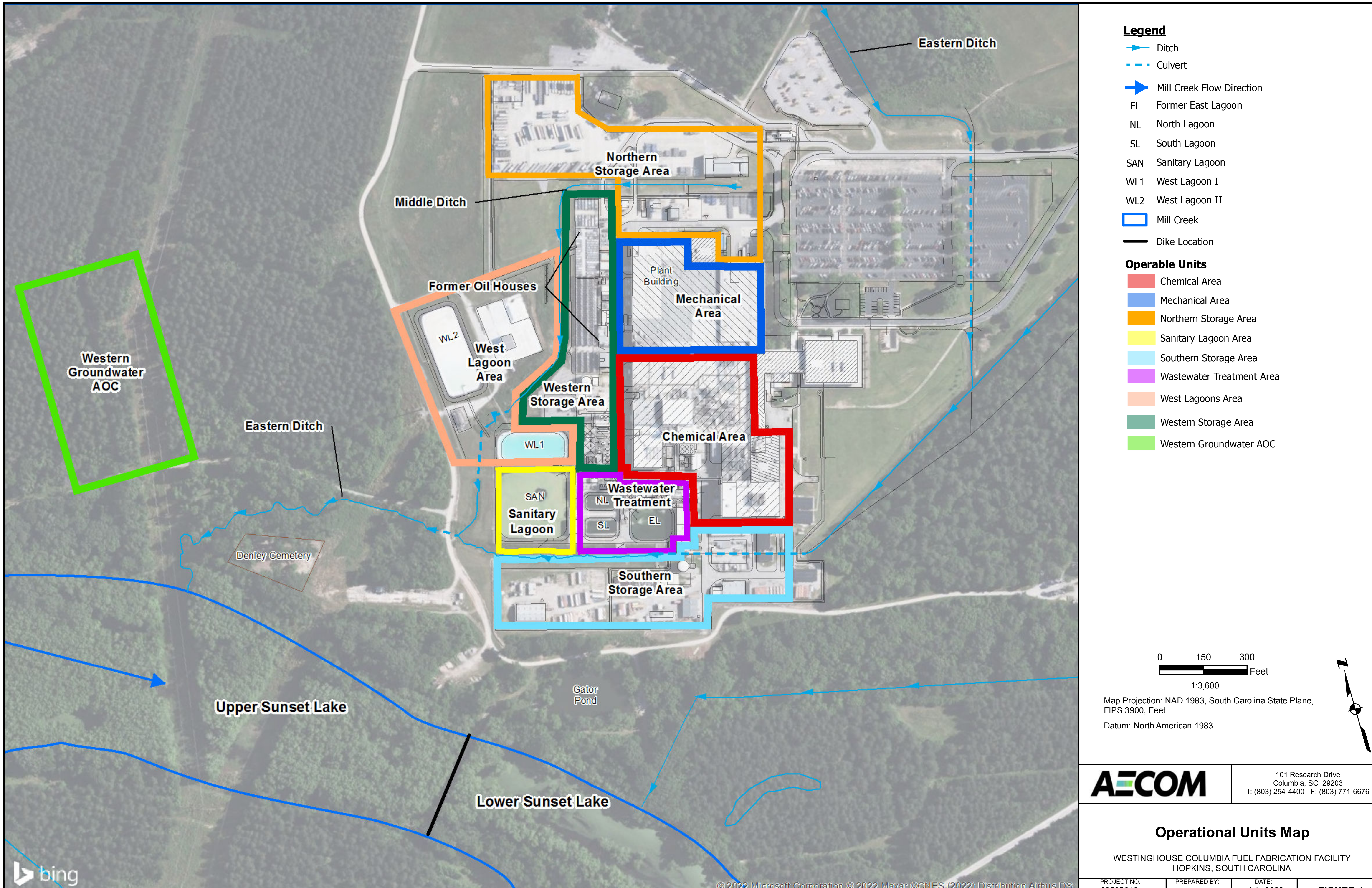
Site Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 3

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F3 SiteMap.mxd



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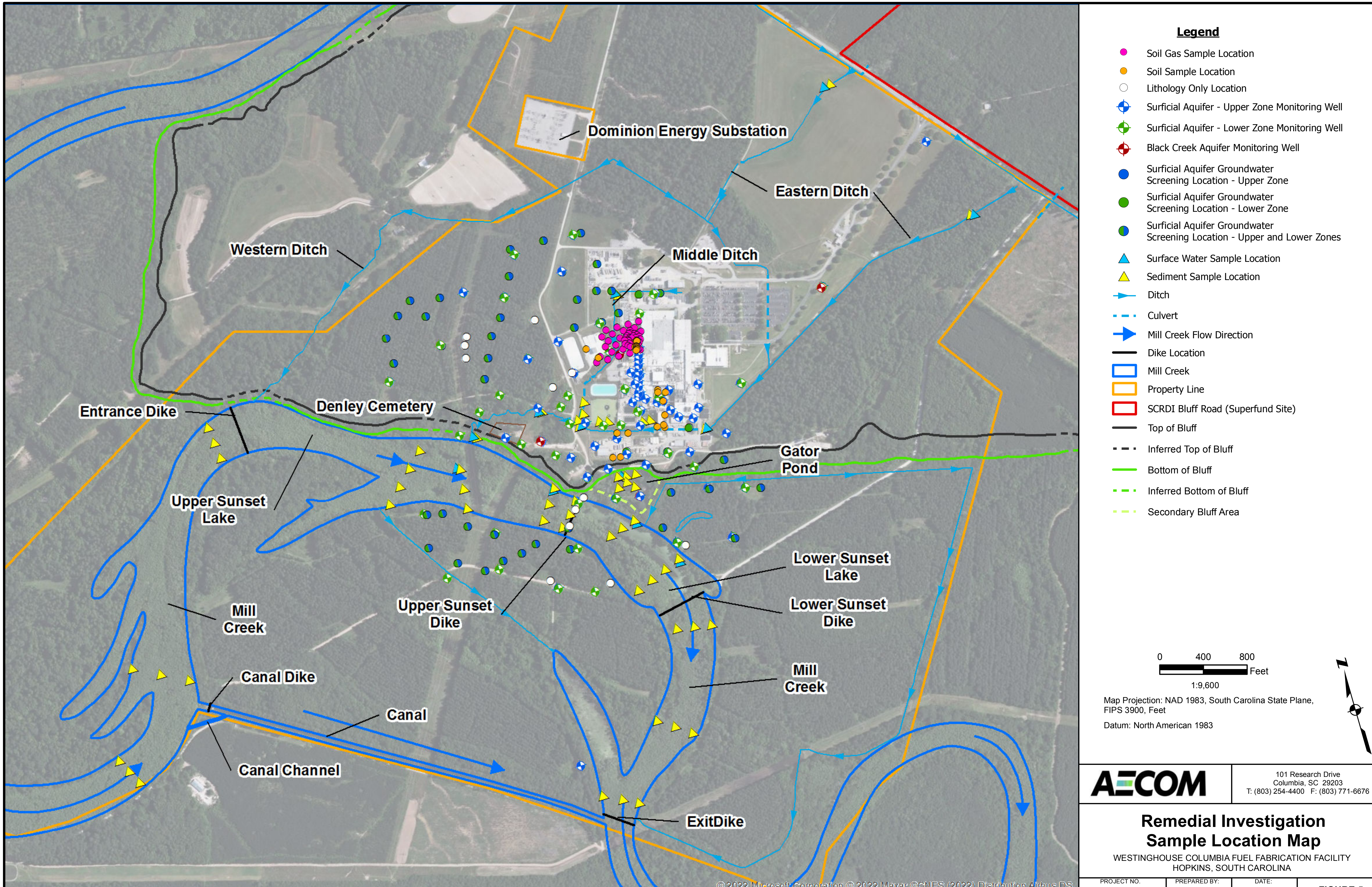
Operational Units Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 4

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F4 Operation Units Map.mxd



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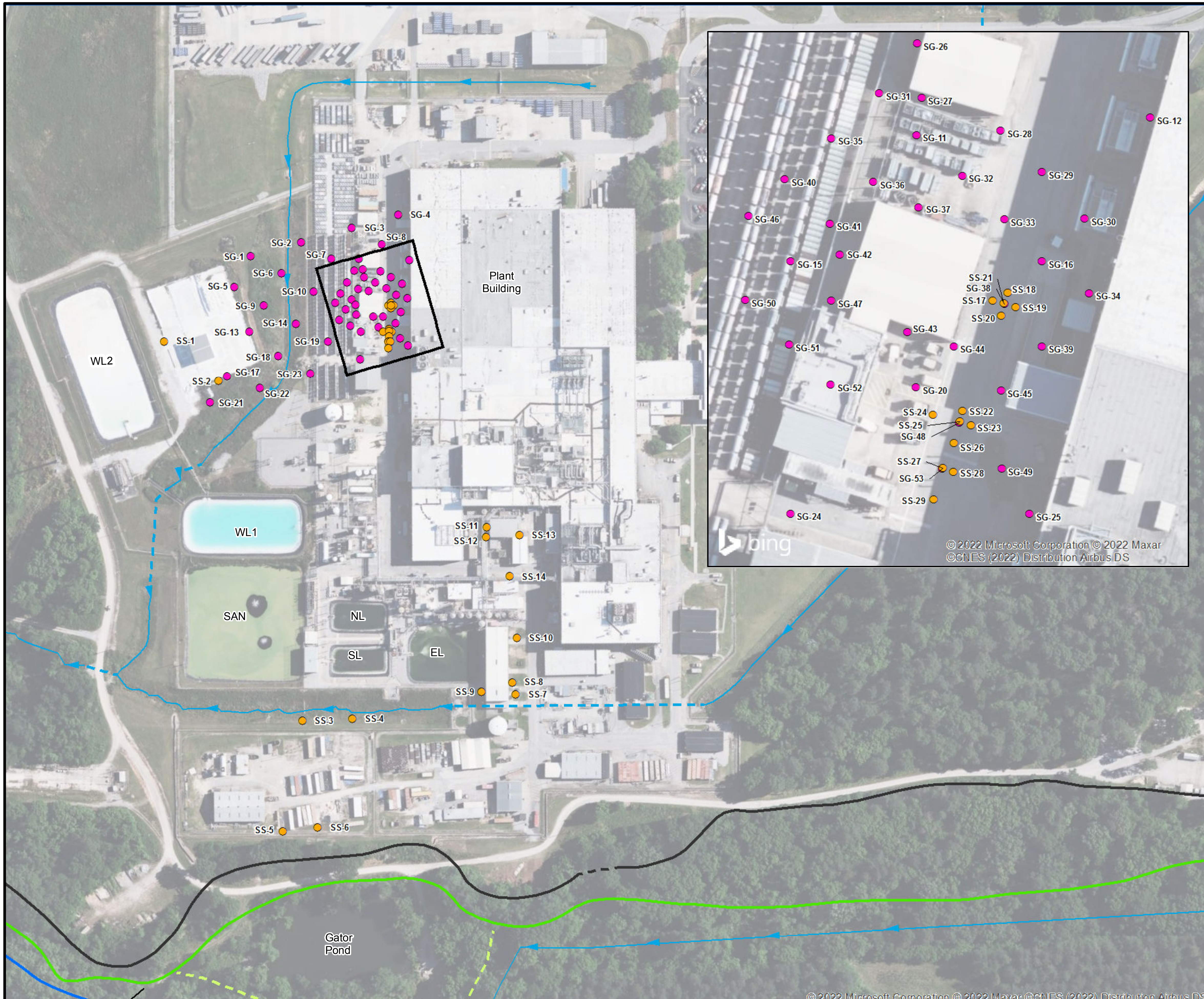
Remedial Investigation Sample Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 5

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F5 RI Sample Location Map.mxd



Legend

- Soil Gas Sample Location
- Soil Sample Location
- Ditch
- Culvert
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon I
- WL2 West Lagoon II

0 100 200 Feet

1:2,400

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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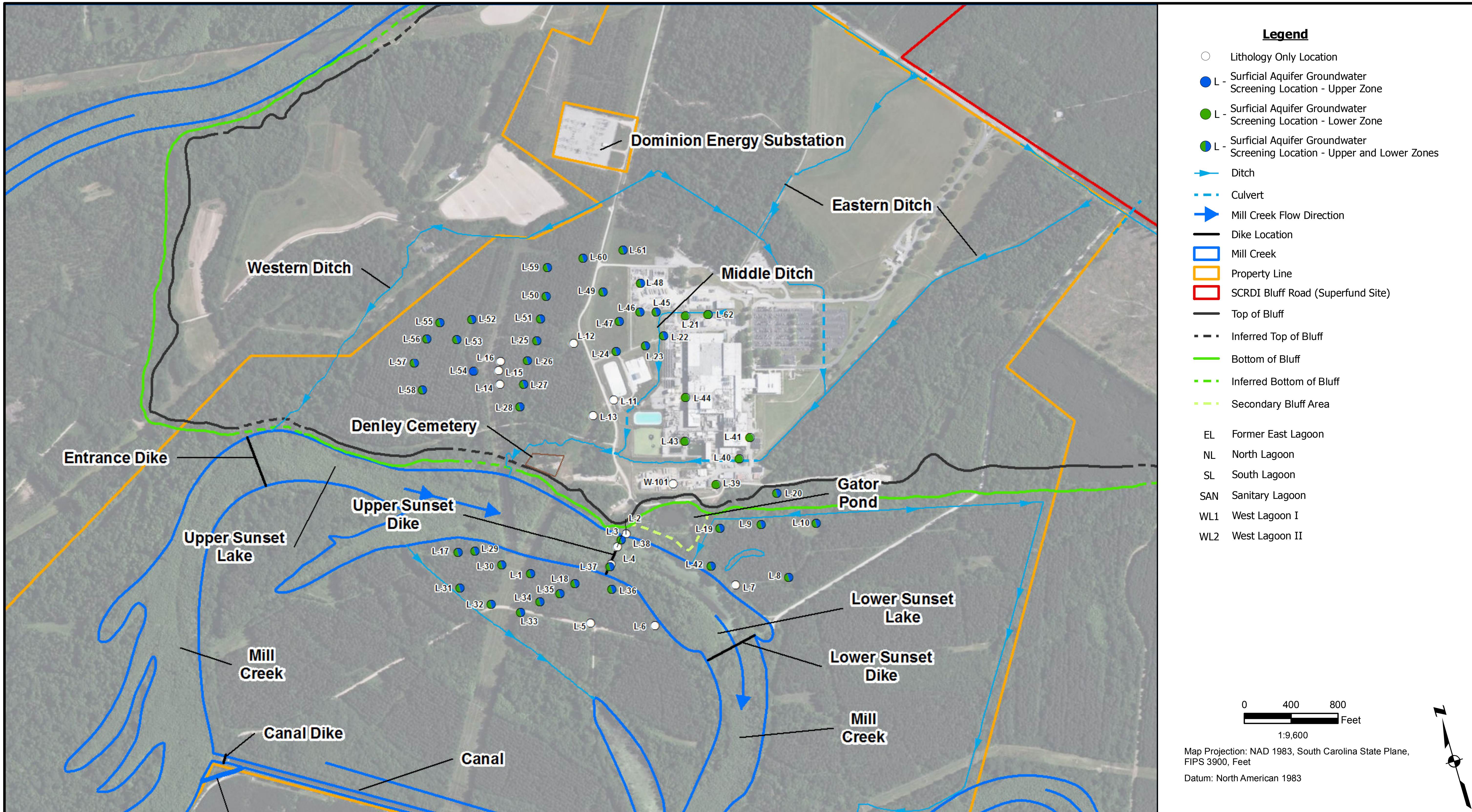
Soil Gas Survey and Soil Sample Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 6

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F6 SoilGas Soil Sample Location Map.mxd



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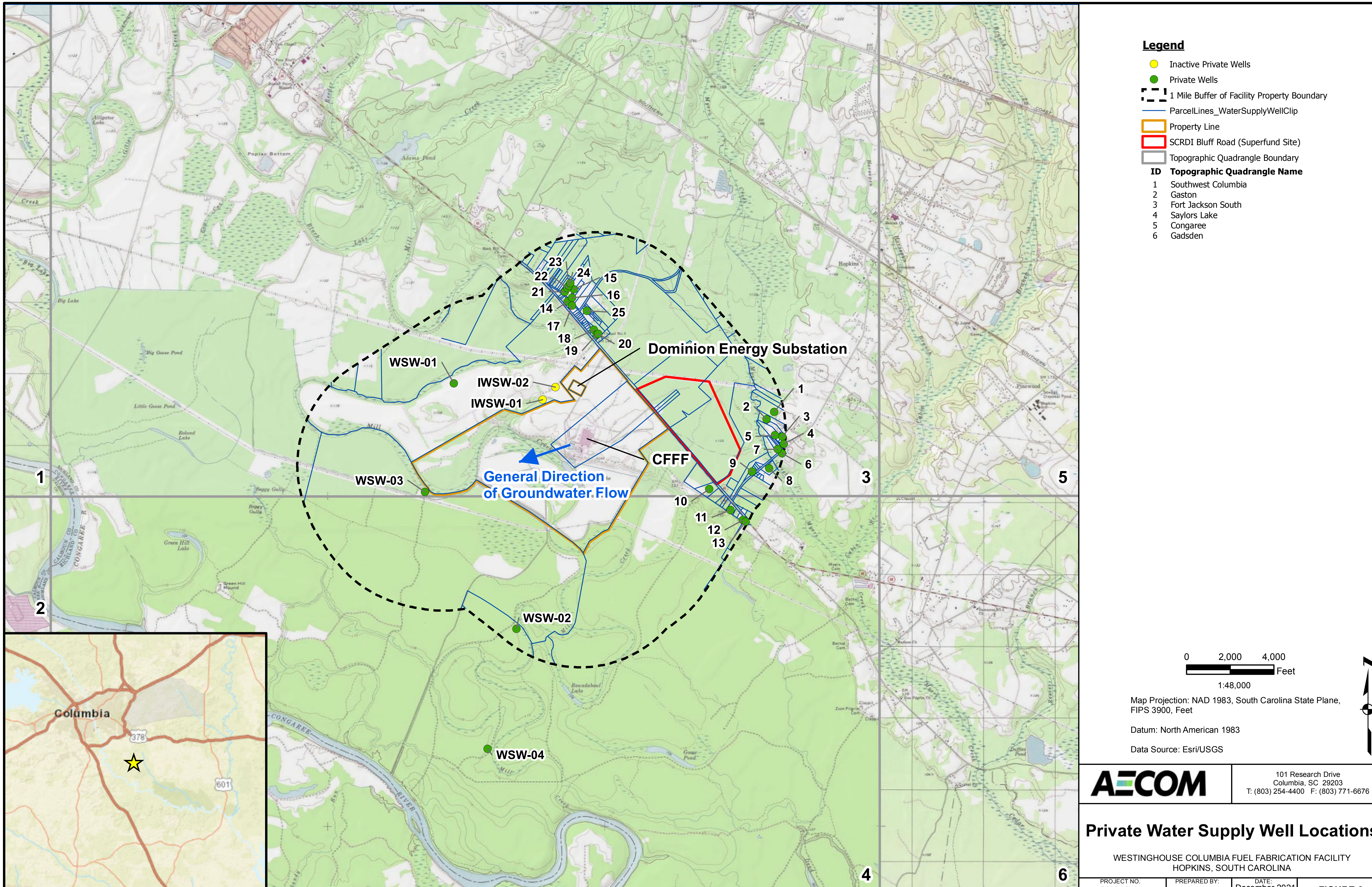
Lithologic Boring and Groundwater Screening Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 7

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F7 LithBoring GW Screening Location Map.mxd



Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Data Source: Esri/USGS

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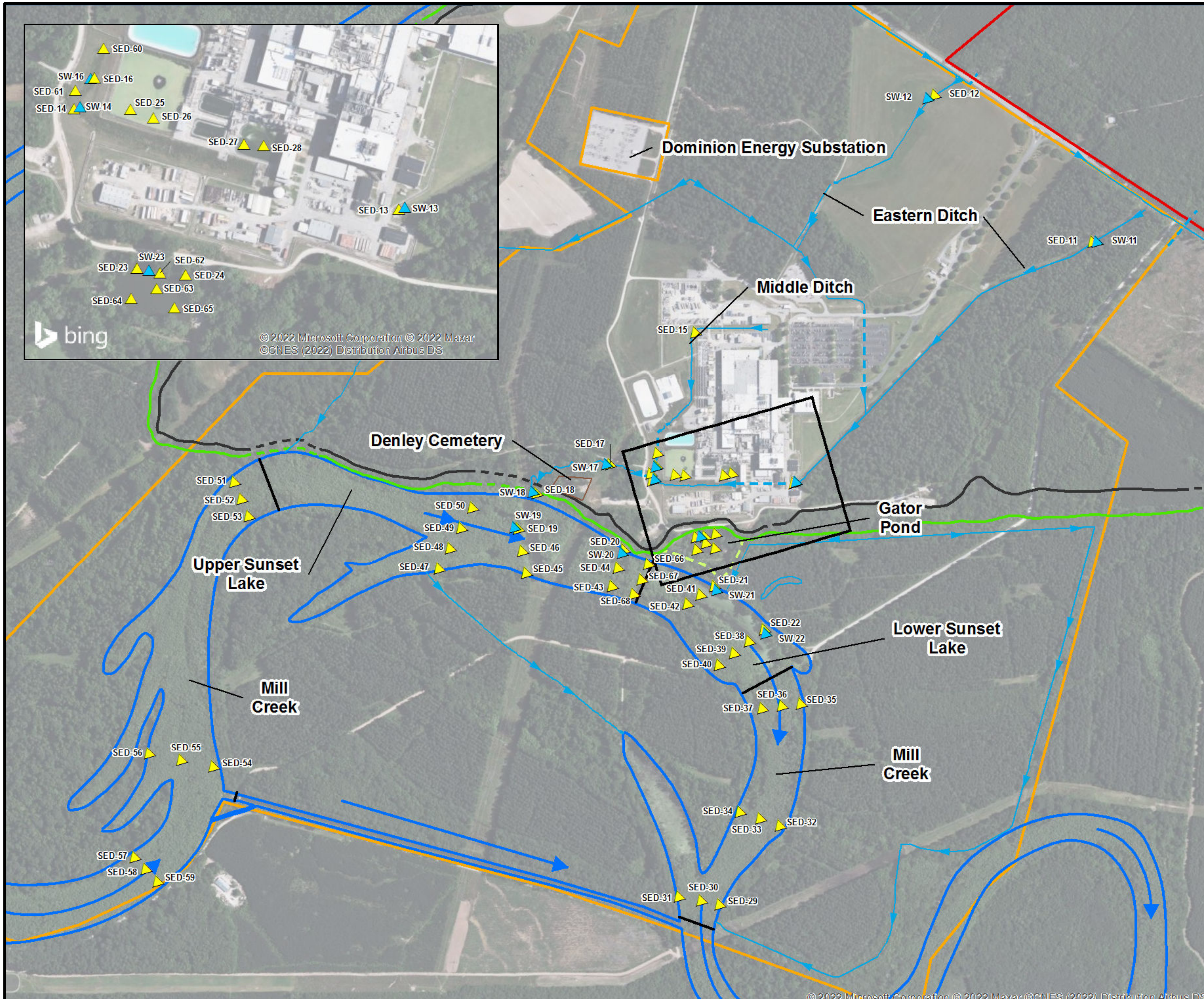
Private Water Supply Well Locations

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	December 2021	FIGURE 8

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F8 PrivateWaterSupplyWells.mxd



Legend

- Surface Water Sample Location
- Sediment Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

0 400 800 Feet

1:9,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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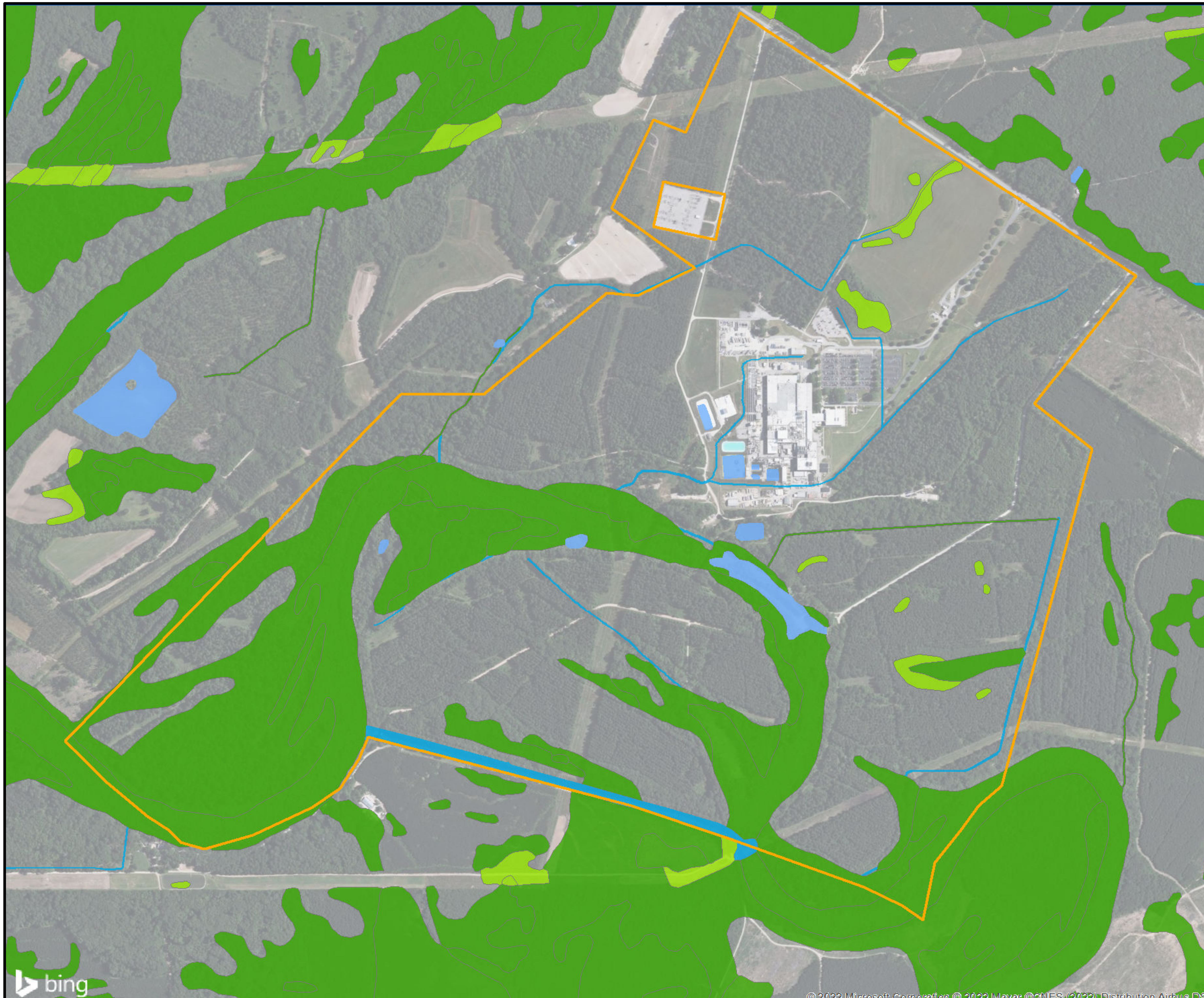
Sediment and Surface Water Sample Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 9

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F9 Sed Surface Water Map.mxd



Legend

Property Line

Wetlands

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

NOTE: Ditch systems on this figure come directly from the U.S. Fish and Wildlife Service and may not accurately reflect the actual ditch configuration.

0 500 1,000 Feet

1:12,000

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

N

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National Wetlands Inventory Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

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Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F10 NWI Map.mxd

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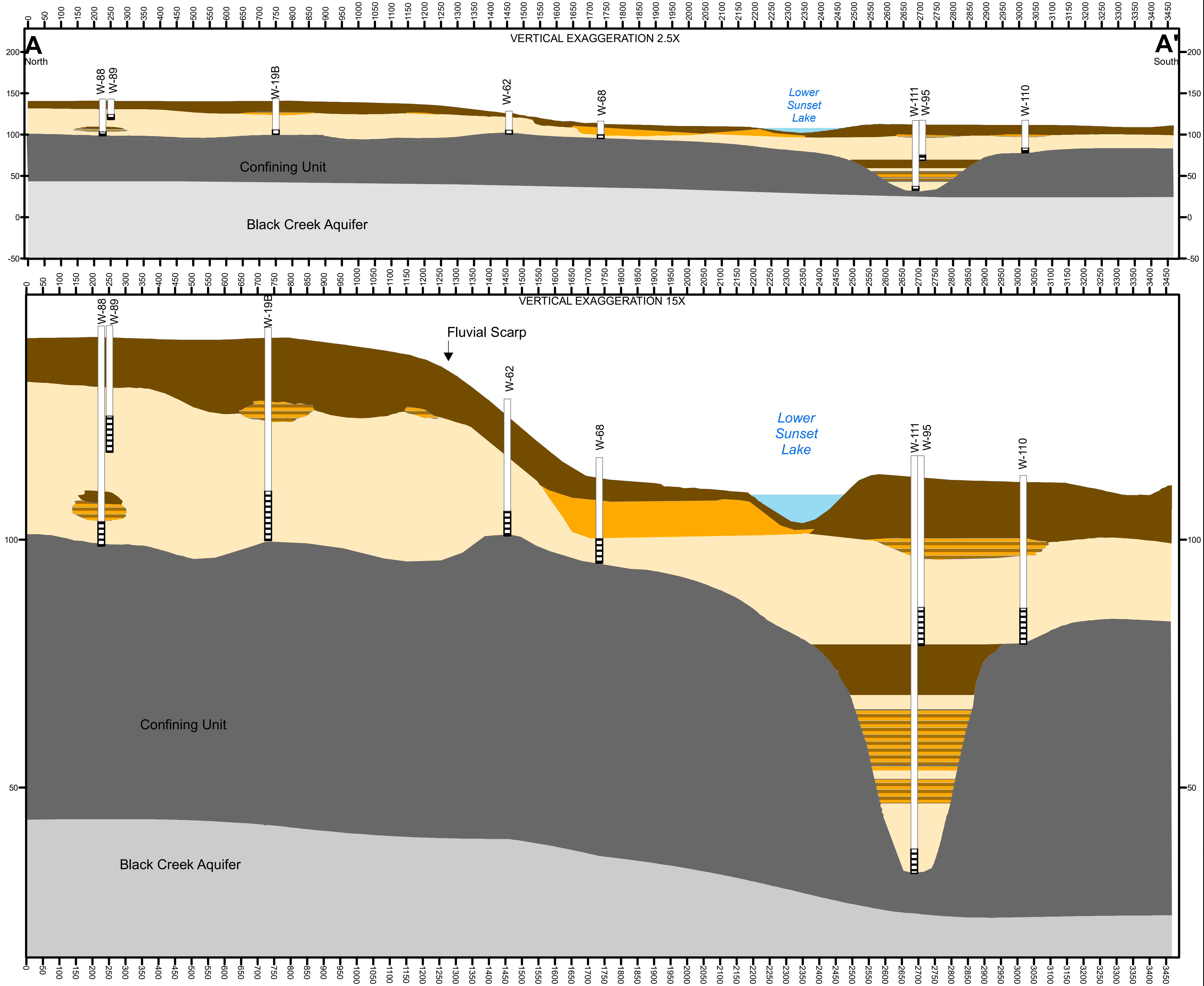
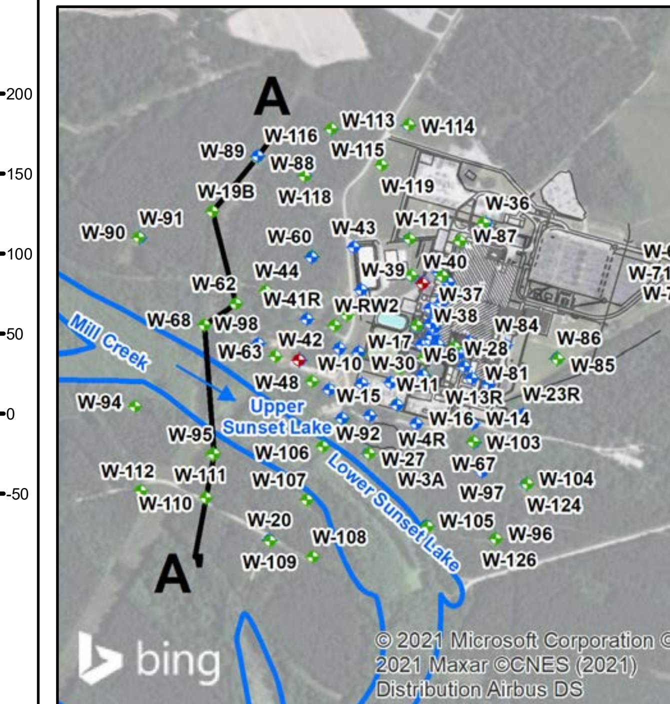
USDA Soil Survey Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	March 2022	FIGURE 11

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F11 USDA Soil Survey Map.mxd





Legend

Groundwater Monitoring Wells
- Upper Surficial
- Lower Surficial
- Black Creek

Mill Creek

Lithology

Surficial Aquifer
- Silty/Clayey Sand
- Clay
- Silt
- Sand

Confining Unit

Black Creek Aquifer

Well Riser

Well Screen

HORIZONTAL SCALE

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

Note: Revised in November 2021.
Original figure submitted in July 2020

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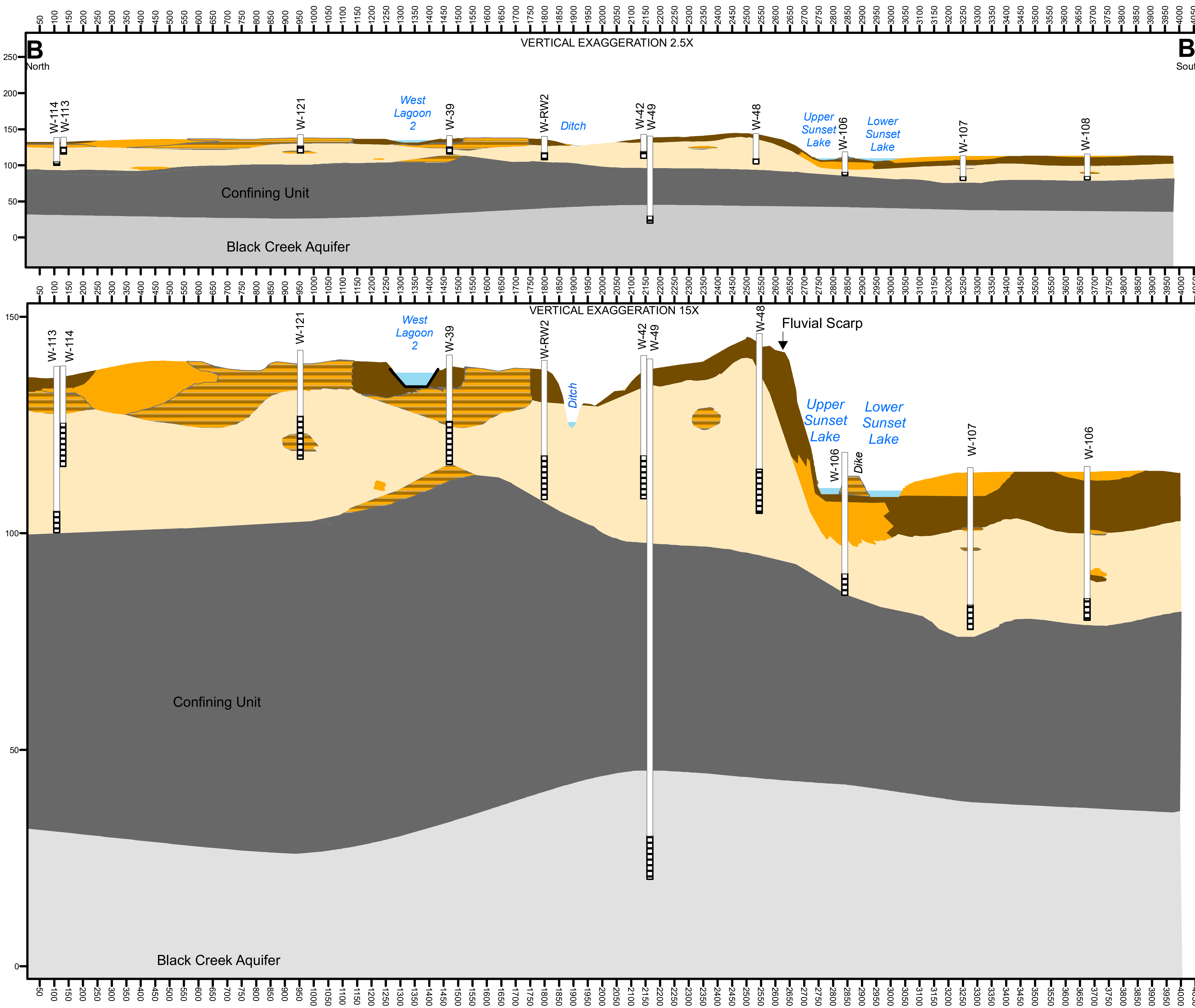
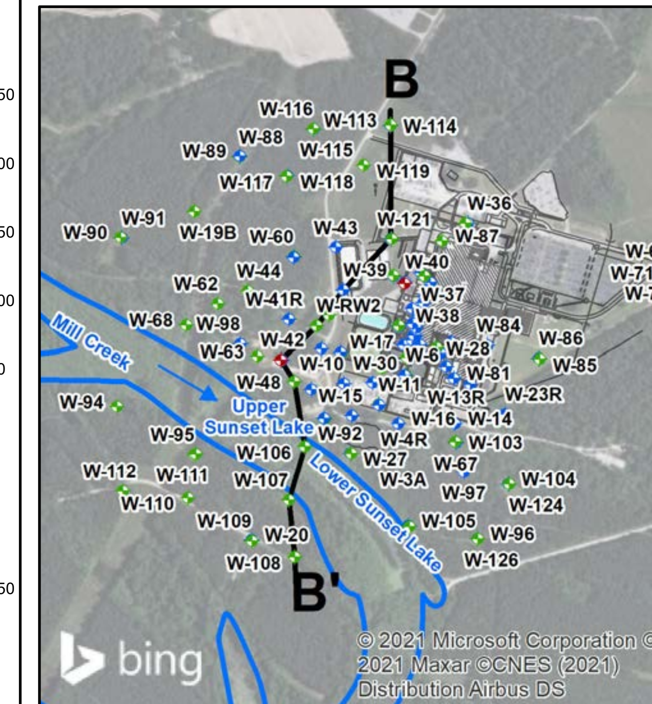
Stratigraphic Cross Section A-A'

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	December 2021	FIGURE 12

Path: C:\Users\Mikealr\OneDrive - AECOM\Documents\AECOM\Westinghouse\mxd\AA15Sectionv2.mxd





Legend

Groundwater Monitoring Wells
- Upper Surficial
- Lower Surficial
- Black Creek

Mill Creek

Lithology

Surficial Aquifer
- Silty/Clayey Sand
- Clay
- Silt
- Sand

- Confining Unit
- Black Creek Aquifer

- Well Riser
- Well Screen

HORIZONTAL SCALE
0 175 350 Feet
1:4,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

Note: Revised in November 2021.
Original figure submitted in July 2020

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Stratigraphic Cross Section B-B'

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	December 2021	FIGURE 13

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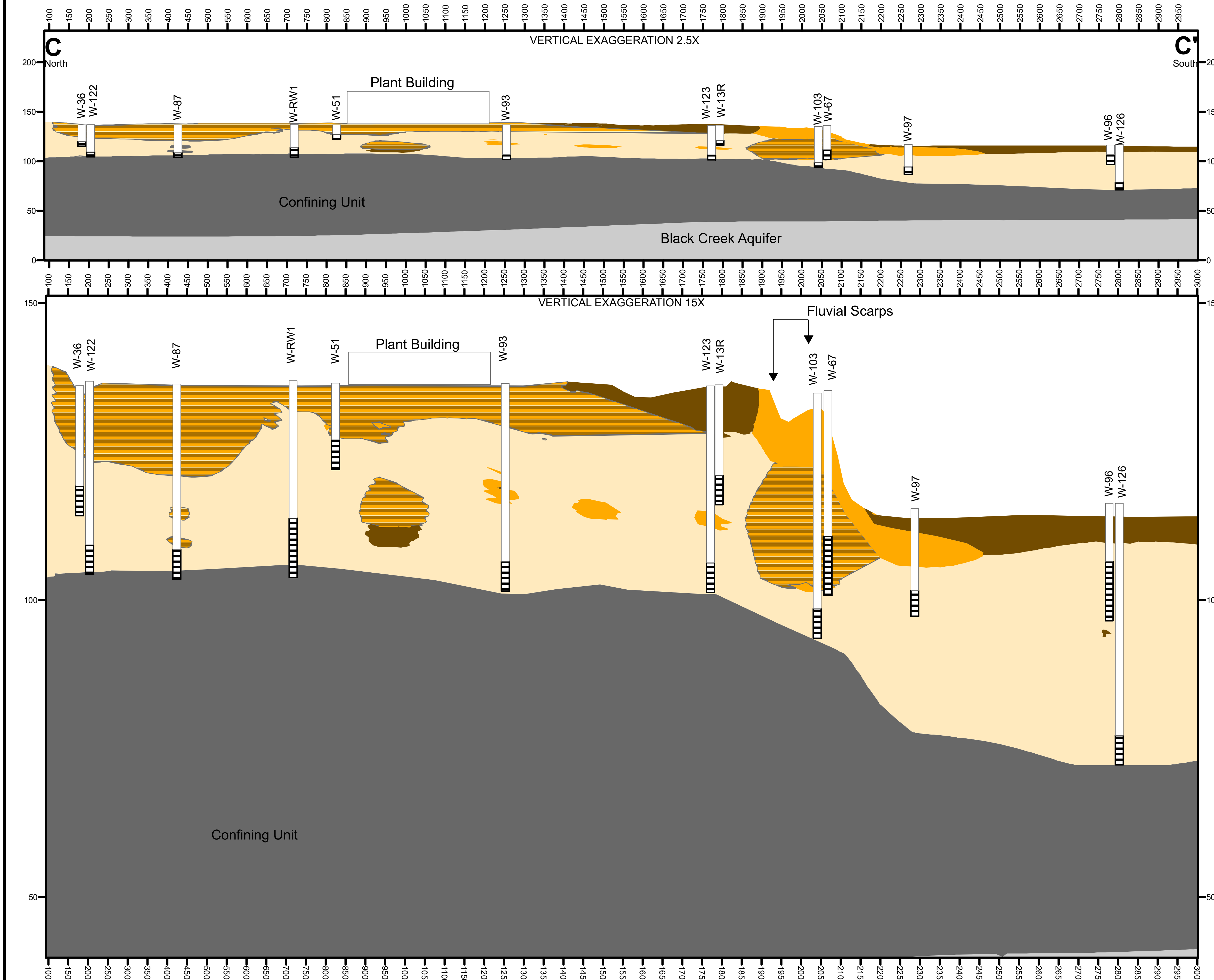

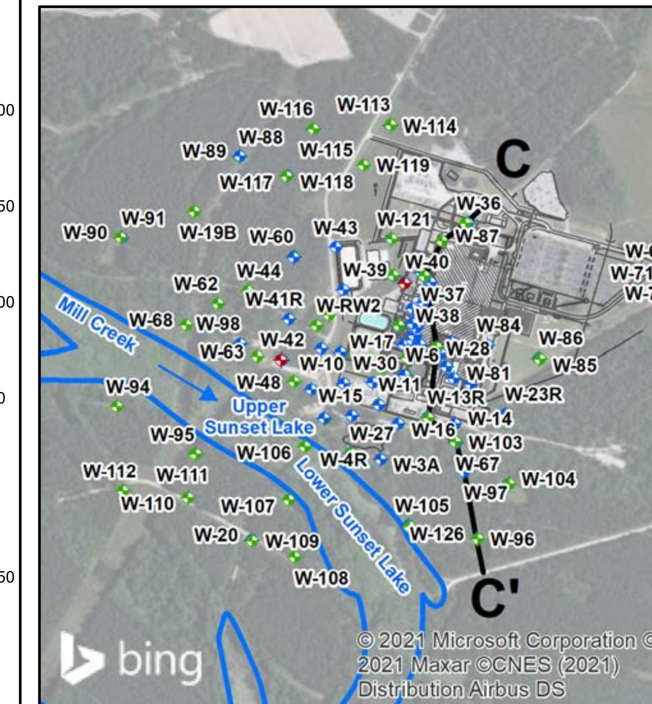

Legend

Groundwater Monitoring Wells
- Upper Surficial
- Lower Surficial
- Black Creek

Mill Creek

Lithology

Surficial Aquifer
- Silty/Clayey Sand
- Clay
- Silt
- Sand

- Confining Unit
- Black Creek Aquifer

- Well Riser
- Well Screen

HORIZONTAL SCALE
0 125 250 Feet
1:3,000

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

Note: Revised in November 2021.
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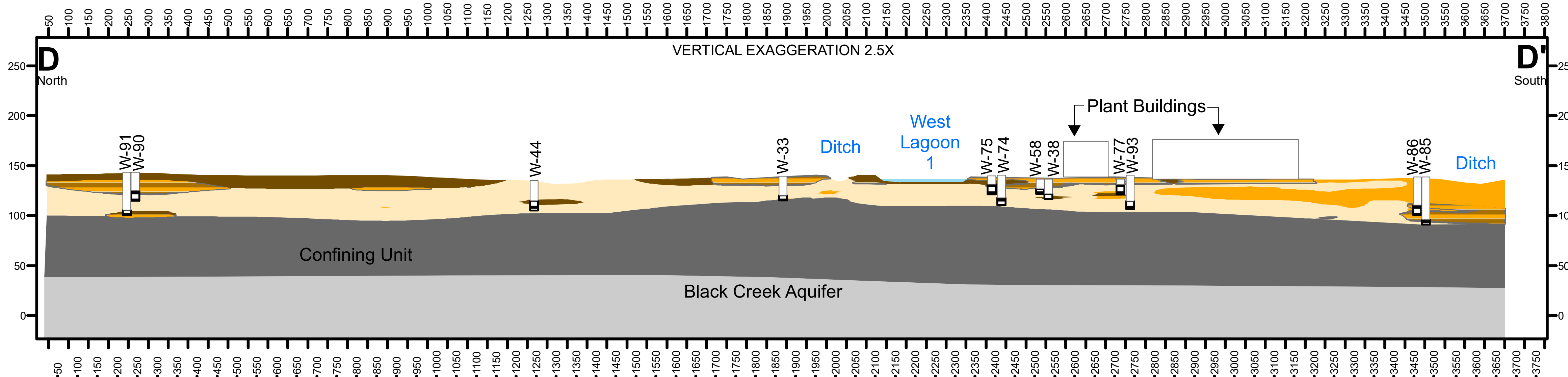
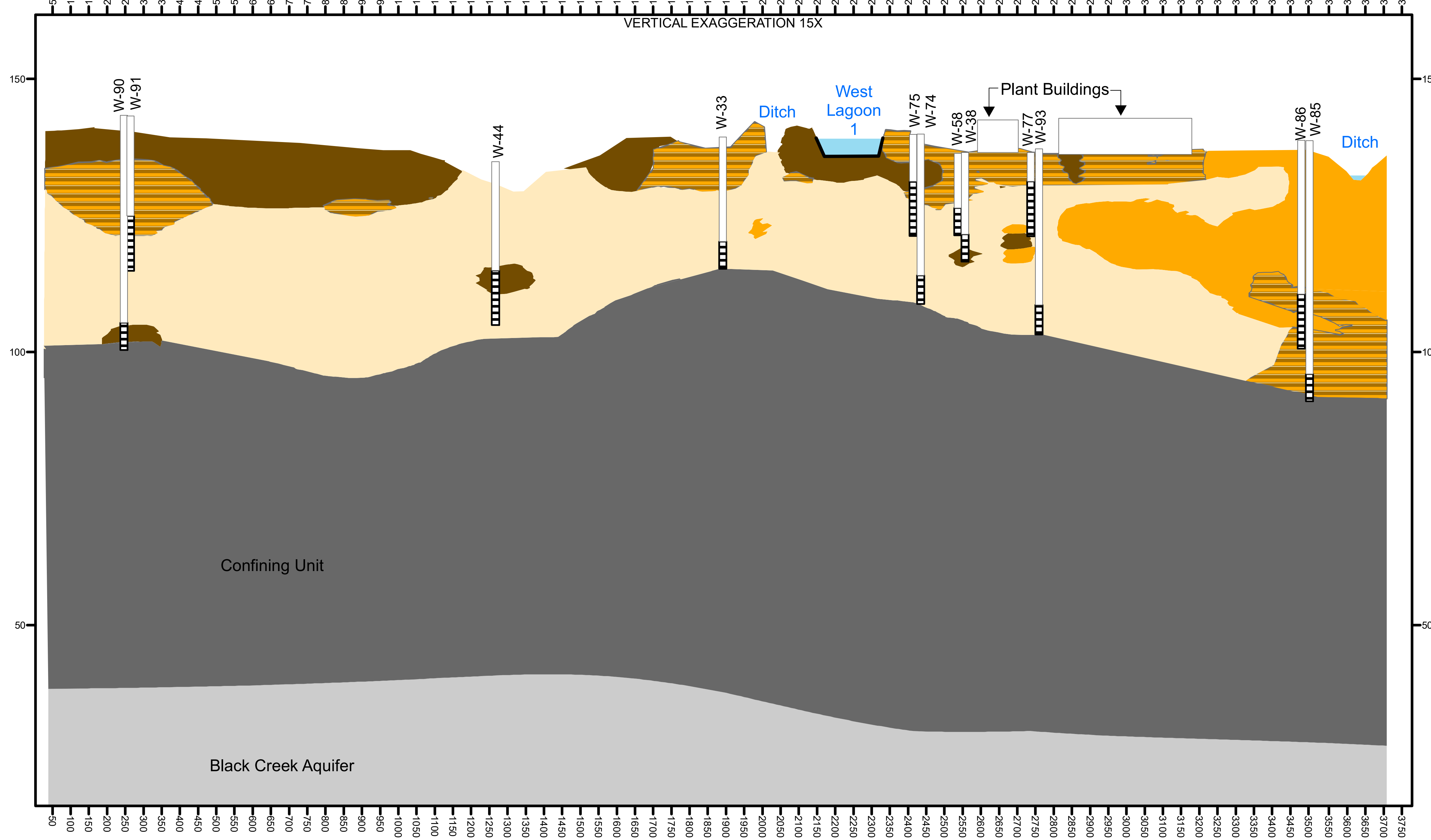
Stratigraphic Cross Section C-C'

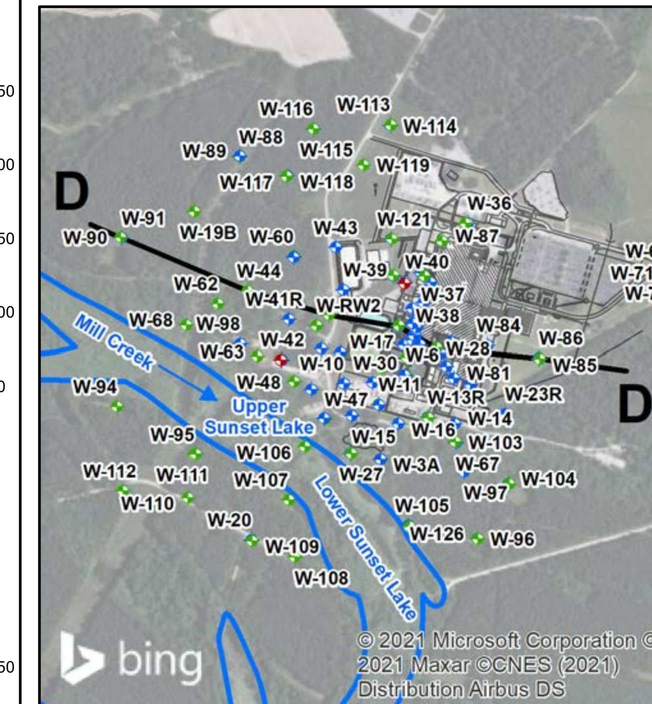
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	December 2021	**FIGURE 14**

Path: C:\Users\Mikealr\OneDrive - AECOM\Documents\AECOM\Westinghouse\mxd\CC15Sectionv2.mxd







Legend

Groundwater Monitoring Wells

- Upper Surficial
- Lower Surficial
- Black Creek

Mill Creek

Lithology

Surficial Aquifer

- Silty/Clayey Sand
- Clay
- Silt
- Sand

- Confining Unit
- Black Creek Aquifer

- Well Riser
- Well Screen

HORIZONTAL SCALE

0 162.5 325 Feet

1:3,900

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

Note: Revised in November 2021.
Original figure submitted in July 2020

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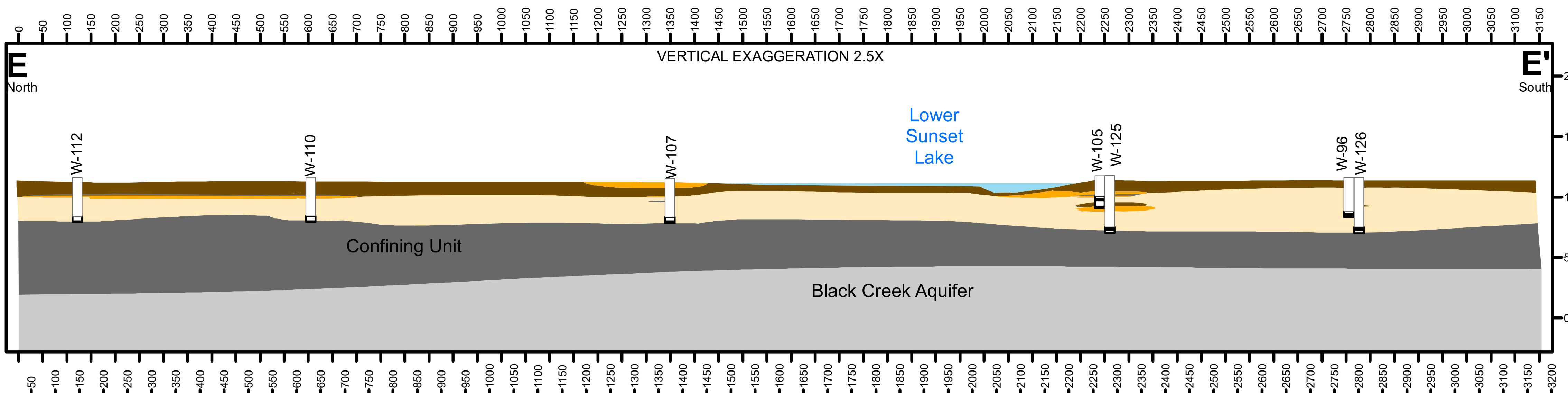
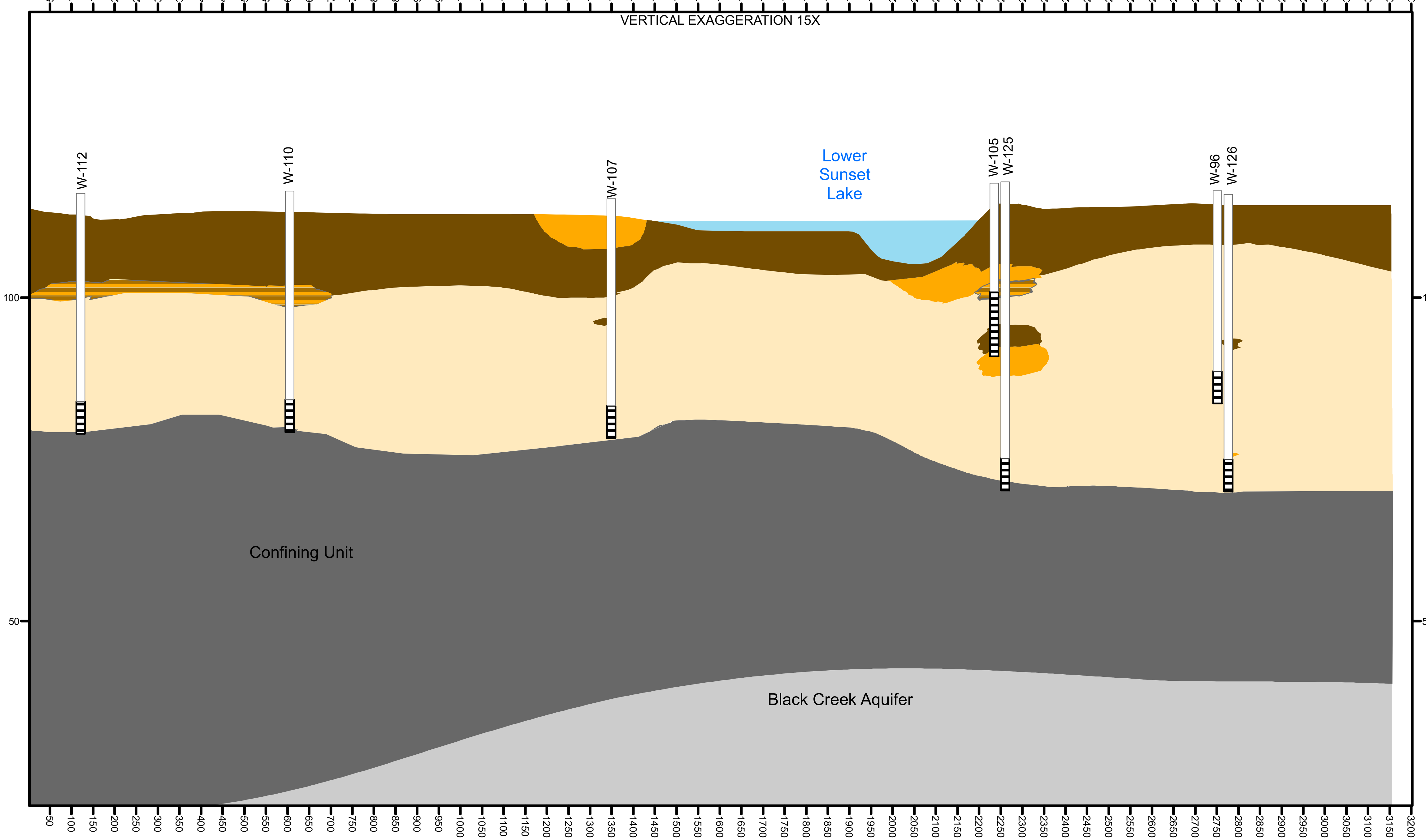
Stratigraphic Cross Section D-D'

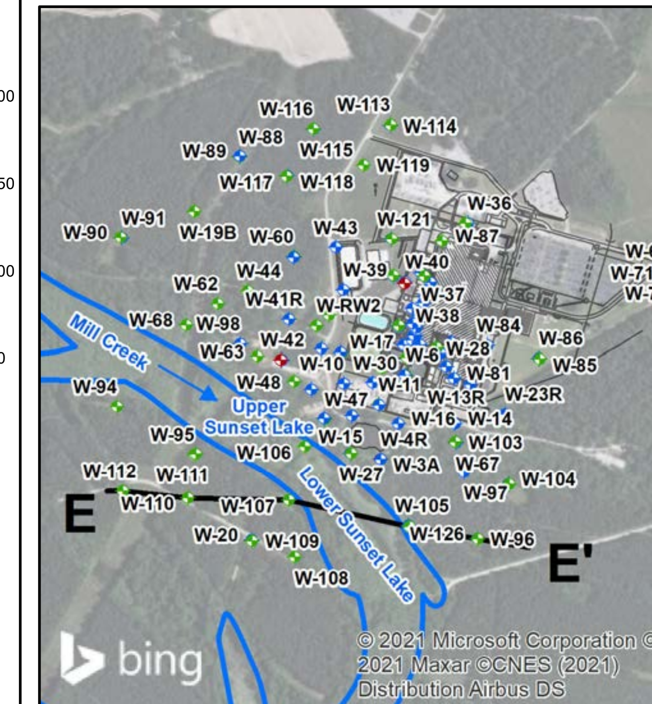
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	December 2021	FIGURE 15

Path: C:\Users\MikeaIr\OneDrive - AECOM\Documents\AECOM\Westinghouse\mxd\DD15Sectionv2.mxd







Legend

Groundwater Monitoring Wells
- Upper Surficial
- Lower Surficial
- Black Creek

Mill Creek

Lithology

Surficial Aquifer
- Silty/Clayey Sand
- Clay
- Silt
- Sand

- Confining Unit
- Black Creek Aquifer

- Well Riser
- Well Screen

HORIZONTAL SCALE
0 137.5 275 Feet
1:3,300

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

Note: Revised in November 2021.
Original figure submitted in July 2020

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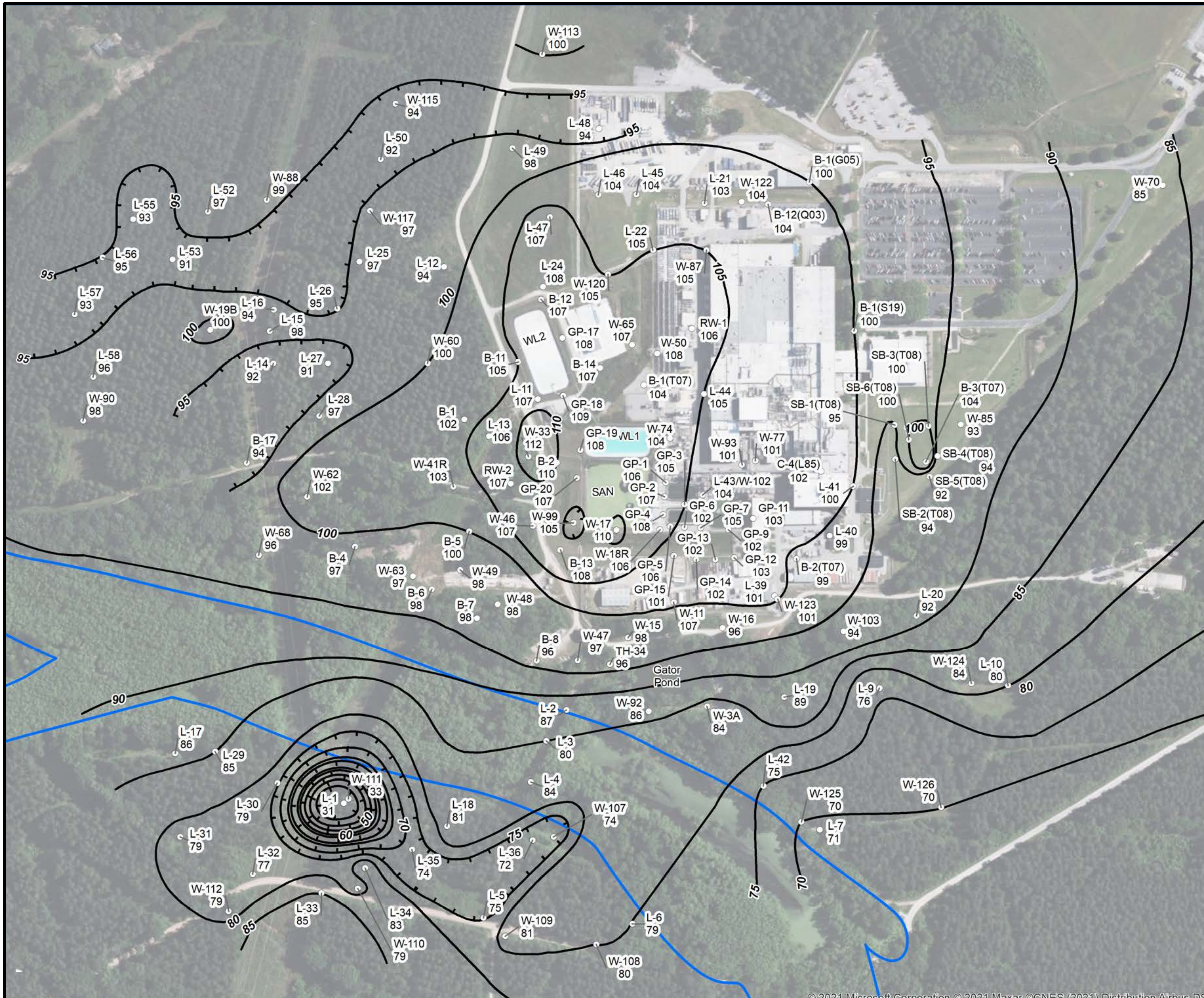
Stratigraphic Cross Section E-E'

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	December 2021	FIGURE 16

Path: C:\Users\MikealrOneDrive - AECOM\Documents\AECOM\Westinghouse\mxd\EE15Sectionv2.mxd



Legend

EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon I
WL2	West Lagoon II
	Mill Creek
	Black Creek Clay Elevation (ft-msl)

Elev. Contour of Top of Black Creek Clay (ft-msl)

Depression 5 ft Contour Interval

Normal 5 ft Contour Interval

0 180 360 Feet

1:4,337

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Note: Revised in November 2021.
Original figure submitted in July 2020

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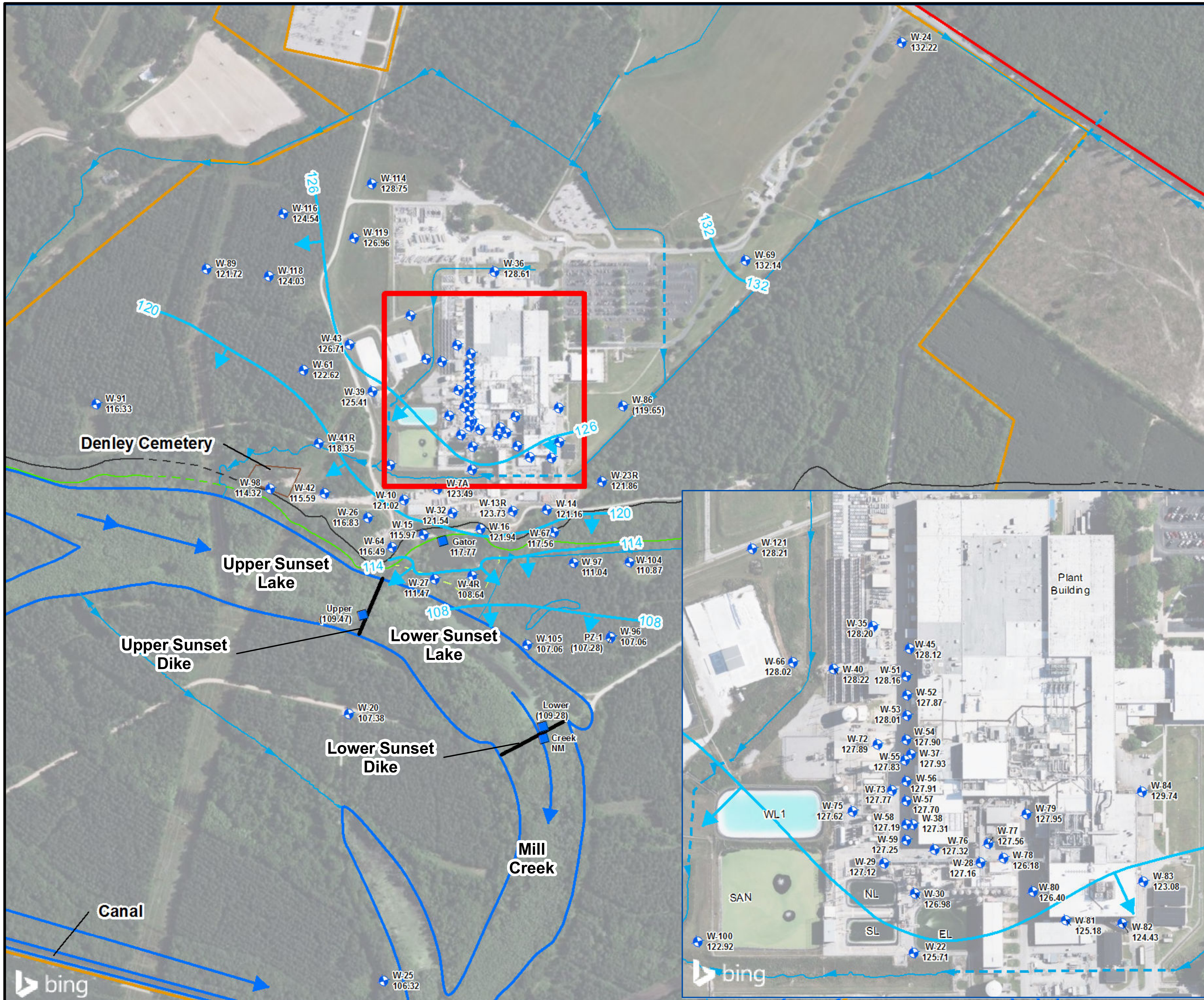
Black Creek Clay Surface Contour Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	RGM	November 2021	FIGURE 17

Path: C:\Users\Mikealr\OneDrive - AECOM\Documents\AECOM\Westinghouse\mxd\Top of Black Creek 20211214.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Culvert
- Ditch
- Mill Creek Flow Direction
- Dike Location
- Staff Gauge Location
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon I
- WL2 West Lagoon II
- Potentiometric Line (C.I. = 6 feet)
- Direction of Groundwater
- 129.74 Groundwater Elevation
- (119.65) Elevation for illustrative purposes only

Based upon data collected on October 4, 2021

0 300 600 Feet

1:7,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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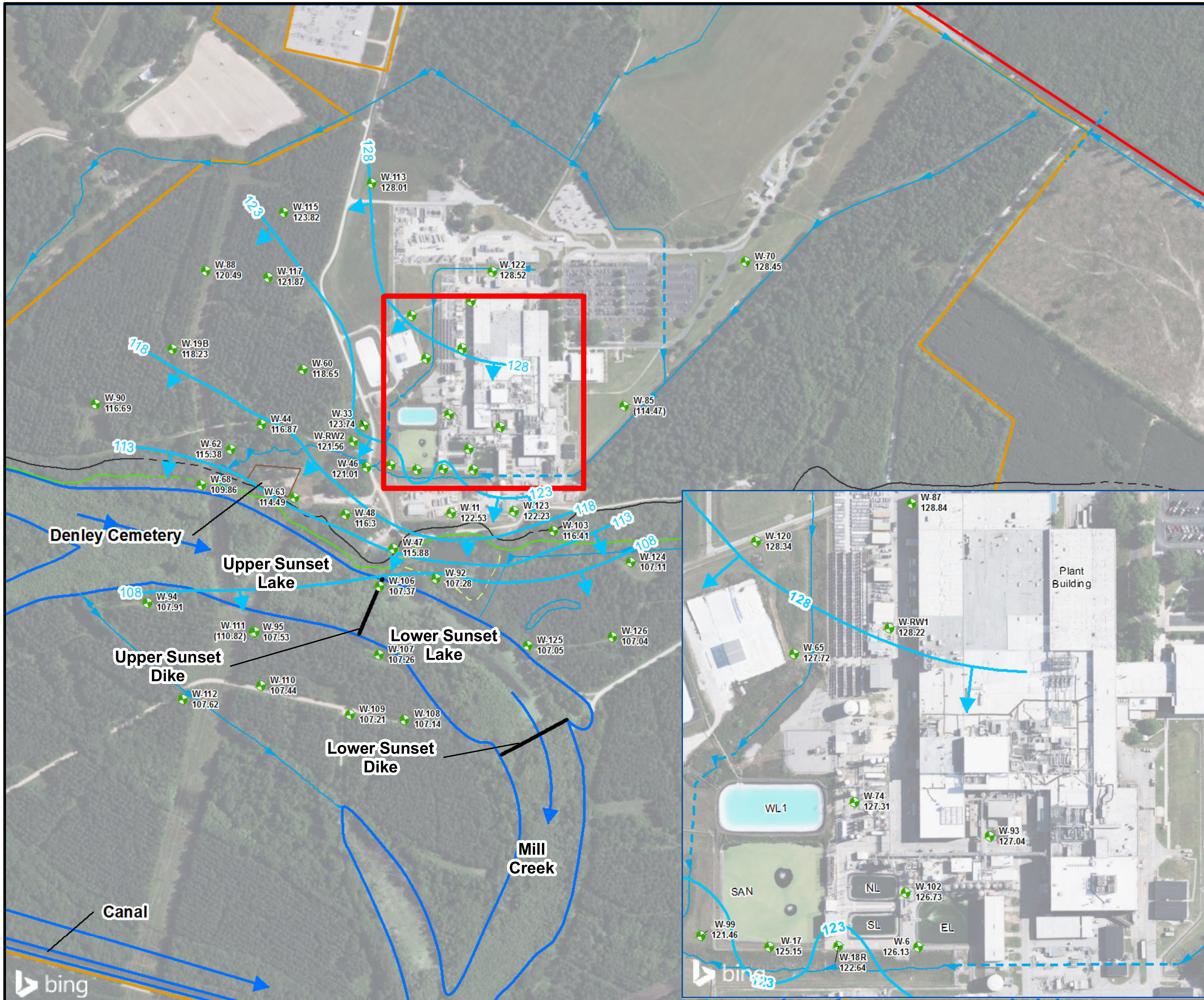
Surficial Aquifer - Upper Zone Potentiometric Map October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 18

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F18 Upper Pot Map Oct 2021.mxd



Legend

- Surficial Aquifer - Lower Zone Monitoring Well
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Culvert
- Ditch
- Mill Creek Flow Direction
- Dike Location
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon I
- WL2 West Lagoon II
- Potentiometric Line (C.I. = 5 feet)
- Direction of Groundwater
- 128.84 Groundwater Elevation
- (114.47) Elevation for illustrative purposes only

Based upon data collected on October 4, 2021

0 300 600 Feet

1:7,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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Surficial Aquifer - Lower Zone Potentiometric Map October 2021

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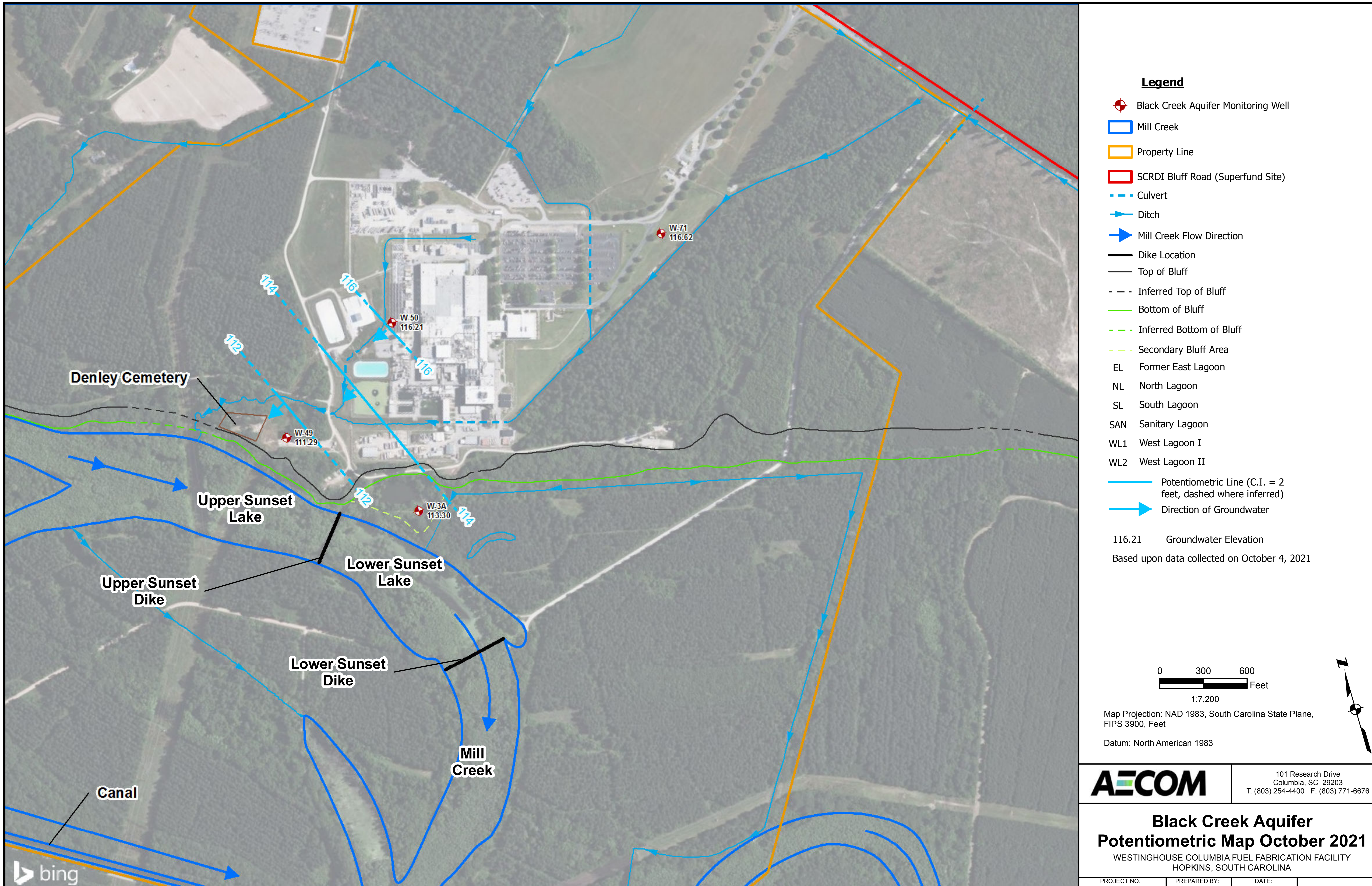
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 19

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F19 Lower Pot Map Oct 2021.mxd



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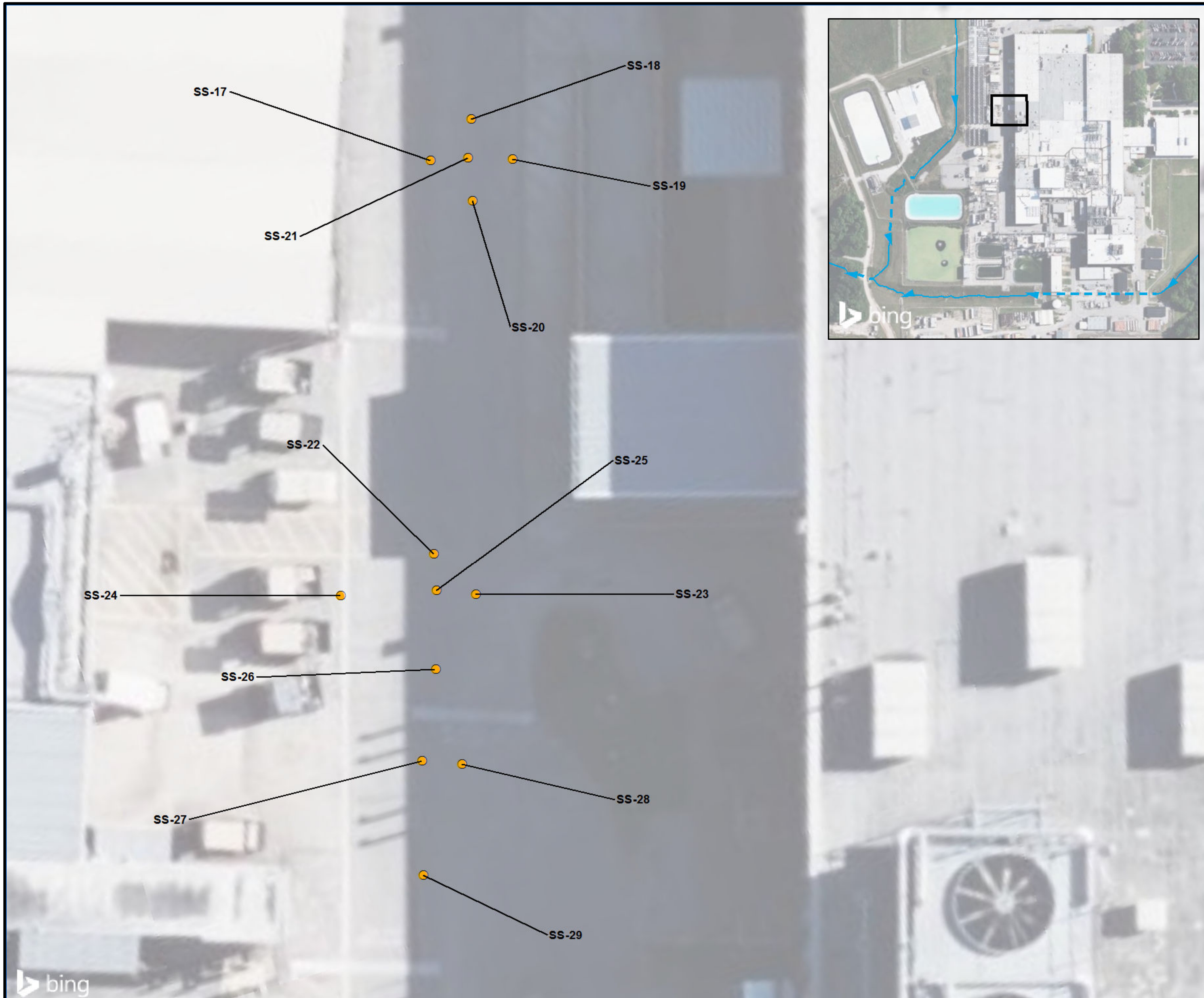
Black Creek Aquifer Potentiometric Map October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 20

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F20 Black Creek Pot Map Oct 2021.mxd



Legend

- Soil Sample Location
- Ditch
- Culvert
- 21 Concentration in ug/kg
- Soil Sampling Location

0 5 10 Feet

1:144

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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Vadose Zone CVOC Soil Detections

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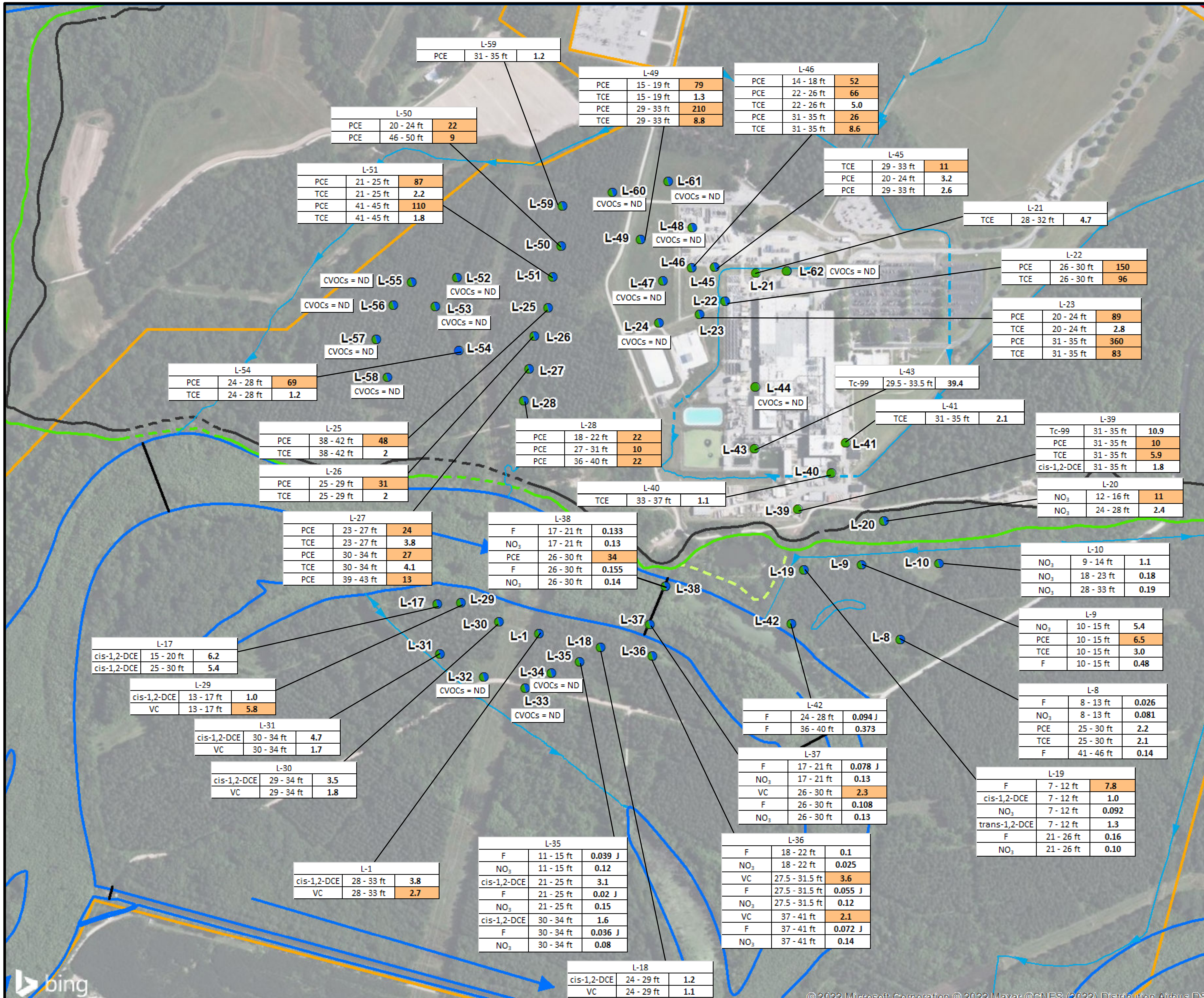
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 21

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F21 Vadose Zone CVOC Soil Detections.mxd



Legend

- L - Surficial Aquifer Groundwater Screening Location - Upper Zone
- L - Surficial Aquifer Groundwater Screening Location - Lower Zone
- L - Surficial Aquifer Groundwater Screening Location - Upper and Lower Zones
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

PCE	Tetrachloroethene
TCE	Trichlorothene
cis-1,2-DCE	cis-1,2-Dichloroethene
trans-1,2-DCE	trans-1,2-Dichloroethene
VC	Vinyl Chloride
F	Fluoride
NO_3	Nitrate
Tc-99	Techenetium-99 (Total)
J	Result below reporting limit
ND	Not Detected

Analyte	MCL	Units
PCE	5	ug/L
TCE	5	ug/L
cis-1,2-DCE	70	ug/L
trans-1,2-DCE	100	ug/L
VC	2	ug/L
F	4	mg/L
NO_3	10	mg/L
Tc-99	900	pCi/L

Notes:
1. Data in boxes shaded orange exceed MCL Concentrations.

0 300 600 Feet

1:7,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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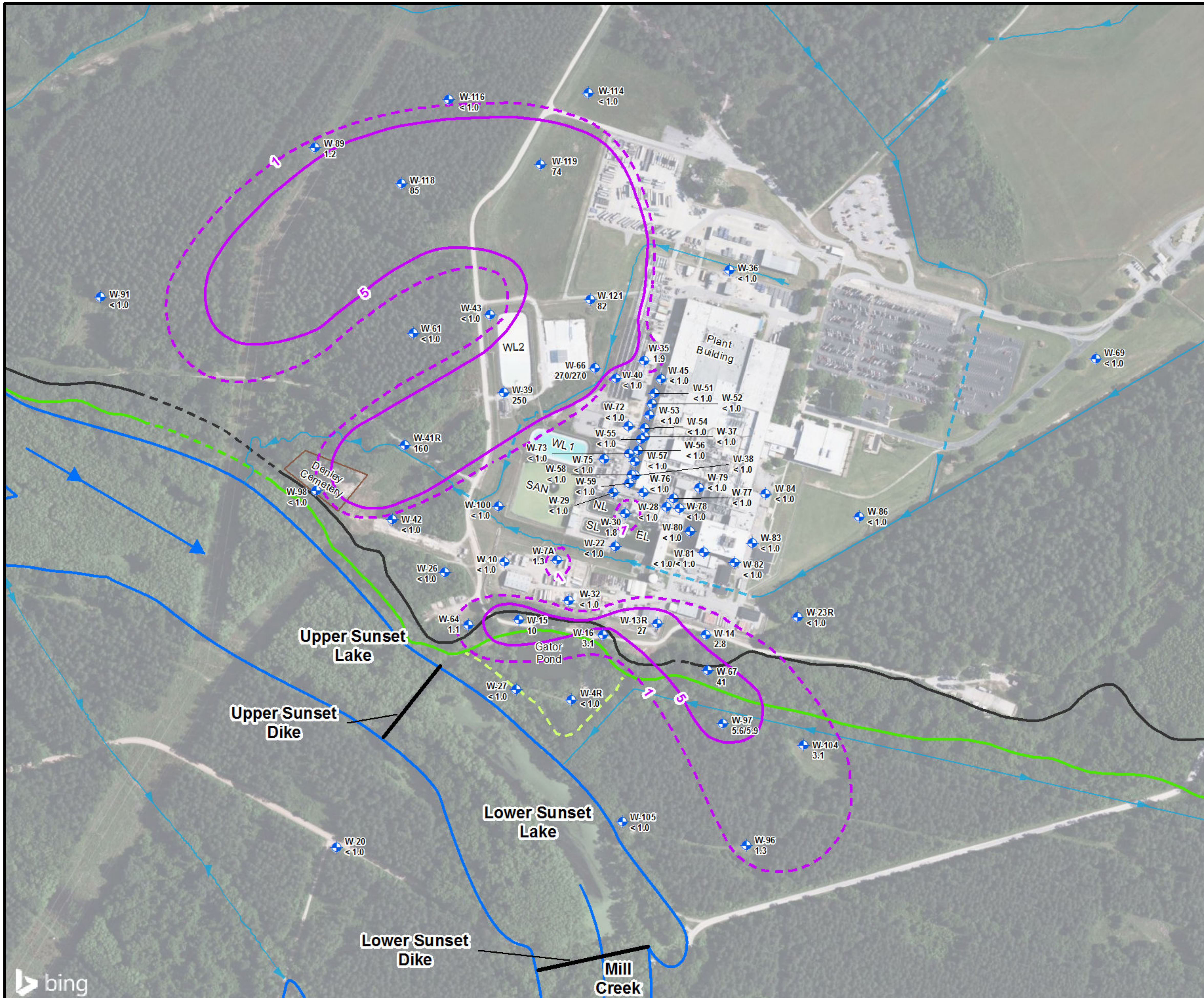
DPT Groundwater Analytical Detections

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 22

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F22 DPT Groundwater Analytical Detections.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek
- Mill Creek Flow Direction
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- PCE Isoconcentration Contour (5 µg/L)
- PCE Isoconcentration Contour at or Above the Detection Limit (µg/L)

270	PCE Concentration in µg/L
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:

Based upon data collected in October 2021.

Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

N

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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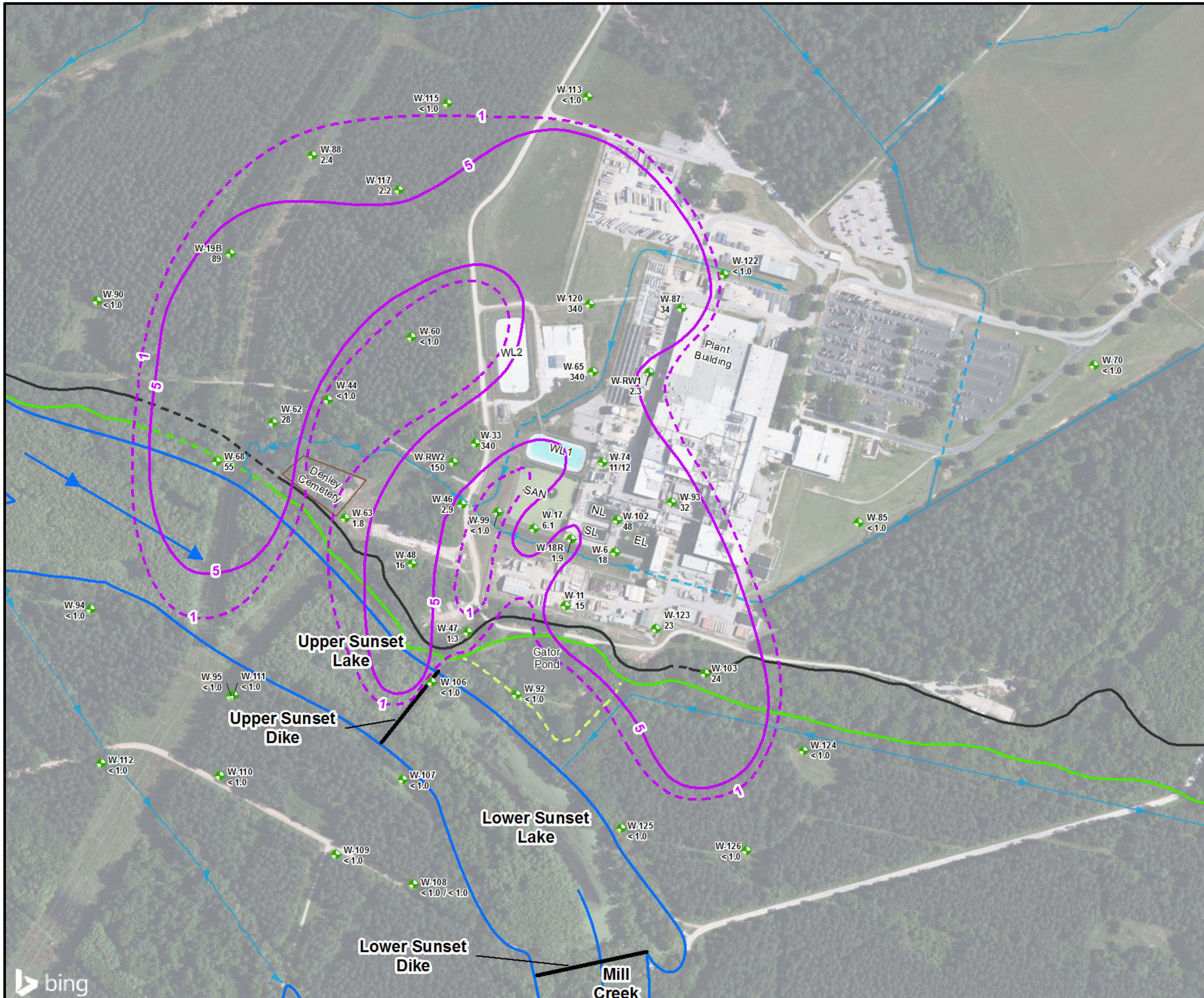
Extent of PCE - Surficial Aquifer - Upper Zone October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 23

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F23 PCE UpperSurf Oct2021.mxd



Legend

- Surficial Aquifer - Lower Zone Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- PCE Isoconcentration Contour (5 µg/L)
- PCE Isoconcentration Contour at or Above the Detection Limit (µg/L)
- 340 PCE Concentration in µg/L
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

Notes:
Based upon data collected in October 2021.
Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet
1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

N

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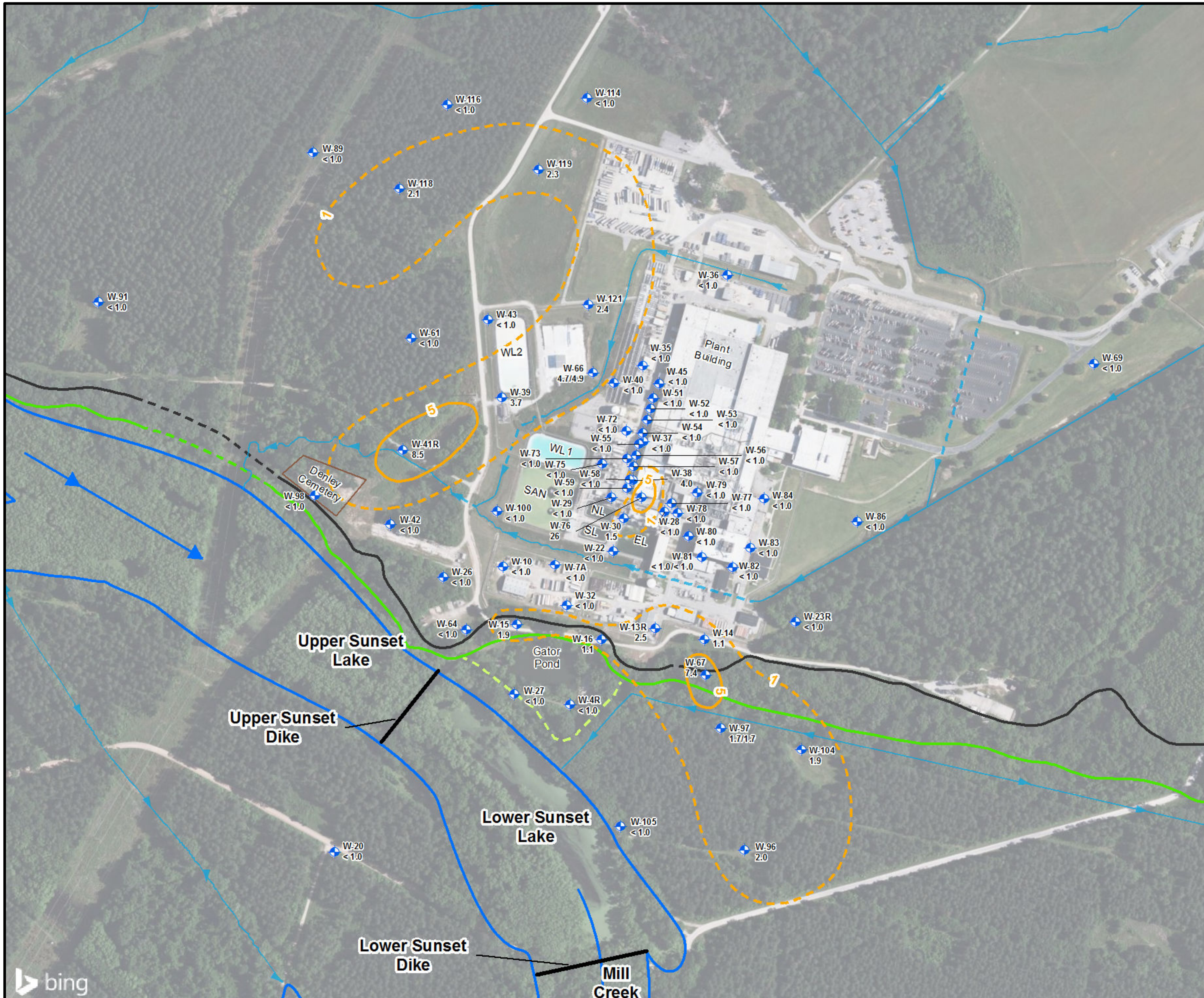
Extent of PCE
Surficial Aquifer - Lower Zone
October 2021
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	**FIGURE 24**

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F24 PCE LowerSurf Oct2021.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- TCE Isoconcentration Contour (5 ug/L)
- TCE Isoconcentration Contour at or Above the Detection Limit (µg/L)

26	TCE Concentration in ug/L
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:
Based upon data collected in October 2021.
Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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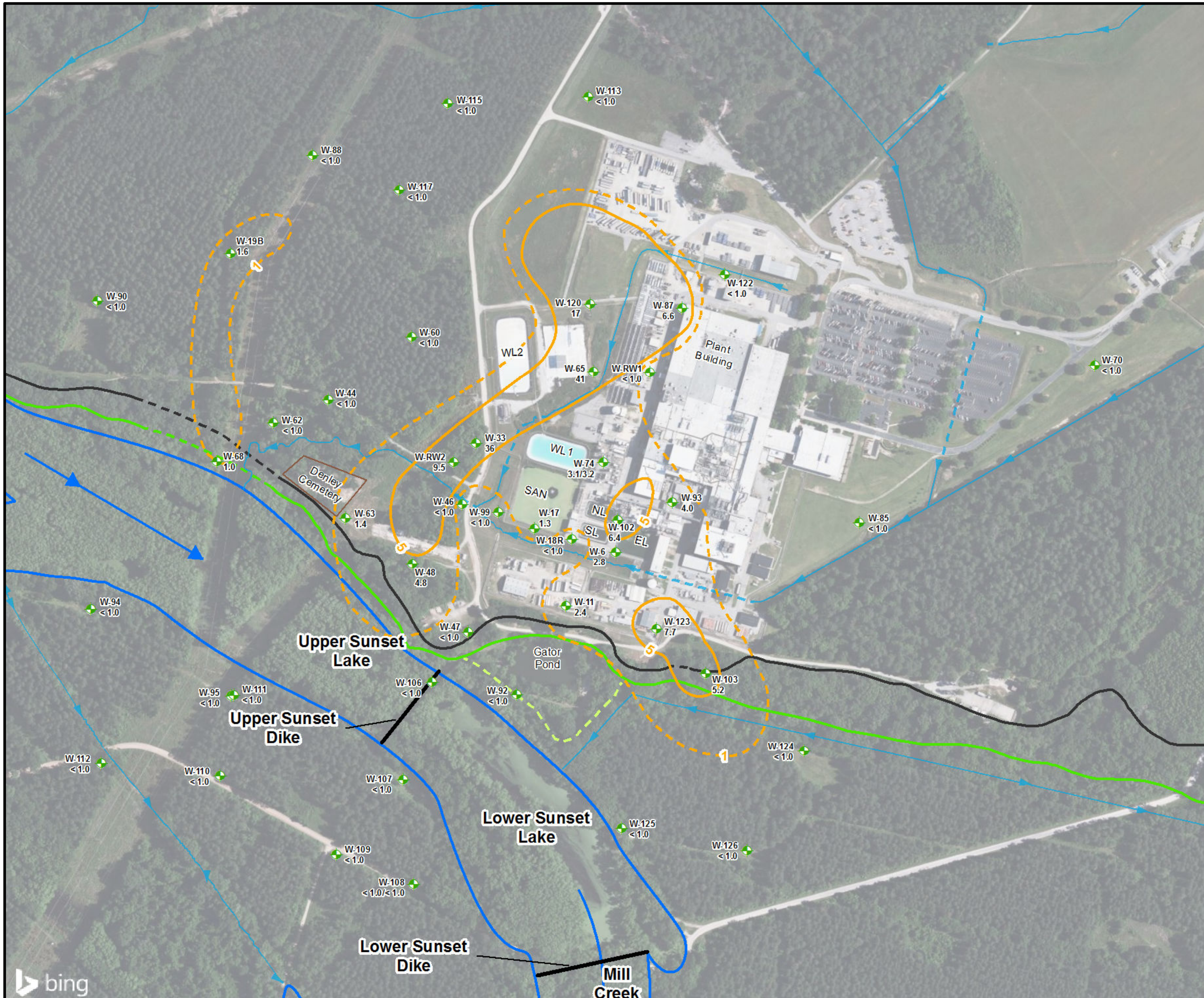
Extent of TCE
Surficial Aquifer - Upper Zone
October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 25

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F25 TCE UpperSurf Oct2021.mxd



Legend

- Surficial Aquifer - Lower Zone Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- TCE Isoconcentration Contour (5 ug/L)
- TCE Isoconcentration Contour at or Above the Detection Limit (µg/L)

41	TCE Concentration in ug/L
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:
Based upon data collected in October 2021.
Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400
Feet
1:4,800

N

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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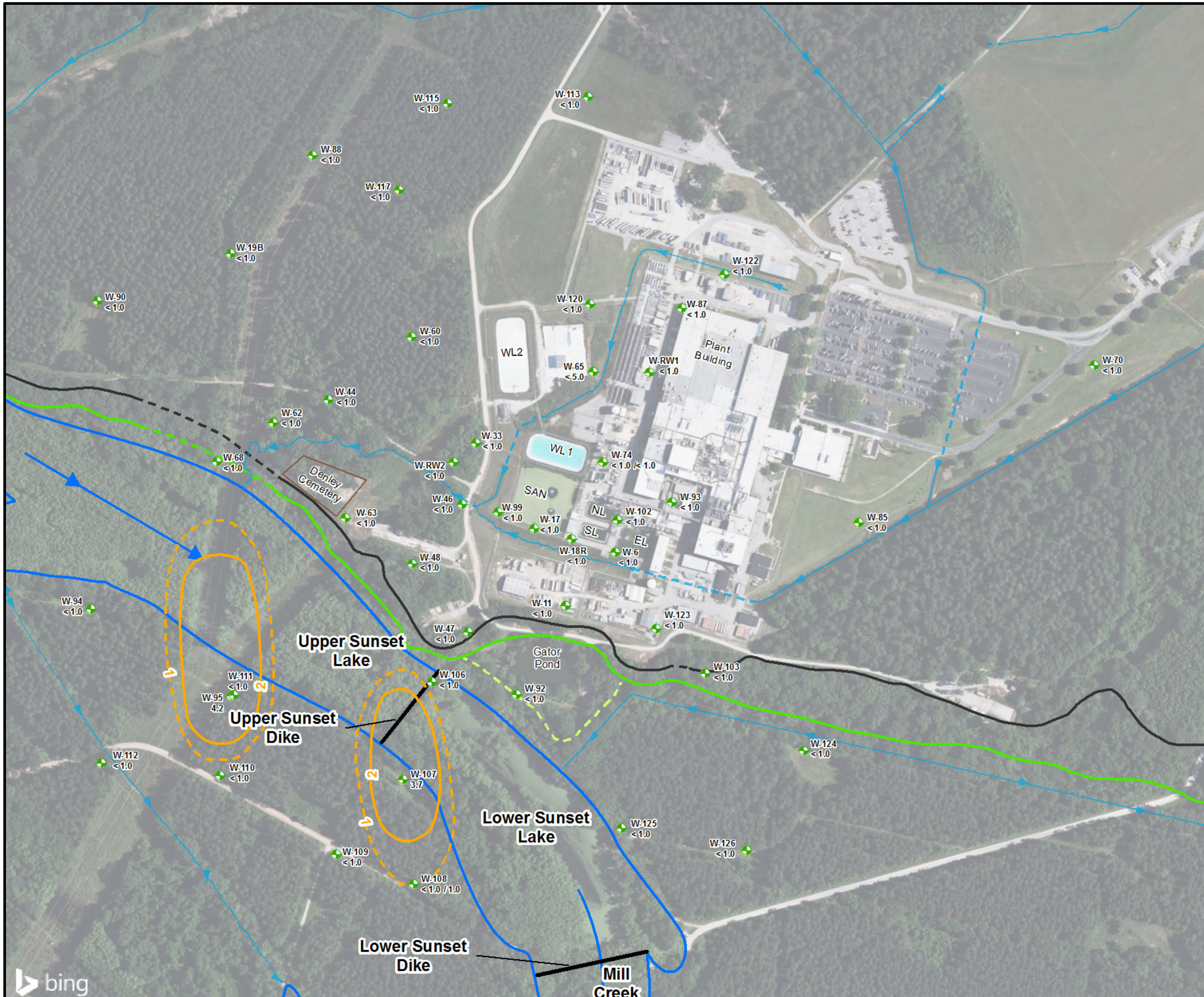
Extent of TCE
Surficial Aquifer - Lower Zone
October 2021
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	**FIGURE 26**

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F26 TCE LowerSurf Oct2021.mxd



Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F27 VC LowerSurf Oct2021.mxd

Legend

- Surficial Aquifer - Lower Zone Monitoring Well
- Ditch
- Culvert
- Ditch
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- VC Isoconcentration Contour (2 ug/L)
- VC Isoconcentration Contour at or Above the Detection Limit (µg/L)
- 4.2 VC Concentration in ug/L
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

Notes:

Based upon data collected in October 2021. Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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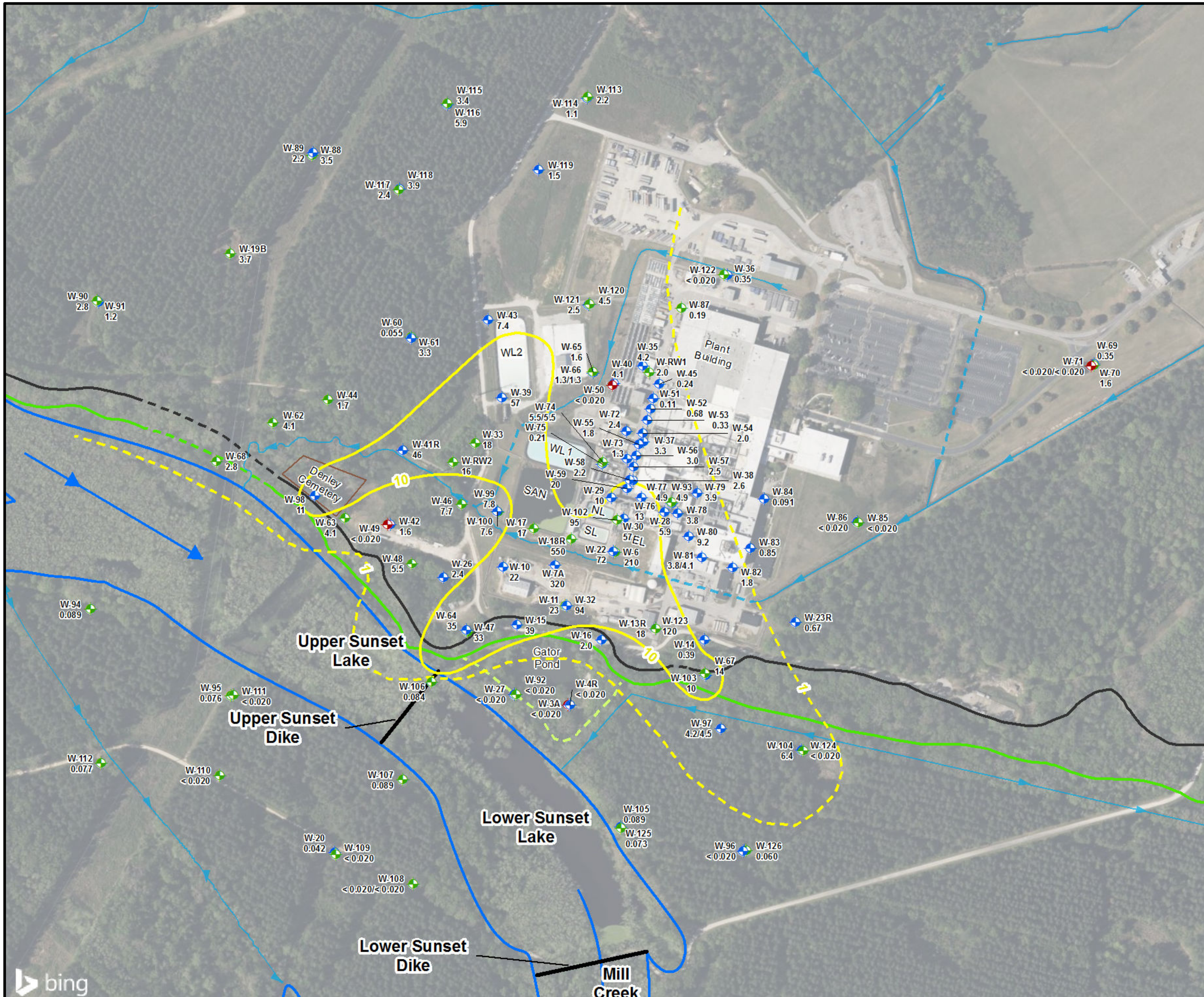
Extent of VC
Surficial Aquifer - Lower Zone
October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	**FIGURE 27**



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- Nitrate Isoconcentration Contour (10 mg/L)
- Nitrate Isoconcentration Contour at or Above the Detection Limit (µg/L)

550	Nitrate Concentration in mg/L
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:

Based upon data collected in October 2021.

Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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Extent of Nitrate in Groundwater October 2021

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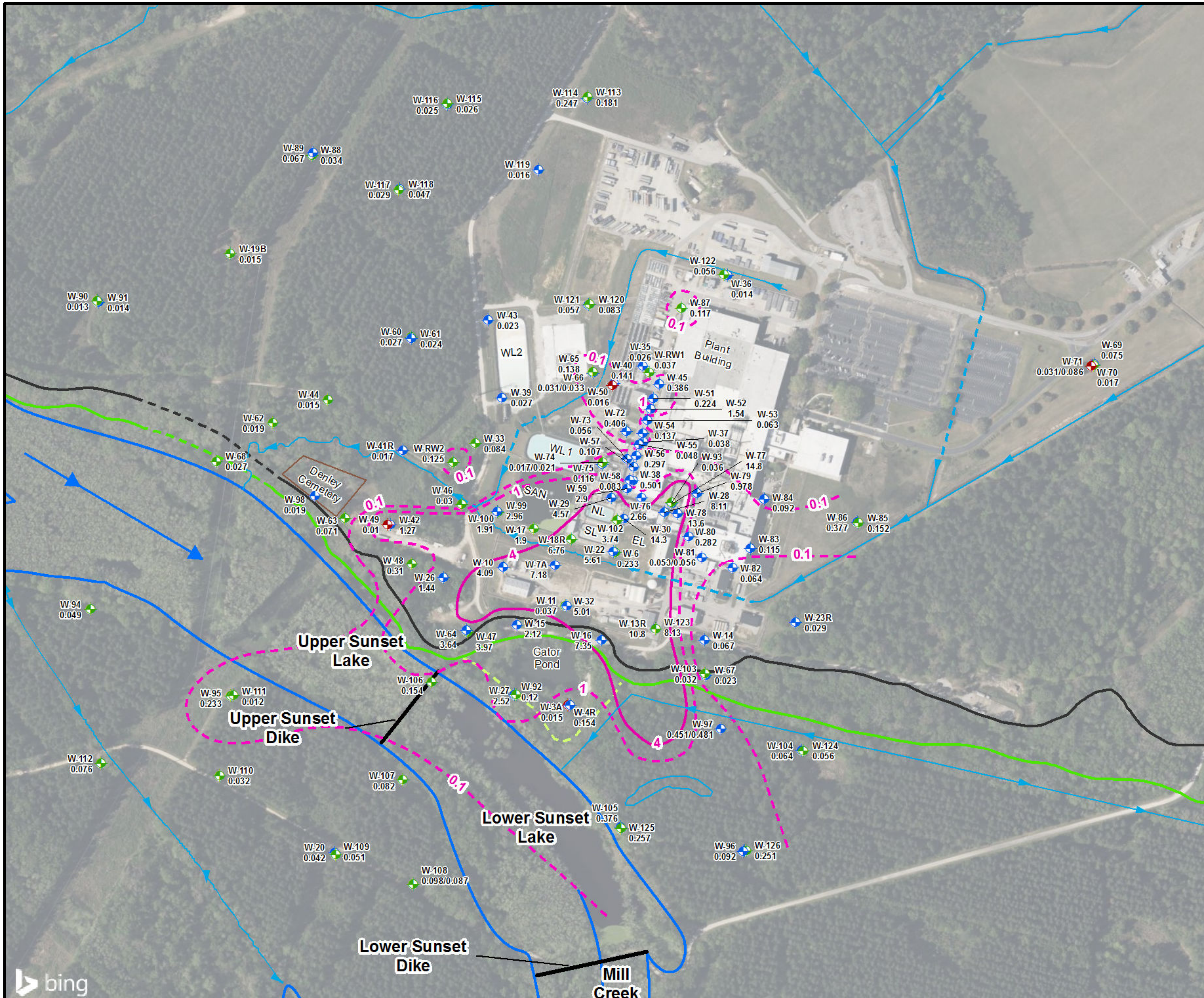
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 28

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F28 Nitrate Oct 2021.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- Fluoride Isoconcentration Contour (4 mg/L)
- Fluoride Isoconcentration Contour at or Above the Detection Limit (µg/L)

14.8	Fluoride Concentration in mg/L
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:
Based upon data collected in October 2021.
Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

N

0 200 400
Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

NAD: North American Datum 1983

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Extent of Fluoride in Groundwater October 2021

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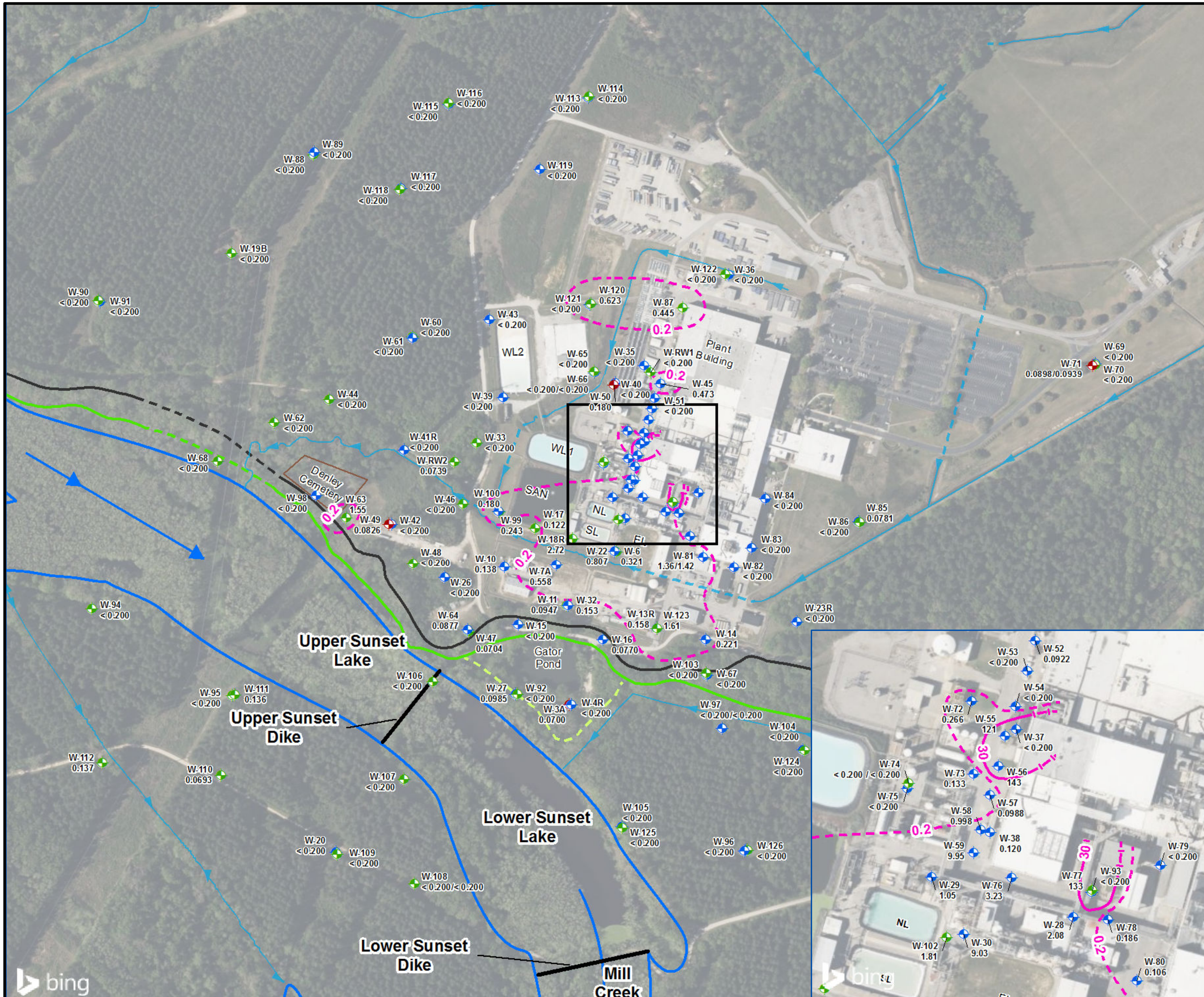
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 29

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F29 Fluoride Oct 2021.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- Uranium Isoconcentration Contour (30 µg/L)
- Uranium Inferred Isoconcentration Contour (µg/L)
- Uranim Isoconcetration Contour at or Above the Minimum Detectible Concentration (µg/L)
- 143 Total Uranium in µg/L
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

Notes:

Based upon data collected in October 2021.

Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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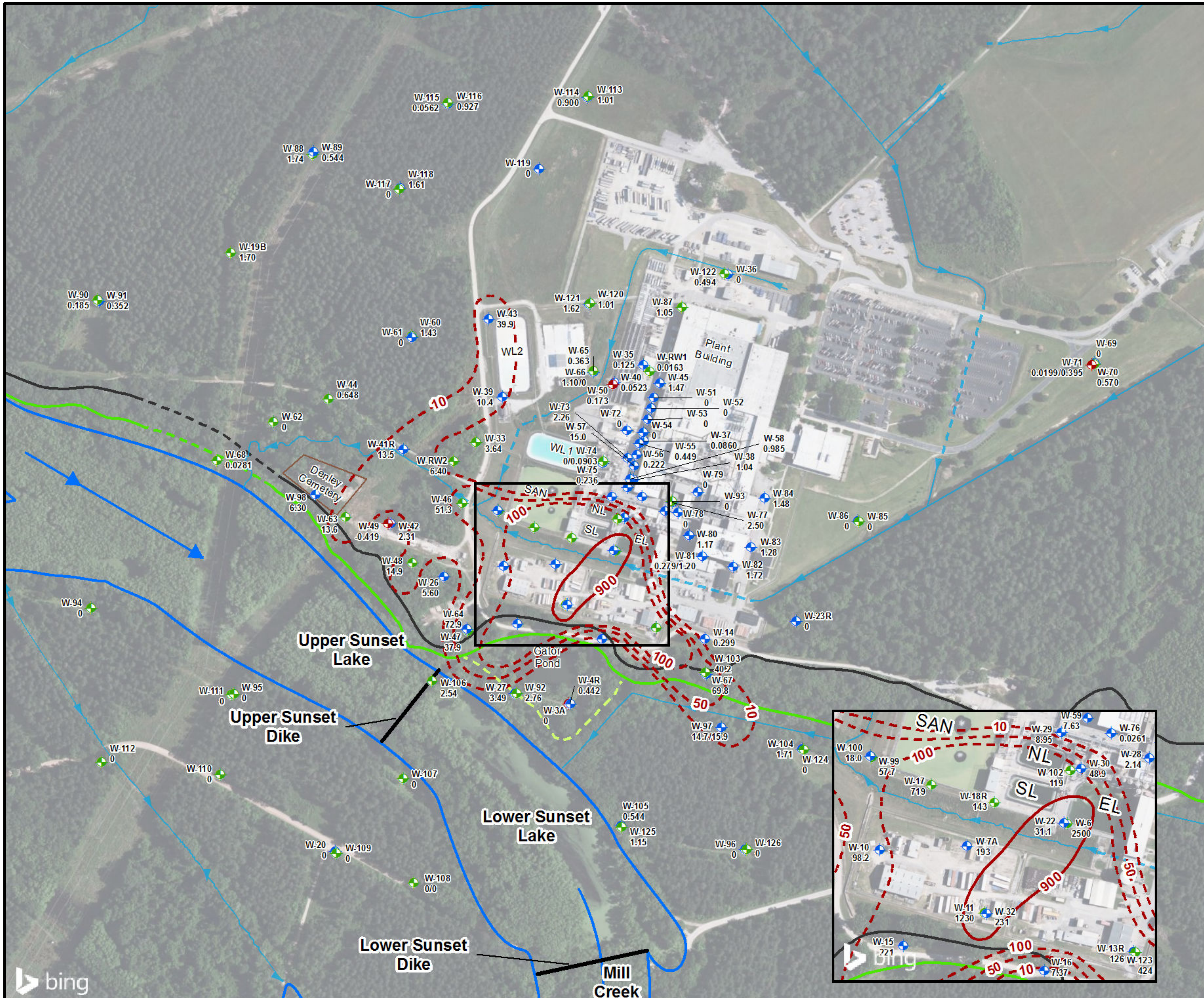
Extent of Uranium in Groundwater in October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 30

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F30 Uranium Oct 2021.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Ditch
- Culvert
- Dike Location
- Mill Creek Flow Direction
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- Tc-99 Isoconcentration Contour (900 pCi/L)
- Tc-99 Isoconcetration Contour at or Above the Minimum Detectible Concentration (pCi/L)

2500	Technetium-99 Concentration in pCi/L
0	Concentration reported as a negative number by the analytical laboratory
EL	Former East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Notes:
Based upon data collected in October 2021.
Although the river terrace sediments above and below the bluff are of different geologic ages (Pleistocene-vs-Holocene), they were deposited under similar conditions, have similar lithologies and are hydrogeologically connected as a single surficial aquifer.

Wells displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet
1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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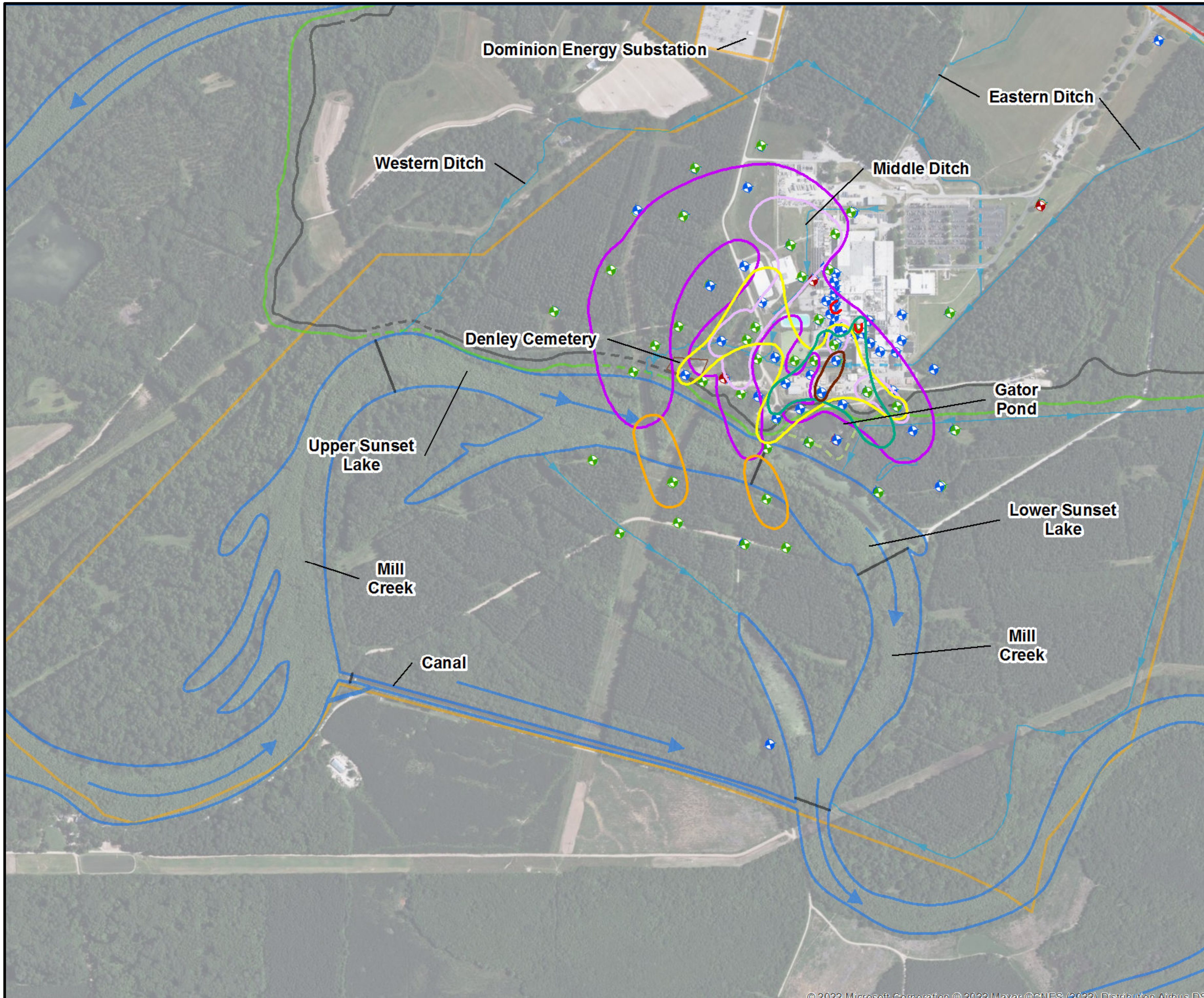
Extent of Technetium-99 in Groundwater October 2021

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 31

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F31 Tech99 Oct 2021.mxd



Legend

- Surficial Aquifer - Upper Zone Monitoring Well
- Surficial Aquifer - Lower Zone Monitoring Well
- Black Creek Aquifer Monitoring Well
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area
- PCE MCL Isocontour Line (5 µg/L)
- TCE MCL Isocontour Line (5 µg/L)
- VC MCL Isocontour Line (2 µg/L)
- Nitrate MCL Isocontour Line (10 mg/L)
- Fluoride MCL Isocontour Line (4 mg/L)
- Technetium 99 MCL Isocontour Line (900 pCi/L)
- Uranium MCL Isocontour Line (30 µg/L)

0 400 800 Feet

1:9,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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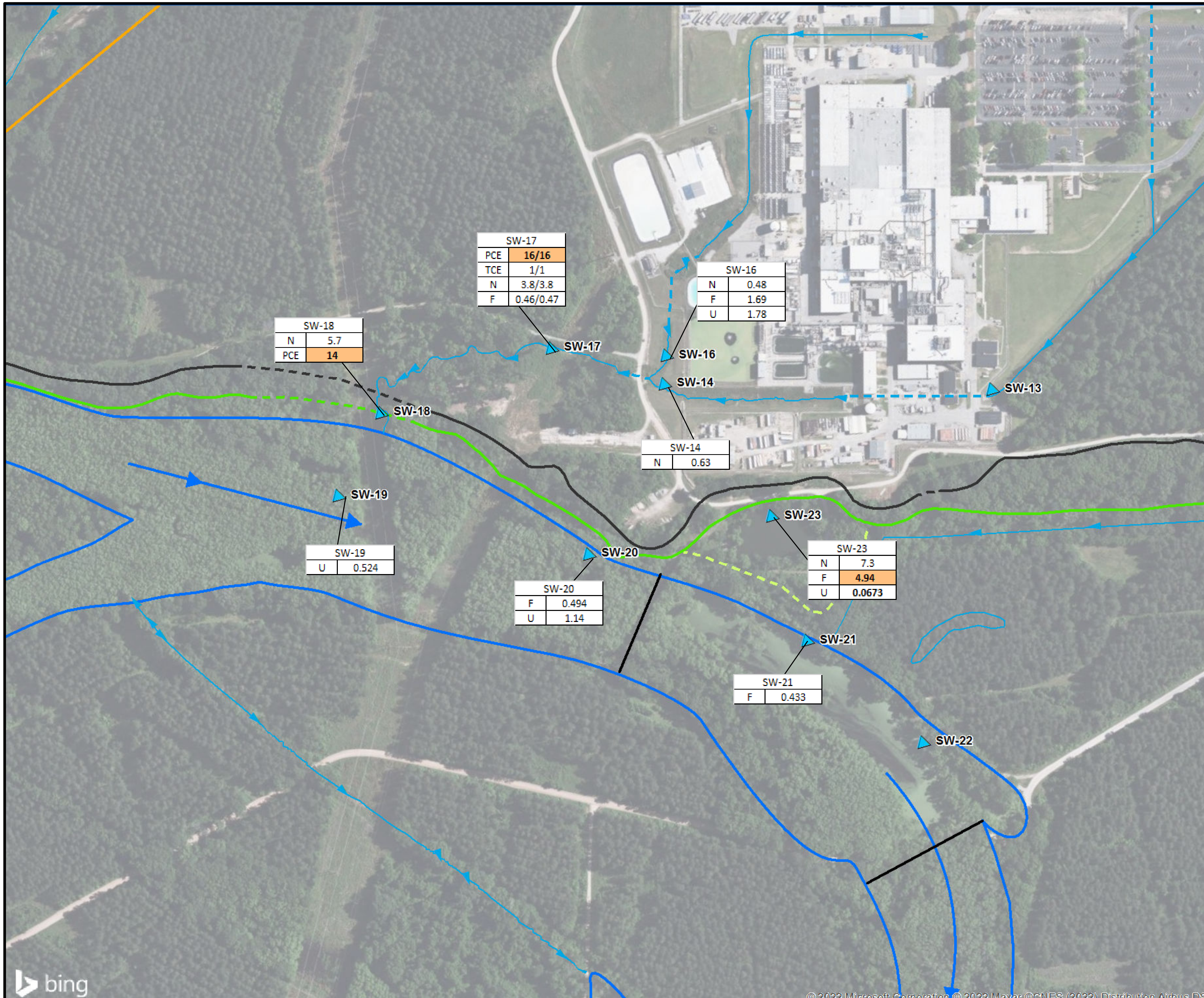
Lateral Extent of MCL Exceedances in Groundwater

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 32

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F32 Lateral Extent of MCL Exceedances GW.mxd



Legend

- Surface Water Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

PCE Tetrachloroethene
TCE Trichloroethene
N Nitrate
F Fluoride
U Total Uranium Istopes

Analyte	MCL	Units
PCE	5	ug/L
TCE	5	ug/L
N	10	mg/L
F	4	mg/L
U	30	ug/L

Notes:
Displayed concentrations are above the calculated background concentration.

Concentrations in shaded cells exceed their MCL.

Locations displaying two concentration values had a quality control duplicate sample taken.

0 170 340 Feet

1:4,130

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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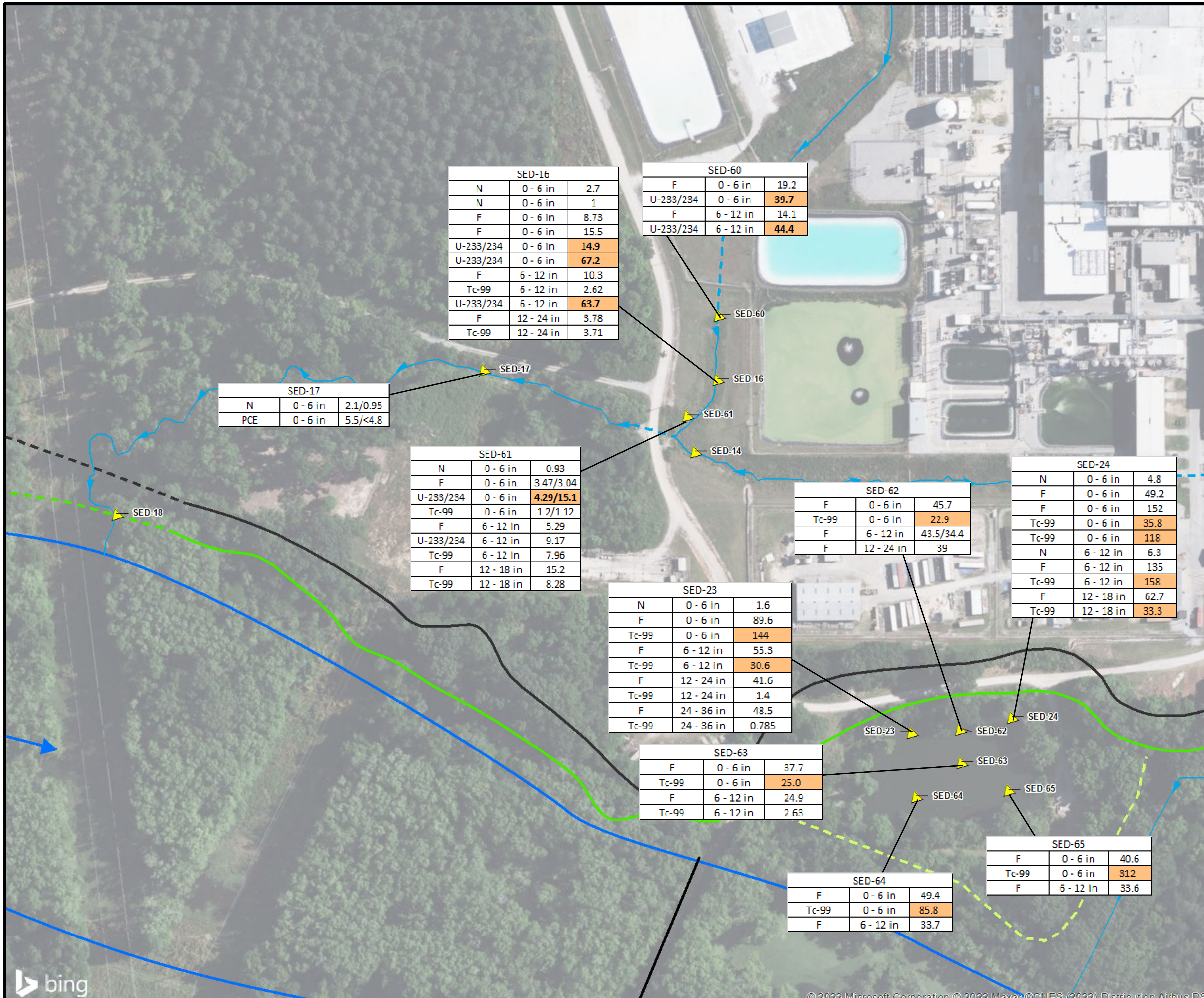
Surface Water Detections

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 33

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F33 Surface Water Detections.mxd



SED-16

N	0 - 6 in	2.7
N	0 - 6 in	1
F	0 - 6 in	8.73
F	0 - 6 in	15.5
U-233/234	0 - 6 in	14.9
U-233/234	0 - 6 in	67.2
F	6 - 12 in	10.3
Tc-99	6 - 12 in	2.62
U-233/234	6 - 12 in	63.7
F	12 - 24 in	3.78
Tc-99	12 - 24 in	3.71

SED-60

F	0 - 6 in	19.2
U-233/234	0 - 6 in	39.7
F	6 - 12 in	14.1
U-233/234	6 - 12 in	44.4

SED-17

N	0 - 6 in	2.1/0.95
PCE	0 - 6 in	5.5/<4.8

SED-61

N	0 - 6 in	0.93
F	0 - 6 in	3.47/3.04
U-233/234	0 - 6 in	4.29/15.1
Tc-99	0 - 6 in	1.2/1.12
F	6 - 12 in	5.29
U-233/234	6 - 12 in	9.17
Tc-99	6 - 12 in	7.96
F	12 - 18 in	15.2
Tc-99	12 - 18 in	8.28

SED-62

F	0 - 6 in	45.7
Tc-99	0 - 6 in	22.9
F	6 - 12 in	43.5/34.4
F	12 - 24 in	39

SED-24

N	0 - 6 in	4.8
F	0 - 6 in	49.2
F	0 - 6 in	152
Tc-99	0 - 6 in	35.8
Tc-99	0 - 6 in	118
N	6 - 12 in	6.3
F	6 - 12 in	135
Tc-99	6 - 12 in	158
F	12 - 18 in	62.7
Tc-99	12 - 18 in	33.3

SED-23

N	0 - 6 in	1.6
F	0 - 6 in	89.6
Tc-99	0 - 6 in	144
F	6 - 12 in	55.3
Tc-99	6 - 12 in	30.6
F	12 - 24 in	41.6
Tc-99	12 - 24 in	1.4
F	24 - 36 in	48.5
Tc-99	24 - 36 in	0.785

SED-63

F	0 - 6 in	37.7
Tc-99	0 - 6 in	25.0
F	6 - 12 in	24.9
Tc-99	6 - 12 in	2.63

SED-64

F	0 - 6 in	49.4
Tc-99	0 - 6 in	85.8
F	6 - 12 in	33.7

SED-65

F	0 - 6 in	40.6
Tc-99	0 - 6 in	312
F	6 - 12 in	33.6

Legend

- Sediment Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

N Nitrate
F Fluoride
Tc-99 Techenetium-99
U-233/234 Uranium Isotopes 233/234
RUSL Residential Use Screening Level

Analyte	Unit	RUSL
Nitrate as N	mg/kg	
Fluoride	mg/kg	
Technetium-99	pCi/g	19
Uranium-233/234	pCi/g	13
Uranium-235/236	pCi/g	8
Uranium-238	pCi/g	14

Notes:
Displayed nitrate and fluoride concentrations are above the calculated background concentration.

Concentrations in shaded cells exceed their RUSL.

Locations displaying two concentration values had a quality control duplicate sample taken.

0 80 160 Feet
1:1,920

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983

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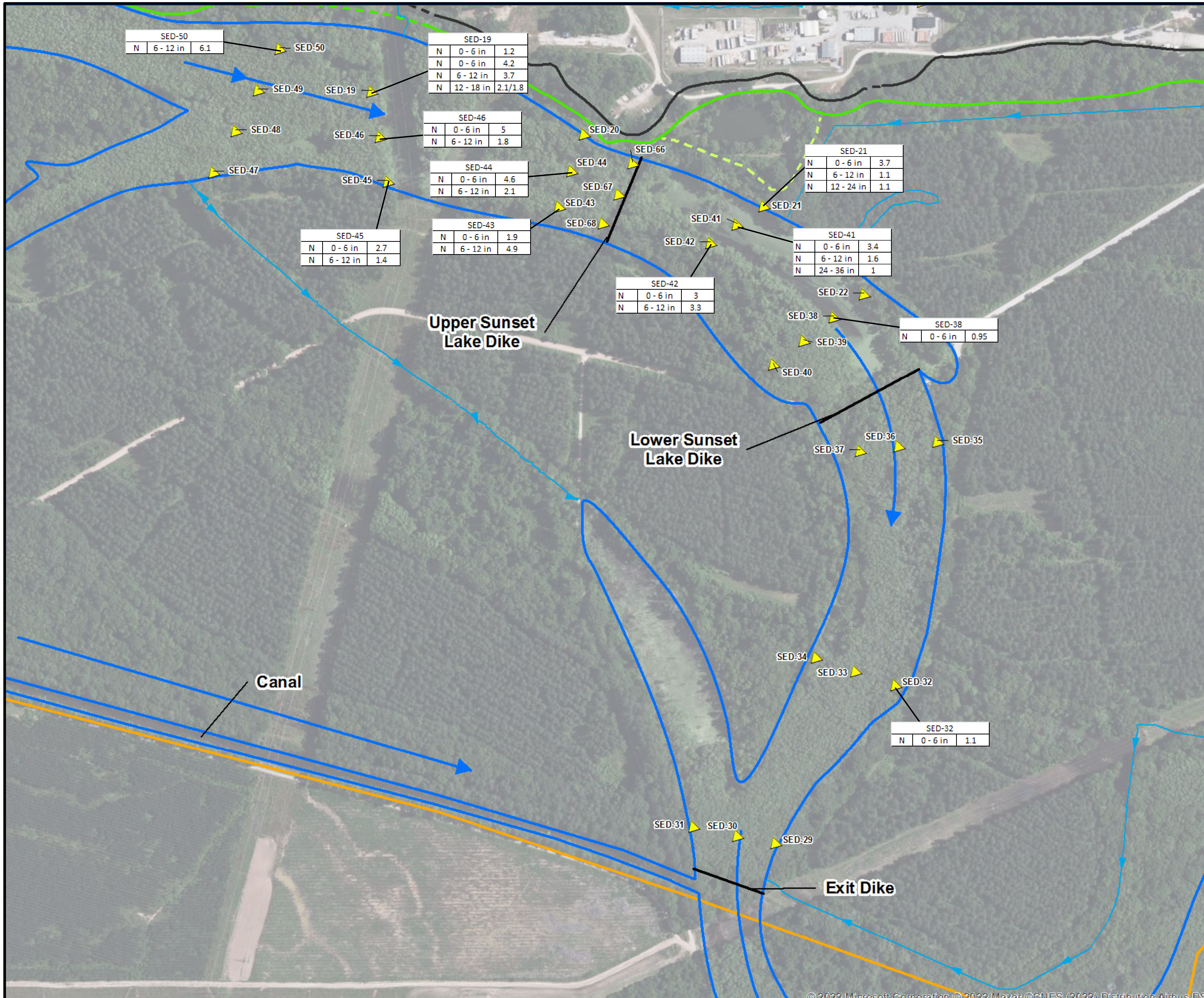
Gator Pond and Ditch COPC Sediment Detections

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 34

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F34 Sed Gator Pond & Ditches.mxd



Legend

- Sediment Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

N Nitrate

Notes:
Displayed concentrations are above the calculated background concentration.

Locations displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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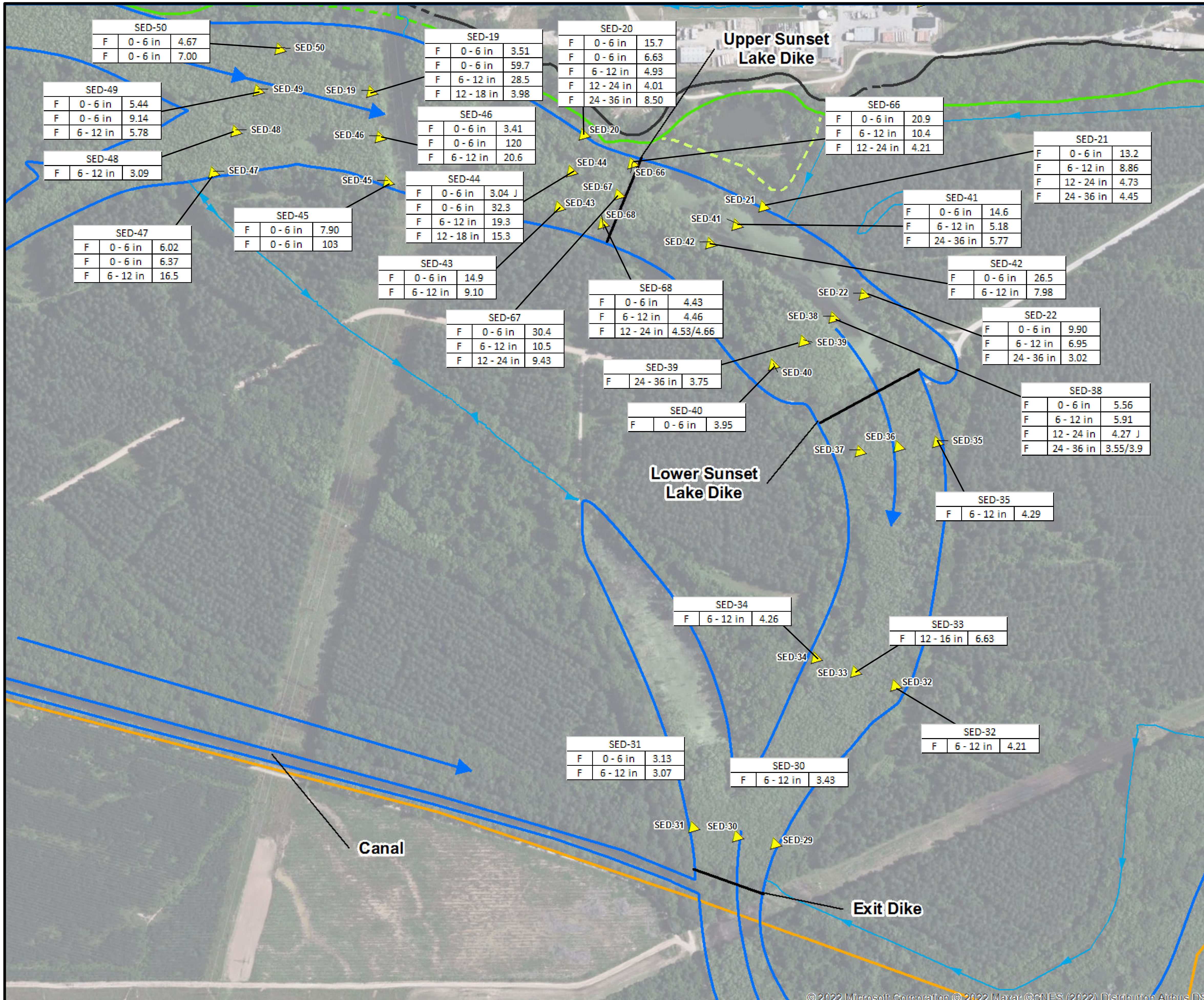
Floodplain Nitrate Sediment Detections

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 35

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F35 Floodplain Nitrate Sed.mxd



Legend

- Sediment Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

F Fluoride

Notes:
Displayed concentrations are above the calculated background concentration.

Locations displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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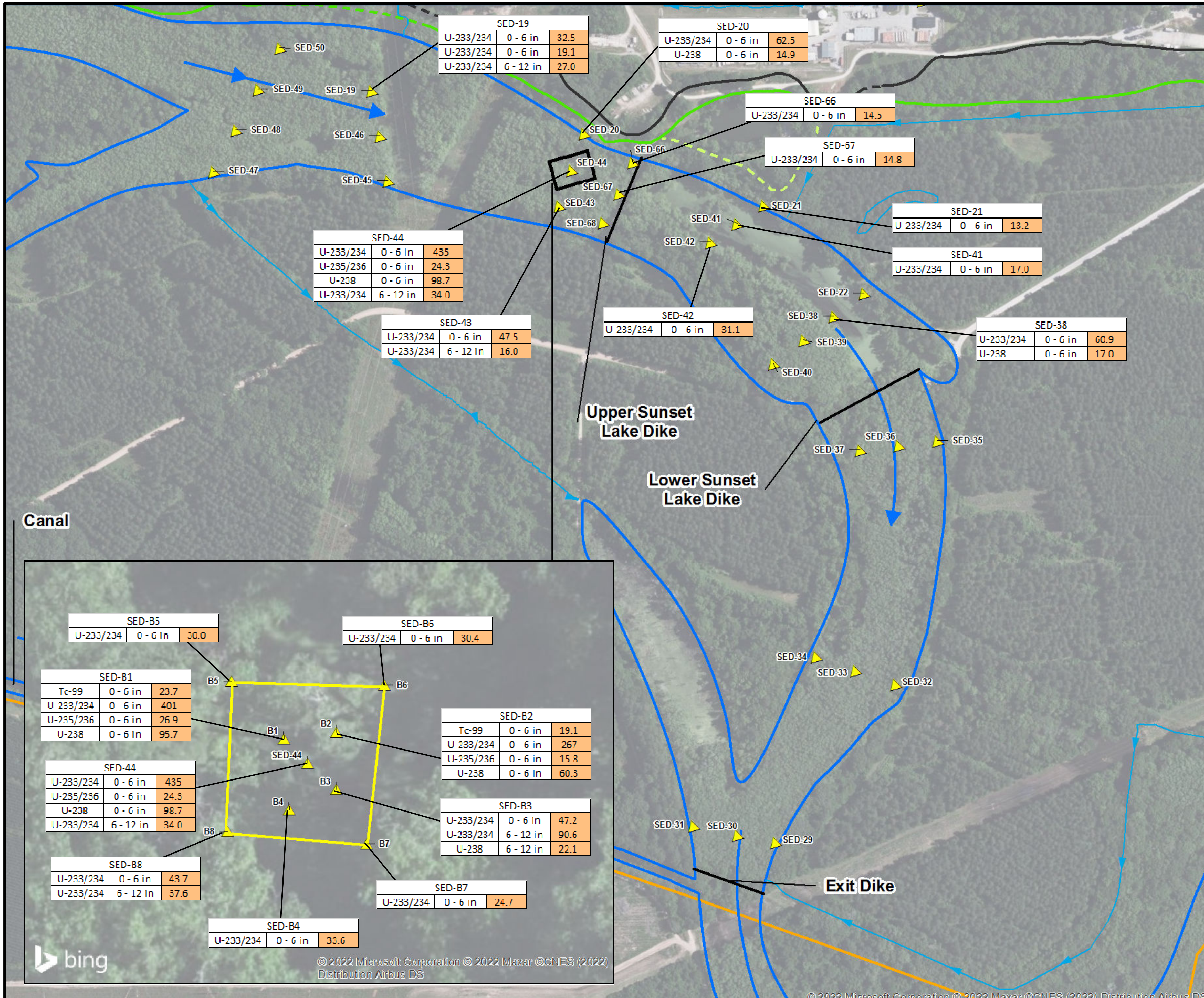
Floodplain Fluoride Sediment Detections

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 36

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F36 Floodplain Fluoride Sed.mxd



Legend

- Sediment Sample Location
- Ditch
- Culvert
- Mill Creek Flow Direction
- Dike Location
- Mill Creek
- Property Line
- 10 Square Meters Bounding Box
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

U-233/234 Uranium Isotopes 233/234
U-235/236 Uranium Isotopes 235/236
U-238 Uranium Isotopes 238
RUSL Residential Use Screening Level

Analyte	Unit	RUSL
Uranium-233/234	pCi/g	13
Uranium-235/236	pCi/g	8
Uranium-238	pCi/g	14

Notes:
Wells displaying two concentration values had a quality control duplicate sample taken.

Locations displaying two concentration values had a quality control duplicate sample taken.

0 200 400 Feet
1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

AECOM

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Floodplain Uranium Sediment Detections Above RUSL

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60595649	CCS	July 2022	FIGURE 37

Path: M:\EnvDataViz\Westinghouse\mxd\2021 RI Report\F37 Floodplain Uranium Sed.mxd

Appendix A
Operable Units Summaries

Operable Units Summaries

Northern Storage Area

Storage located in the Northern Storage Area Operable Unit (OU) includes final product shipping containers, radioactive waste intermodal containers awaiting shipment, and drums of lubricants and flammable liquids in the Oil House. Operations include refurbishment of shipping containers. Constituents of potential concern (COPCs) in this area are volatile organic compounds (VOCs) and U.

Mechanical Area

Manufacturing operations conducted in the Mechanical Area of the plant building include fuel rod inspection and storage, final assembly and storage, packaging, tube preparations, machining and tooling operations, grid fabrication, skeleton assembly, non-fuel component fabrication, and shipping and receiving. There was a small nickel plating operation within the Mechanical Area for coating grid straps for certain fuel designs. Containerization and off-site shipment of plating waste materials began in May of 2012 after the sump in the plating process area was refurbished. In March of 2020, the facility decommissioned the plating room. An external vendor cleaned the plating room tanks and associated air scrubbing system and removed all hazardous materials and chemicals. After cleaning, plating room controls and energy sources were locked out until the tanks could be physically removed later in 2020. Maintenance operations within the Mechanical Area OU use fuel oil, mineral spirits, and cutting oil. COPCs within the Mechanical Area include nickel, nitrate, and VOCs.

Chemical Area

Manufacturing operations conducted in the Chemical Area of the plant building include U conversion, powder blending, pellet manufacturing, including nuclear absorber addition, fuel rod loading, analytical services laboratory, and Uranium Recovery and Recycle Services (URRS). URRS operations include cylinder washing, incineration, U dissolution and purification through solvent extraction, and waste disposal preparations. There are two different feed materials used in the plant building for the uranium conversion process. One feed material, uranium hexafluoride (UF_6), is contained in cylinders and is heated from a solid to a gaseous state. The other feed material, liquid uranyl nitrate (UN), is "spiked" with hydrofluoric acid (HF) in a batch operation. Above ground and underground piping in the Chemical Area OU conveys wastewater to the Wastewater Treatment Area OU.

Bulk chemical storage tanks containing UN and HF, small chemical drum storage (dodecane, kerosene, and tributyl phosphate) used in the solvent extraction process, deionized water (DI) processing, and other miscellaneous operations are located outside of the plant building within the Chemical Area OU. Tetrachloroethylene (PCE) use in the solvent extraction process was discontinued in April 2020 and replaced with dodecane. CFFF decommissioning records describe historic releases in this OU. COPCs within the Chemical Area include VOCs, U, Technetium-99 (Tc-99), nitrate, ammonia, and fluoride.

West Lagoons Area

Two lined settling ponds exist within the West Lagoons area, West Lagoon I (WL I) and West Lagoon II (WL II). These lagoons were relined from December 2008 through February 2009 with 80 mil textured geomembrane high density polyethylene (HDPE). The liners have an approximate life span of 30 years. Since liner installation, maintenance inspections have been performed to assure liner integrity.

West II Lagoon receives treated wastewater from Waterglass, solvent extraction and incinerator areas, U removal processes, and still bottoms from ammonia distillation. The effluent from WL II flows to WL I. In both lagoons, calcium fluoride (CaF_2) solids settle out from the treated wastewater. Periodically, the settled CaF_2 solids are removed through a dredging and dewatering campaign. Removed CaF_2 is typically stored on a concrete pad adjacent to WL II prior to shipping off-site for recycling into cement or use in brick manufacturing operations. Runoff from the CaF_2 pad is collected in a drainage system and returned to WL II. COPC within the West Lagoons Area include VOCs, U, Tc-99, nitrate, ammonia, and fluoride.

Wastewater Treatment Area

Two lined settling ponds (North and South Lagoons), a sodium silicate (Waterglass) wastewater treatment process to treat U-contaminated, ammoniated wastewater from the conversion process, and several storage tanks exist in the Wastewater Treatment Area OU.

The North and South Lagoons were relined from January through February 2012 with 80 mil textured geomembrane HDPE. The liners have an approximate life span of 30 years. Since liner installation, maintenance inspections have been performed to assure liner integrity. Of the two remaining lagoons, the East Lagoon was closed in 2021 and plans are underway to close the Sanitary Lagoon.

The North and South Lagoons receive treated wastewater from the WL I and WL II. Operations in the West Lagoons Area OU are described above. Treated liquid process waste from the North or South Lagoon is mixed with treated sanitary wastewater in an underground pipe prior to transfer into the facility lift station. Before the North or South Lagoon is discharged, a four-corner sample is taken and analyzed for pH, total suspended solids (TSS), ammonia, fluoride and activity. The combined wastewater is then passed through a final aerator, followed by dechlorination and pH adjustment and subsequently discharge to the Congaree River via a 6-inch pipeline.

The Waterglass wastewater treatment process includes removal of residual U from ammoniated wastewater originating in the Chemical Area OU through flocculation and filtration. The filtered wastewater contains less than 0.2 parts per million (PPM) U. Following U removal, lime is added, and the wastewater is processed through a distillation column to remove and recover ammonia and fluoride.

The former East Lagoon received non-SNM liquid inputs such as effluent from the Deionized Water Building and rainwater from containment areas such as the bulk chemical storage area / tank farm. The lagoon also provided extra capacity for overflow from other lagoons or for containment in the event of a spill or emergency. Historic practices associated with lagoon operations included the introduction of materials containing low level, radiological contamination. The East Lagoon was monitored for pH and liquid level and was sampled for fluoride, ammonia and TSS. Once liquid levels in the East Lagoon reached a prescribed height, it was pumped to either the North or South Lagoon. The East Lagoon was removed from service, with remediation and closure activities completed in 2021 in accordance with a DHEC-approved Closure Plan (GEL, 2020).

Storage vessels in the Wastewater Treatment Area include tanks of nitric acid, sulfuric acid, sodium silicate, calcium oxide and calcium hydroxide, totes of sulfuric acid and nitric acid, tanks of contaminated ammoniated wastewater, and drums of Waterglass solids, containing ammonia and U. Low level radioactive waste packaging and UF_6 cylinder recertification operations are also performed.

COPCs within the Wastewater Treatment Area include U, Tc-99, fluoride, nitrate, and ammonia.

Sanitary Lagoon Area

Site sanitary sewage, including potentially contaminated sanitary wastewater from showering and handwashing in the Chemical Area OU is treated in an extended aeration package plant prior to discharge to a polishing lagoon (e.g., Sanitary Lagoon). U is captured in biosolids within the package plant and shipped offsite for burial. The Sanitary Lagoon was installed in 1968 and is not lined. The discharged effluent is chlorinated and mixed with treated liquid process waste in the Wastewater Treatment Area. COPCs within the Sanitary Lagoon Area OU are U and Tc-99. Sludge in the Sanitary Lagoon was characterized in 2021 in support of the planned closure of the lagoon, which is currently scheduled for 2024. Sludge samples were analyzed for isotopic U, Tc-99, fluoride, nitrate, and ammonia. Sludge samples were also collected at five additional systematic locations and analyzed for target compound list (TCL) VOCs and TCL SVOCs.

Southern Storage Area

Miscellaneous activities exist within the Southern Storage Area such as onsite emergency response operations; storage buildings containing new, spare and surplus process equipment; and hazardous waste storage beginning in 2020. Past operations included a storage pad where low-level radioactive material was packaged for off-site disposal;

intermodal containers with inventory stored for U recovery and with excess equipment; and UF_6 cylinders that were empty or contained only heel quantities of material. This OU currently stores fuel oil, gasoline and used oil tanks and drums of coolant and paint. COPCs within the Southern Storage Area OU include VOCs, fluoride, U and Tc-99.

Western Storage Area

Bulk chemical storage (e.g., ammonium hydroxide, fuel oil #2, and sodium hydroxide), UF_6 cylinder storage, hazardous waste storage and respirator cleaning operations exist in the Western Storage Area OU. In addition, two former oil houses were in this area. COPCs within the Western Storage Area OU include fluoride, U, Tc-99, nickel, nitrate, ammonia, and VOCs.

References

GEL, 2020. East Lagoon Closure Plan, Westinghouse Columbia Fuel Fabrication Facility, Hopkins, South Carolina, June, 2020.

Appendix B
Facility Description and Operational Background

Facility Description and Operational Background

The developed area of the property is approximately 130-140 feet above mean sea level. Elevations drop to approximately 110 feet above mean sea level immediately south of the plant/wastewater treatment plant (WWTP) area, on the Congaree River floodplain. The change in elevation occurs abruptly along a bluff that defines the southern edge of the developed portion of the property.

The Gator Pond is a manmade pond constructed prior to Columbia Fuel Fabrication Facility's development of the site. It is located approximately 500 feet southwest of the WWTP within a man-made step-down area of the bluff. The pond is fed by a combination of groundwater and precipitation. Water discharges from the pond through groundwater seepage or overland flow during periods of high precipitation. The pond has a 6-inch diameter discharge pipe/valve that is currently closed.

Upper and Lower Sunset Lakes are located west and south of the Gator Pond and approximately 900 feet southwest of the WWTP. The Sunset Lakes are located within a natural oxbow created by a former channel of the Congaree River. Mill Creek flows into the former river channel west of the site and occupies the channel until it flows into the Congaree River approximately three miles south of the site. A manmade dam approximately 1,700 feet south of the WWTP backs up water in Mill Creek, creating Lower Sunset Lake. A second manmade dam cuts across Mill Creek approximately 1,000 feet southwest of the WWTP, creating Upper Sunset Lake. The majority of the flow of Mill Creek is diverted away from Sunset Lakes via the man-made canal along the southern property boundary.

Surface drainage above the bluff at the developed area of the site flows into several man-made stormwater ditches across the property and surrounding areas. These ditches merge and flow into natural ditches that flow into Upper Sunset Lake. The southern portion of the property, including the Gator Pond, Mill Creek, and the Sunset Lakes are located within the floodplain of the Congaree River. Overland flow in these areas flows into the Gator Pond, Sunset Lakes, Mill Creek, and natural ditches.

The SCRDI Bluff Road site (formerly known as South Carolina Recycling and Disposal, Inc.) is located across Bluff Road from the northern property boundary. According to information on the internet (Justia US Law – law.justia.com), hazardous waste storage began on this property in late-1973 or early-1974, and operations ceased in 1982. This property was placed on the United States Environmental Protection Agency's Superfund Program's National Priority List in 1983. Releases at SCRDI are not known to have impacted the Columbia Fuel Fabrication Facility.

References

JUSTIA US Law website (USA/SCDHEC vs SCRDI et al. lawsuit), http://law.justia.com/cases/federal/district-courts/FSupp/653/984/2400694/, reviewed by Mr. Jeremy Grant of AECOM on September 24, 2017.

Appendix C
Historical Assessment Report Summaries and Excerpts

Historical Investigations and Summaries

1980 Davis and Floyd Report on Groundwater Investigations

The first environmental investigation was performed at the site in 1980 when a fish kill occurred in the Gator Pond southwest of the wastewater treatment plant (WWTP). Elevated concentrations of fluoride and ammonia nitrogen were detected by the Columbia Fuel Fabrication Facility (CFFF) in surface water samples collected from the pond. Davis and Floyd, Inc. (Davis and Floyd) performed a groundwater investigation in 1980 following the surface water sampling. The groundwater investigation included the installation of 28 monitoring wells (W-6 through W-33) between the WWTP and the Gator Pond. The results were presented in the *Report on Groundwater Investigations* (Davis and Floyd, 1980).

Fluoride and ammonia concentrations exceeded the maximum contaminant level (MCL) in groundwater samples from 10 and 12 of the monitoring wells, respectively, located between the WWTP and the Gator Pond. Davis and Floyd concluded that the sources of the fluoride and ammonia nitrogen were the concentrated waste treatment tanks, the ammonia storage tank area, and the waste treatment lagoons in the WWTP.

1982 Soil & Material Engineers, Inc. Groundwater Hydrology Study

Following the Davis and Floyd investigation, the CFFF and the South Carolina Department of Health and Environmental Control (DHEC) questioned the need for additional monitoring wells and whether it was likely that deeper aquifers beneath or adjacent to the site could become impacted. Soil and Material Engineers (S&ME) was contracted by Davis and Floyd to review previous studies and make recommendations as to whether additional hydrogeologic investigations were warranted. During the study, S&ME reviewed existing site and regional hydrogeologic data, performed borehole geophysical logging, and completed one deep stratigraphic boring.

The *Groundwater Hydrology Study* (S&ME, 1982) identified three hydrogeologic units beneath the CFFF, Unit I, Unit II, and Unit III. Unit I, the uppermost unit, was identified as the terrace aquifer system (currently referred to as the surficial aquifer). Unit II was identified as a confining unit in the upper portion of the Black Mingo Formation (misidentified previously, currently identified as the Black Creek Formation). Unit III was identified as a confined aquifer in the Black Mingo Formation. The groundwater flow direction was determined to be to the south-southwest toward the Gator Pond and Sunset Lakes. The study indicated that the number and depth of the monitoring wells were adequate to monitor groundwater quality.

1984 and 1985 Studies

Monitoring wells currently designated as W-40 and W-45 were installed in the shallow aquifer in 1984, and well W-3A was installed in the Black Creek Aquifer in 1985 by Law (RUST, 1995). However, neither AECOM nor CFFF have a report detailing the reasons or findings from the well installations.

1988 Soil & Material Engineers, Inc. Groundwater Mixing Zone Request

A report entitled *Ground-Water Mixing Zone Request* (S&ME, 1988) was submitted to DHEC in response to the Department's suggestion that criteria for the establishment of a mixing zone possibly could be met. The report included historical data from 1980 through 1987 and indicated that the four criteria for establishment of a groundwater mixing zone at the facility could be met based on the groundwater quality data available at the time. Subsequent correspondence by the CFFF resulted in a proposed boundary for the mixing zone and proposed alternate maximum concentration limits for ammonia, nitrate, and fluoride.

After an initial favorable determination, subsequent correspondence by DHEC raised several issues that resulted in the Mixing Zone not being approved. Among these issues were the need for further study of the lateral extent of groundwater impacts in the shallow aquifer in the WWTP area, further study of the competency of the underlying confining unit, further study of the discharge of groundwater to surface water in the Sunset Lakes area, and the monitoring of parameters other than ammonia, nitrate, and fluoride.

1989 EPA Westinghouse Screening Site Inspection Final Report

The United States Environmental Protection Agency (EPA) performed a Screening Site Inspection (SSI) in 1989. The SSI involved the collection of groundwater, surface water, soil, sediment, and field blank samples for analyses of organic and inorganic constituents. The SSI Report (EPA, 1989) indicated that a variety of organic and inorganic compounds were detected in groundwater samples collected at the facility.

Following submittal of the SSI report, meetings were held between DHEC, CFFF, and SEC Donohue to discuss the results of the SSI and the status of the mixing zone request. Concern with the validity of some of the results of the SSI were raised by both DHEC and CFFF. The basis for the concern was the manner that groundwater samples were obtained during the SSI that resulted in high turbidity in the samples. Other concerns were raised about the results representing only one sampling event and that conclusions were based on estimated concentrations. During the meeting it was agreed that additional investigation was warranted to verify the presence or absence of organic compounds.

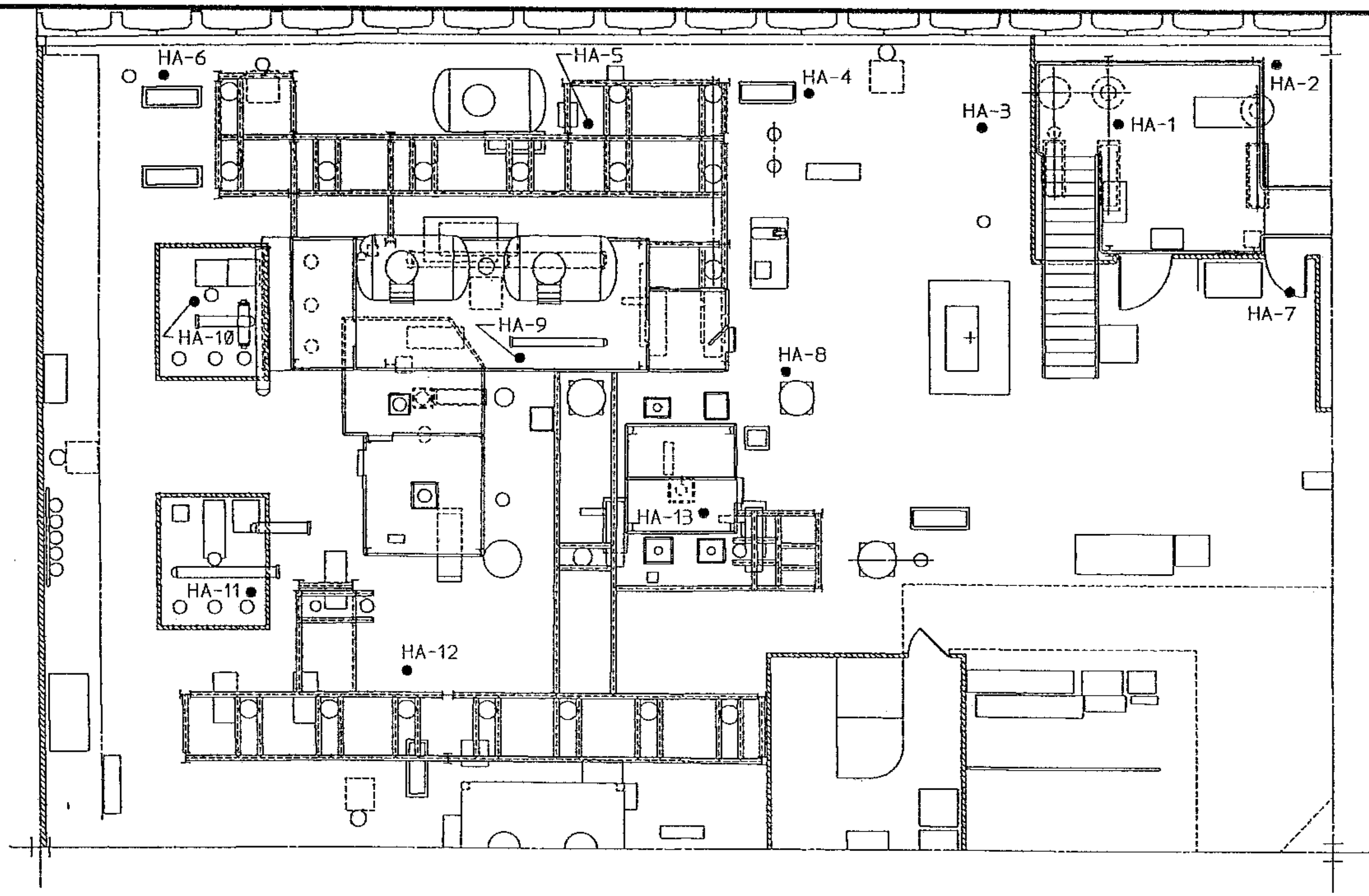
1992 Westinghouse Environmental and Geotechnical Services, Inc. Report of Soil Sampling Solvent Extraction Area

In November 1991, Westinghouse Environmental and Geotechnical Services, Inc. (WEGS) completed hand auger borings and collected soil samples below the concrete floor of the plant building in the Solvent Extraction Area (SOLX) within the Chemical Area where nitric acid is used. Cracks detected in the floor indicated that soil below the building may have been impacted. The soil sampling methods and soil boring records are presented in the *Report of Soil Sampling Solvent Extraction Area* (WEGS, 1992).

The soil samples were analyzed for gross alpha by CFFF. Results of the soil sample analyses were presented by CFFF to the NRC on January 23, 1992. Gross alpha concentrations were detected in depth-discrete soil samples from two borings. As a result of the meeting, CFFF agreed to perform additional soil and groundwater sampling and analyses outside of the SOLX to assess potential environmental impacts. These data were submitted to DHEC under separate cover.

Pertinent excerpts from this report are included below.

AB2341A



LEGEND

HA-10 ● HAND-AUGER SOIL SAMPLING LOCATION

10 0 10 20

APPROXIMATE SCALE IN FEET

Source: 1992 Westinghouse and Geotechnical Services, Inc. Report of Soil Sampling Solvent Extraction Area

WESTINGHOUSE ELECTRIC CORPORATION COMMERCIAL NUCLEAR FUEL DIVISION COLUMBIA, SOUTH CAROLINA CLWE044	Westinghouse Environmental and Geotechnical Services, Inc.	SOIL SAMPLING LOCATIONS SOLVENT EXTRACTION AREA

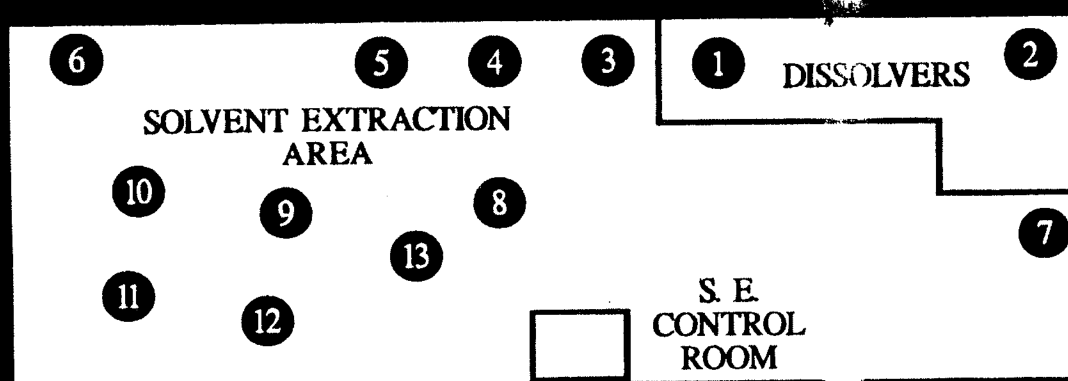
CAPITAL BLUEPRINT CO. N50663

COMMERCIAL NUCLEAR FUEL DIVISION
COLUMBIA, S. C. PLANT

SOIL SAMPLING RESULTS

SAMPLE NUMBER	2'	4'	6'	8'	10'	12'
	SAMPLE ACTIVITY(PCI/GM) @ VARIOUS DEPTHS(FT)					
1	645	2068	2711	2584	2412	–
2	752	549	184	–	–	–
3	385	69	811	328	3	–
4	1962	1601	2045	–	–	–
5	44	11	–	–	–	–
6	3	5	–	–	–	–
7	208	8	–	–	–	–
8	9	10	5	4	6	2
9	3	5	–	–	–	–
10	24	5	–	–	–	–
11	24	27	11	34	3	–
12	16	5	3	3	2	–
13	252	183	–	–	–	–

SAMPLE LOCATIONS WITHIN FACILITY



Source: CFFF Tabulation of Results From the 1991 Solvent Extraction Area Soil Sampling by Westinghouse Environmental and Geotechnical Services, Inc.

SOLVENT EXTRACTION SOIL SAMPLING

CHEMICAL RESULTS

NOVEMBER 22, 1991

SAMPLE	DEPTH	RESULT, PPM NO3
1	12’	1440
2	6’	163
3	10’	274
4	6’	1620
5	4’	109
6	4’	67
7	4’	91
8	10’	71
9	4’	13
10	4’	13
11	10’	8
12	10’	15
13	3’	391

Source: CFFF Tabulation of Results From the 1991 Solvent Extraction Area Soil Sampling by Westinghouse Environmental and Geotechnical Services, Inc.

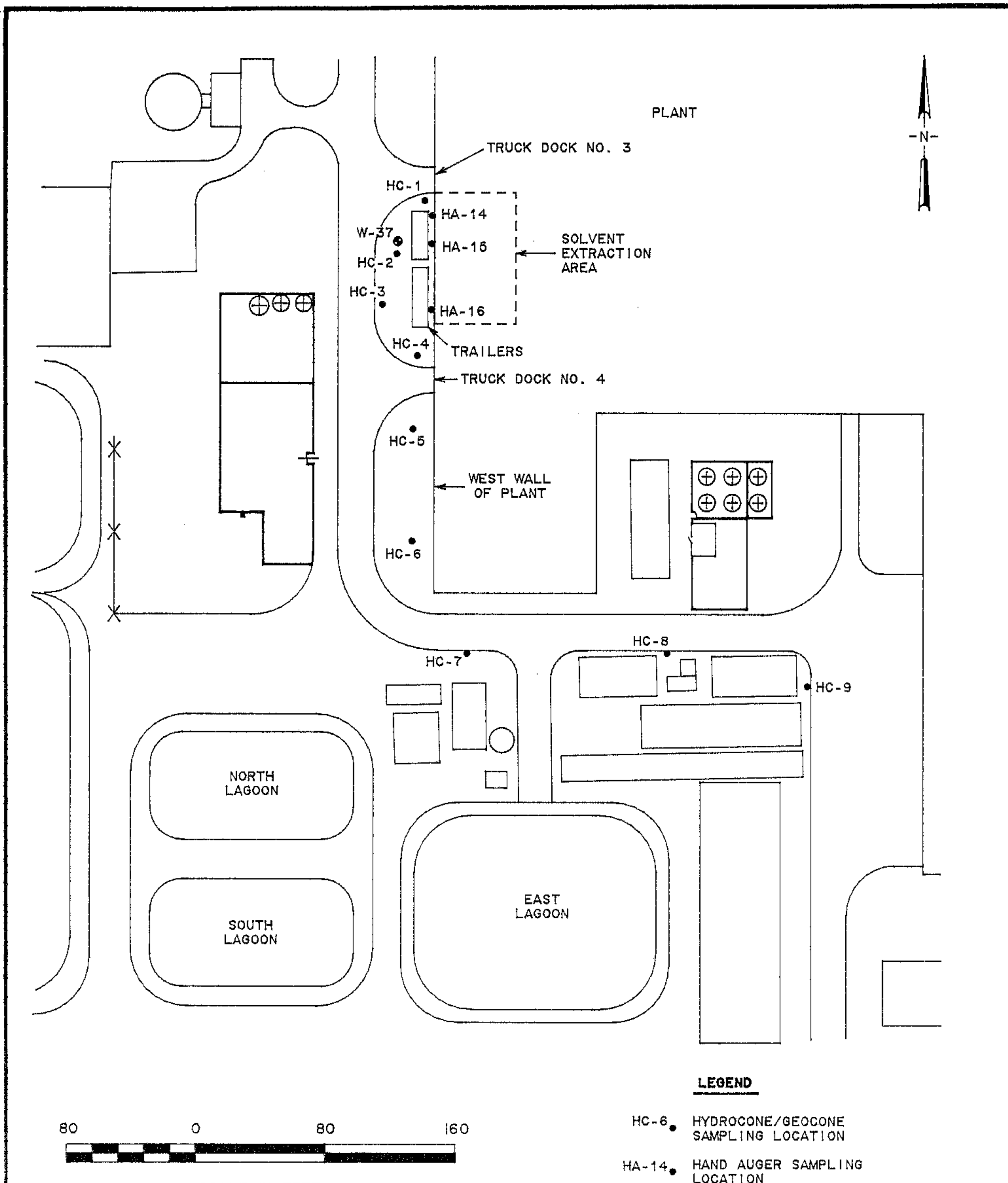
1992 SEC Donohue Report of Soil and Ground-Water Sampling Outside of the Solvent Extraction Area

Soil and groundwater samples were collected by SEC Donohue Environment & Infrastructure (SEC Donohue) outside of SOLX during an investigation in February 1992. Soil samples were collected using hand-augers and direct push technology (DPT), and groundwater samples were collected from temporary DPT wells and one permanent monitoring well. The samples were analyzed for nitrate and radioactivity. The results of the investigation are presented in the *Report of Soil and Groundwater Sampling* (SEC Donohue, 1992a).

Gross alpha in soil exceeded activities considered a potential “regulatory concern” in two soil samples. Nitrate concentrations in soil were detected in the range of naturally occurring nitrate; therefore, the results indicated that soil had not been impacted with nitric acid.

Groundwater samples were collected at two intervals in each temporary well. Gross alpha in groundwater ranged from 4 picocuries per liter (pCi/L) to 21 pCi/L. Gross beta ranged from 11 pCi/L to 19 pCi/L at both depth intervals in eight temporary wells and one interval in the ninth temporary well. Gross beta was detected at 166 pCi/L in the second interval of the ninth temporary well. Nitrate concentrations in groundwater exceeded the MCL of 10 milligrams per liter (mg/L) in at least one sample interval in five temporary groundwater wells at concentrations ranging from 10.0 mg/L to 41.2 mg/L. The study concluded that it was not likely that a significant impact to groundwater had occurred in the vicinity of SOLX.

Pertinent excerpts from this report are included below.



Source: 1992 SEC Donohue Report of Soil and Ground-Water Sampling Outside of the Solvent Extraction Area

WESTINGHOUSE ELECTRIC CORP.
COMMERCIAL NUCLEAR
FUEL DIVISION
COLUMBIA, SOUTH CAROLINA
CE044

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
MAP OF SOIL AND
GROUND-WATER
SAMPLING LOCATIONS

N50663

TABLE 1.

SUMMARY OF GEOCONE AND HAND AUGER SOIL ANALYSES

Westinghouse Electric Corporation
Commercial Nuclear Fuel Division
Columbia, South Carolina

SAMPLE LOCATION	DEPTH INTERVAL feet	RADIOACTIVITY GROSS ALPHA pCi/G	NITRATE mg/kg
HC-1	1.5-3	5.4	0.9
	4.5-6	4.6	0.4
	7.5-9	4.4	0.3
HC-2	1.5-3	5.1	0.9
	4.5-6	4.1	4.3
	7.5-9	5.1	2.2
HC-3	1.5-3	5.2	2.0
	4.5-6	5.0	1.4
	7.5-9	4.9	1.1
HC-4	1.5-3	5.7	0.9
	4.5-6	7.8	1.2
	7.5-9	5.7	1.7
HC-5	1.5-3	18.5	2.0
	4.5-6	8.1	4.0
	7.5-9	9.0	2.4
HC-6	1.5-3	12.8	0.5
	4.5-6	6.8	1.0
	7.5-9	9.0	2.0
HC-7	1.5-3	9.5	0.9
	4.5-6	7.3	0.7
	7.5-9	30.5	0.5
HC-8	1.5-3	8.8	0.5
	4.5-6	9.3	0.6
	7.5-9	14.0	1.2
HC-9	1.5-3	11.3	0.1
	4.5-6	22.5	0.2
	7.5-9	12.3	0.5
HA-14	2-3	18.3	1.5
	5-6	44.3	0.9
	8-9	4.2	1.0
HA-15	2-3	21.3	0.9
	5-6	28.8	0.5
	8-9	18.4	0.6
HA-16	2-3	9.3	1.8
	5-6	6.0	1.8

wcp01t1.wk1

Source: 1992 SEC Donohue Report of Soil and Ground-Water Sampling Outside of the Solvent Extraction Area

TABLE 2.

SUMMARY OF HYDROCONE AND MONITORING WELL
GROUND-WATER ANALYSES

Westinghouse Electric Corporation
Commercial Nuclear Fuel Division
Columbia, South Carolina

SAMPLE LOCATION	DEPTH INTERVAL feet	FIELD CONDUCTIVITY umhos/cm	LAB pH	RADIOACTIVITY GROSS ALPHA pCi/L	RADIOACTIVITY GROSS BETA pCi/L	NITRATE mg/L
HC-1	14.5-15.5	140	7.0	5	12	3.3
	24-25	120	6.8	5	12	5.1
HC-2	11-12	130	7.1	5	12	6.9
	17-18	180	6.7	6	12	7.7
HC-3	14-15	190	6.7	6	12	7.8
	24-25	90	6.1	5	12	6.0
HC-4	11-12	370	6.4	6	11	29.0
	18-19	170	5.8	5	11	10.6
HC-5	11-12	270	4.6	19	12	11.7
	16.5-17.5	155	7.1	5	12	10.0
HC-6	11-12	130	5.3	21	19	8.6
	18-19	125	5.2	ND	12	9.9
HC-7	11-12	320	5.9	8	13	2.7
	18-19	400	7.6	5	166	41.2
HC-8	11-12	235	6.9	8	14	11.2
	18-19	140	5.6	ND	12	10.3
HC-9	11-12	310	6.2	6	12	9.5
	18-19	295	6.8	6	11	16.6
W-37	15.5-20.5	165	6.0	4	12	5.8

ND = Not Detected

wcp01t2.wk1

Source: 1992 SEC Donohue Report of Soil and Ground-Water Sampling Outside of the Solvent Extraction Area

1992 SEC Donohue Confirmatory Ground-Water Investigation Report

A confirmatory groundwater investigation was performed by SEC Donohue in 1992 based on the meetings following the EPA's SSI. The investigation included redevelopment of existing monitoring wells, replacement of one monitoring well (W-7A), and the installation of two new monitoring wells (W-35 and W-36). Filtered and unfiltered groundwater samples were collected for metals analysis as well as aluminum and turbidity analysis to assess relative sediment content of each sample. In addition, two rounds of confirmatory groundwater sampling and analysis for verification were conducted, with the results presented in the *Confirmatory Ground-Water Investigation Report* (SEC Donohue, 1992b).

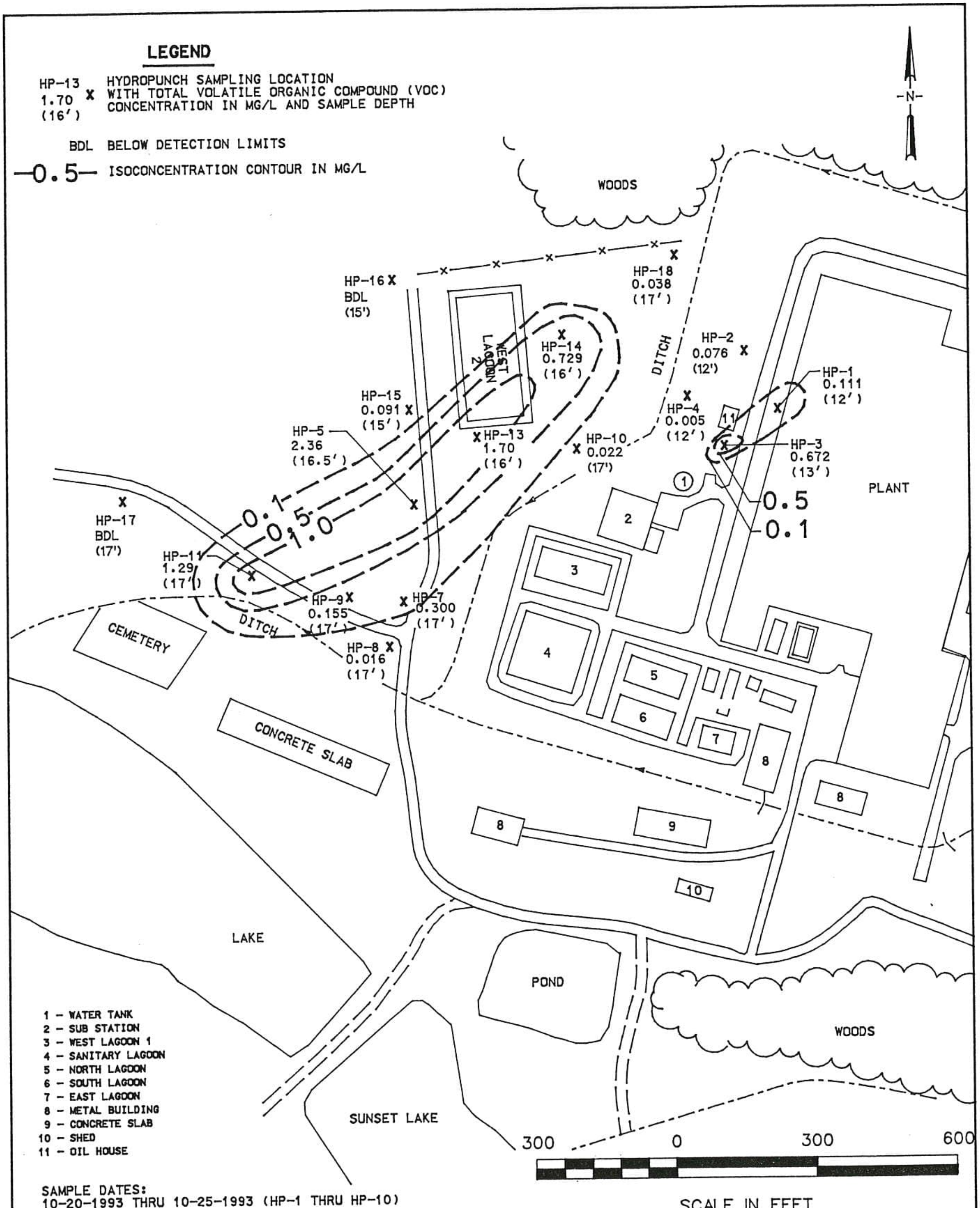
The confirmatory groundwater sampling indicated concentrations of fluoride and nitrate above the MCLs in groundwater samples collected from wells W-7A and W-30 near the WWTP. Chemical analyses indicated that tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected at concentrations exceeding the MCLs in groundwater samples from two monitoring wells (W-33 and W-35). Monitoring well W-35 was located adjacent to a former Oil House which was used to store oils and previously to store solvents. Concentrations of metals during the confirmatory investigation were within the range detected in the background samples and generally below MCLs. The *Confirmatory Ground-water Investigation Report* recommended that the establishment of a groundwater mixing zone in the vicinity of the WWTP should proceed for the fluoride-ammonia-nitrate plume. The report indicated that further investigation may be necessary for the detected volatile organic compounds (VOCs).

1994 Rust Environment and Infrastructure, Inc. Chlorinated Solvent Assessment Report

Based on the results of the confirmatory groundwater investigation, DHEC, in 1993, denied a groundwater mixing zone and requested that CFFF assess the source and horizontal and vertical extent of the chlorinated VOCs (CVOCs) in soil and groundwater. The chlorinated solvent assessment was performed by Rust Environment and Infrastructure (Rust) in late 1993 and early 1994. The assessment included redeveloping three monitoring wells, collecting depth-discrete groundwater samples from 18 borings using a Hydropunch™ sampler, installation and sampling of five new monitoring wells (W-39 and W-41 through W-44), sampling of eight existing wells, and collection of surface water samples from six locations. The results were presented in the *Chlorinated Solvent Assessment Report* (Rust, 1994).

The results indicated that PCE and TCE were detected at concentrations exceeding MCLs in groundwater samples in the vicinity of the former Oil House formerly located adjacent to monitoring well W-35 and areas downgradient of the former Oil House. The report indicated that the source of the CVOCs was most likely the former Oil House, which was used to store oils and previously to store drums of chlorinated solvents prior to 1980. The *Chlorinated Solvent Assessment Report* indicated that the horizontal and vertical extent of CVOCs in groundwater had not been fully defined.

Pertinent excerpts from this report are included below.

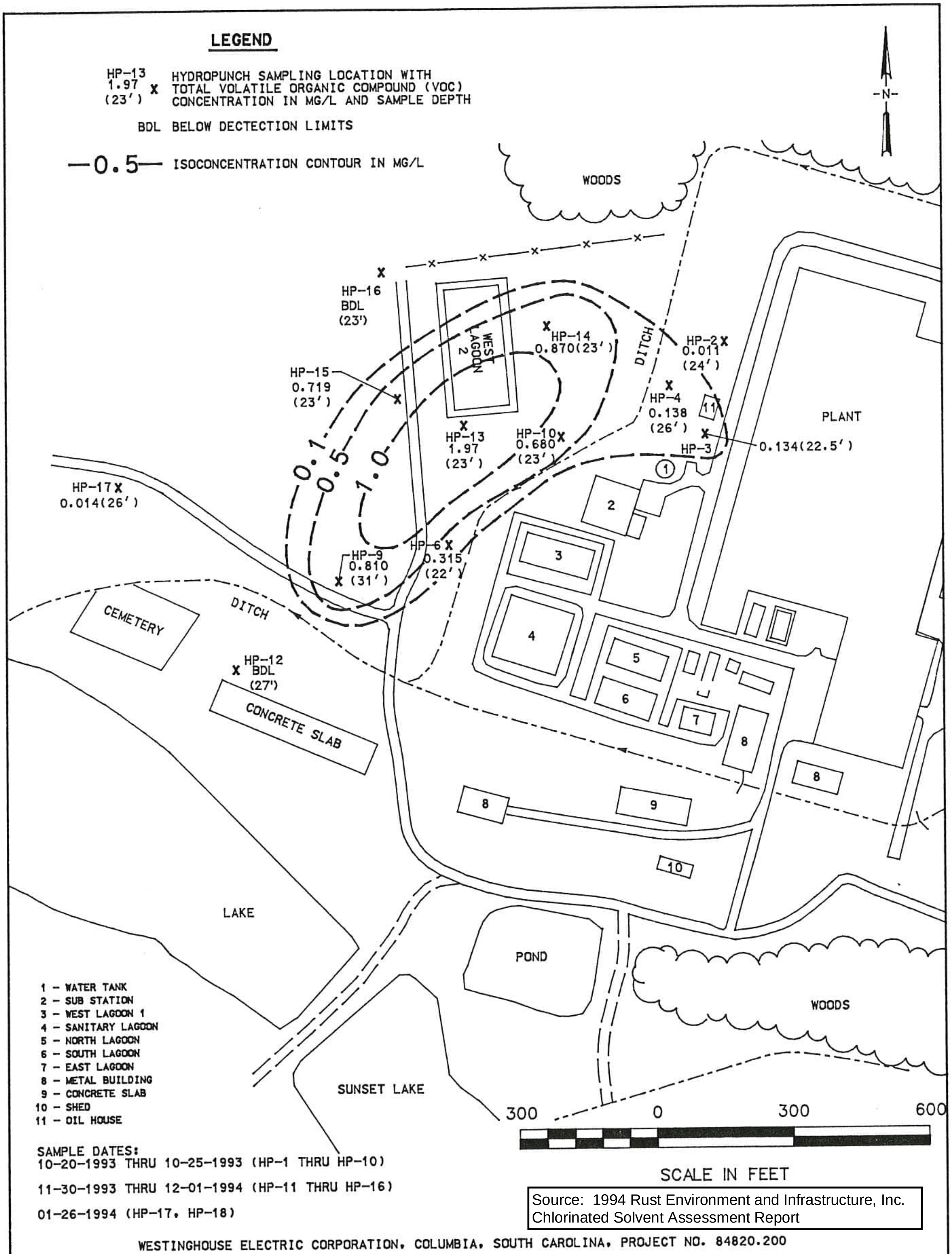


Source: 1994 Rust Environment and Infrastructure, Inc. Chlorinated Solvent Assessment Report

WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 84820.200

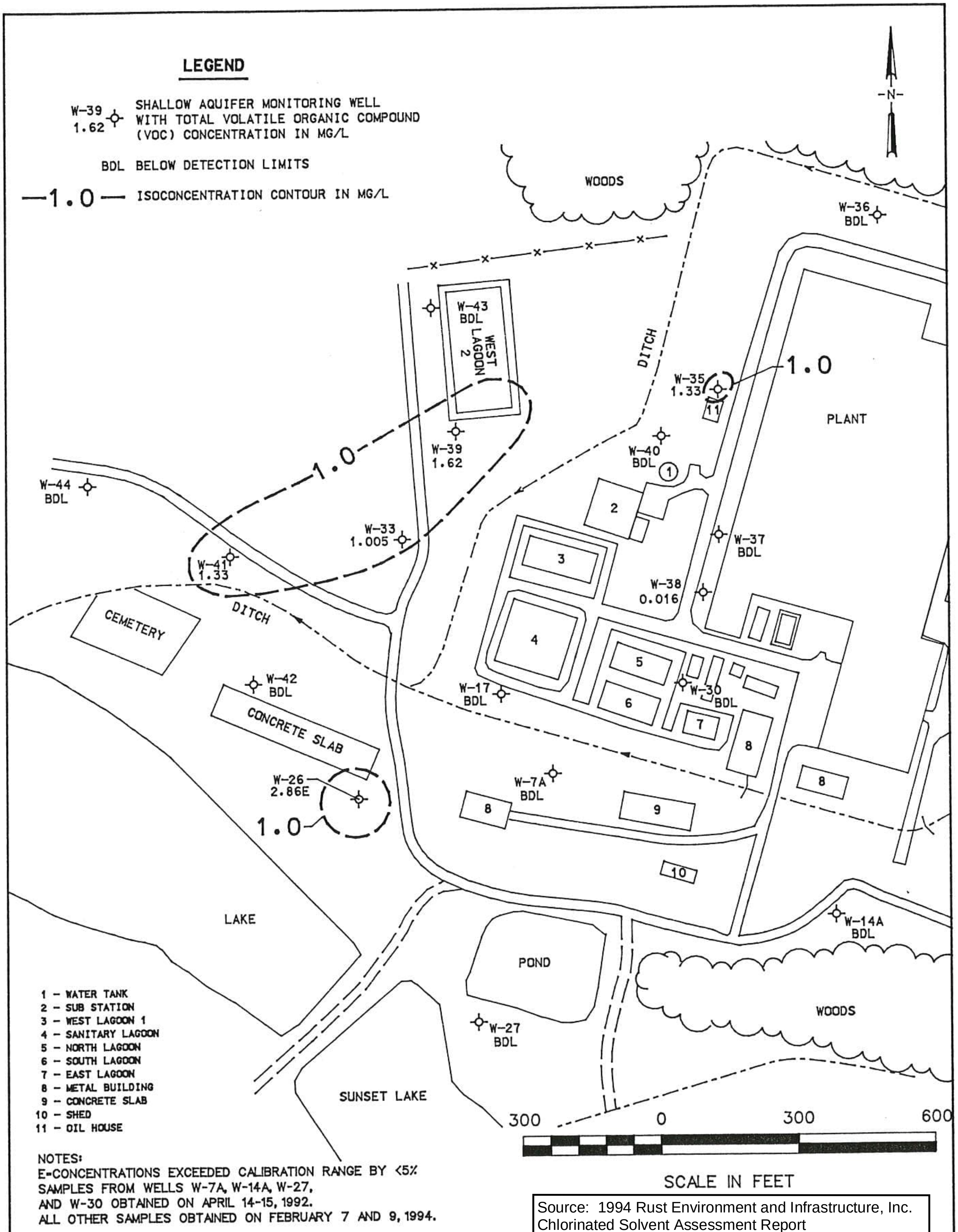
RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-2
MAP OF TOTAL VOC CONCENTRATIONS IN UPPER SHALLOW AQUIFER HYDROPUNCH SAMPLES



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-3
MAP OF TOTAL VOC CONCENTRATIONS
IN LOWER SHALLOW AQUIFER
HYDROPUNCH SAMPLES

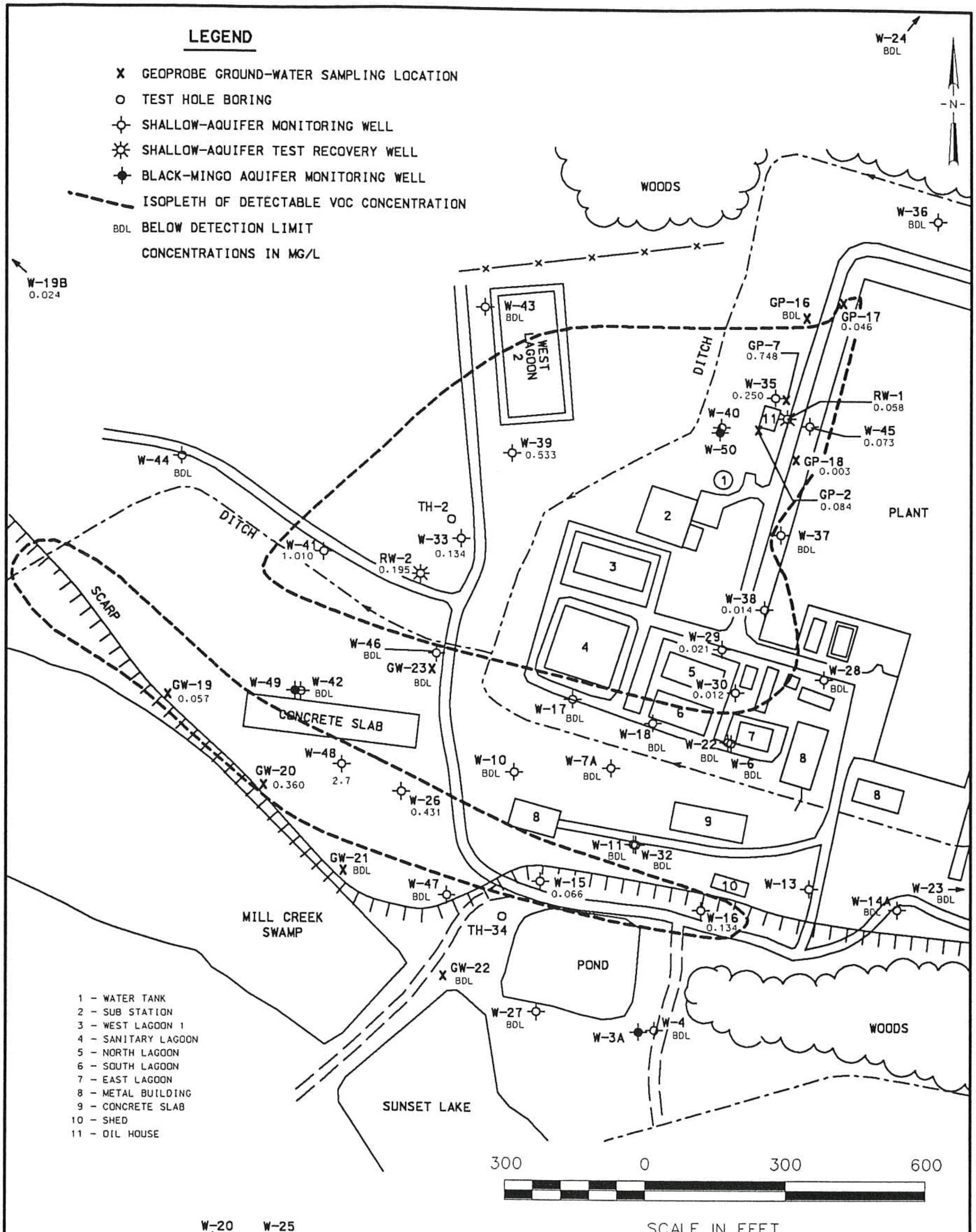


Source: 1994 Rust Environment and Infrastructure, Inc. Chlorinated Solvent Assessment Report

WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 84820.200

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-5
MAP OF TOTAL VOC CONCENTRATIONS IN SHALLOW AQUIFER MONITORING WELL SAMPLES



Source: 1994 Rust Environment and Infrastructure, Inc. Chlorinated Solvent Assessment Report

WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 33143.500

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-8
MAP OF TOTAL VOLATILE ORGANIC COMPOUND (VOC) CONCENTRATIONS, APRIL 1995

1995 Rust Environment and Infrastructure, Inc. Conceptual Design Report

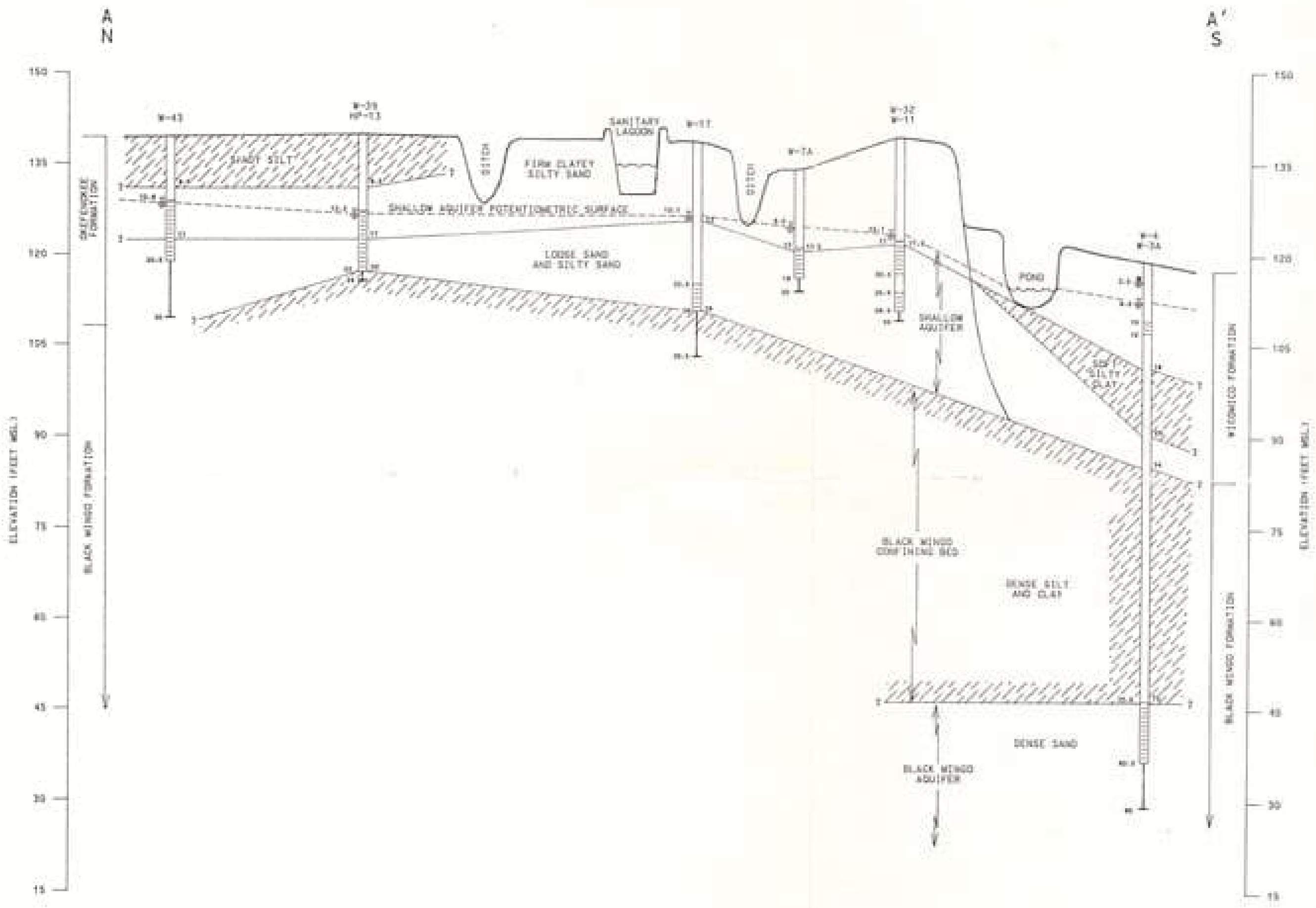
Based on the results of the *Chlorinated Solvent Assessment Report*, a remedial design investigation was performed by Rust in 1995 as part of a remedial design plan for remediation of the CVOCs. The investigation included well abandonments, DPT soil and groundwater sampling, monitoring well and recovery well installations, groundwater sampling, surface water sampling, and hydraulic testing (pump tests and slug tests). The results are presented in the *Conceptual Design Report* (Rust, 1995).

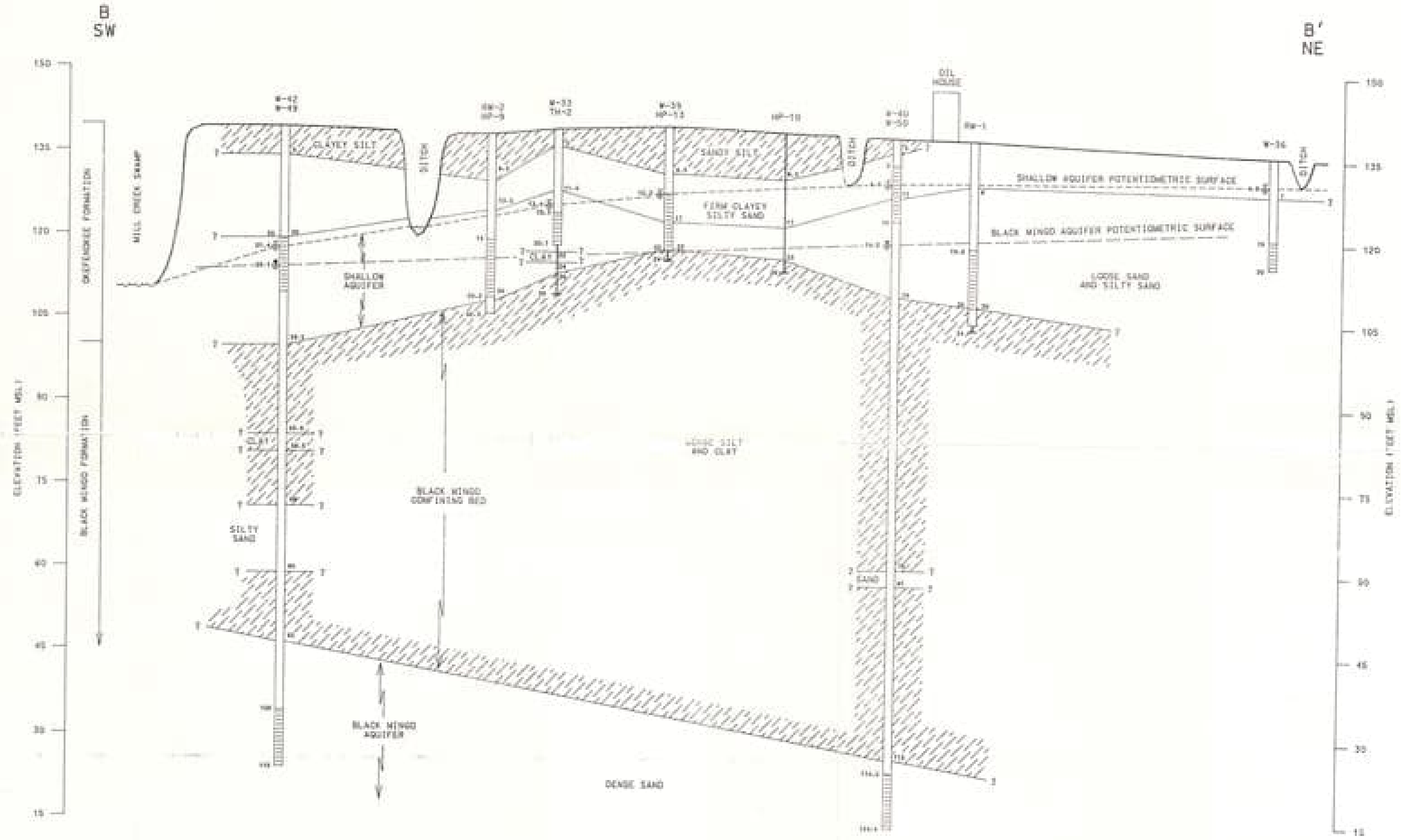
The report included refined interpretations of the site hydrogeology, source area soil and groundwater results, DPT and monitoring well groundwater results, surface water results, and aquifer hydraulic testing results. The results indicated that highest CVOCs were present in one soil sample adjacent to the former Oil House located adjacent to monitoring well W-35. The highest concentration of total petroleum hydrocarbons was detected in one soil sample near the former location of a diesel fuel underground storage tank.

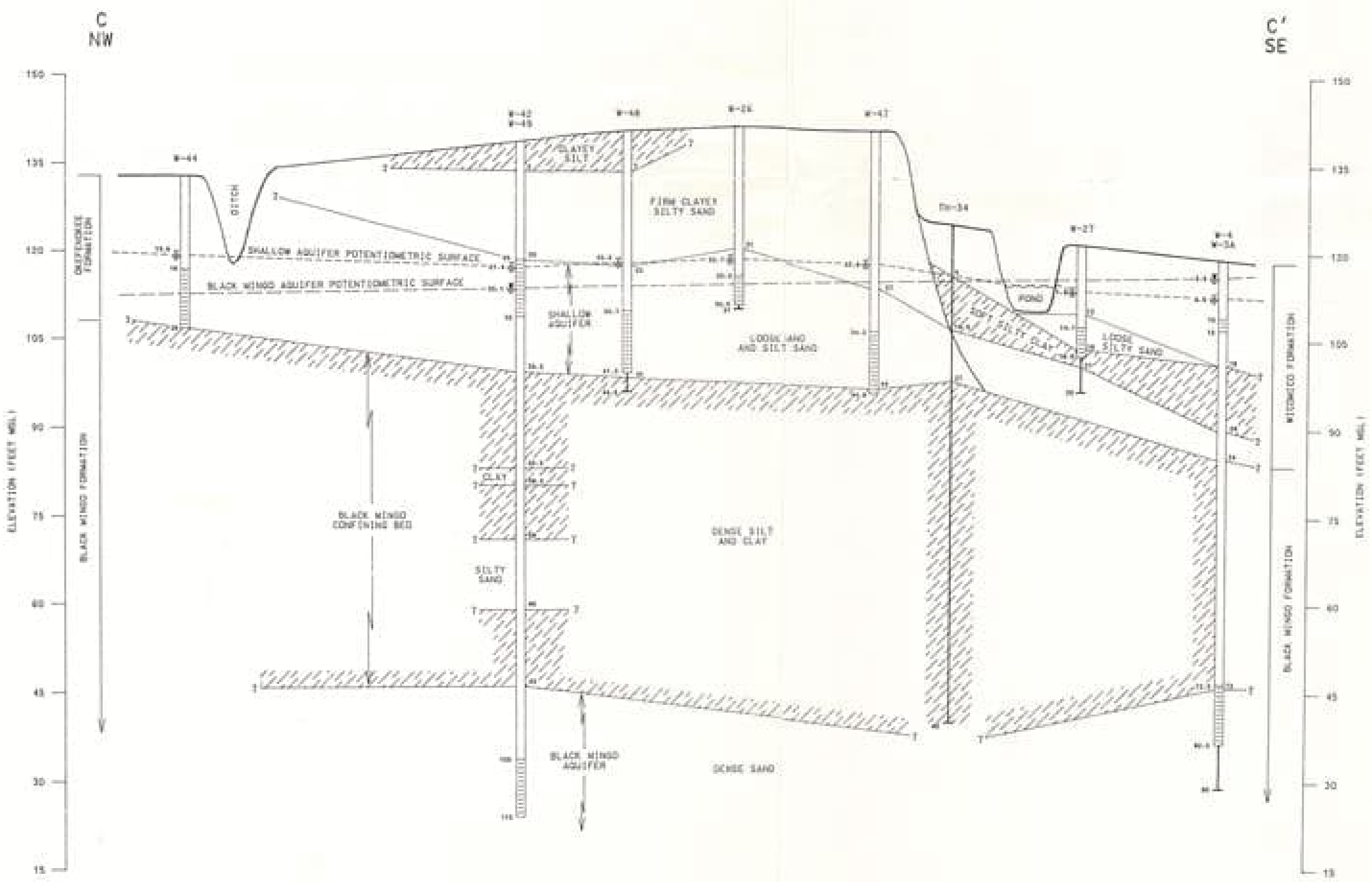
The *Chlorinated Solvent Assessment Report* and *Conceptual Design Report* indicated that PCE, TCE, cis-1,2-dichlorothylene (cis-1,2-DCE), and vinyl chloride (VC) were detected at concentrations exceeding MCLs in the surficial aquifer and that the former Oil House was the likely source of the CVOCs. Concentrations of fluoride and nitrate were detected at concentrations exceeding MCLs in groundwater samples collected within and downgradient of the WWTP. The report indicated that the objectives of remediation would be to limit CVOC migration and remove CVOCs through the interception and treatment of groundwater from the leading edge of the plume. The report recommended additional aquifer testing and review of treatment and disposal options.

CFFF and Rust personnel met with DHEC in 1995 to review the *Conceptual Design Report* and to discuss practical approaches for groundwater remediation of CVOCs. Groundwater pump and treat technologies were determined to be infeasible because of the excessive predicted quantities of wastewater, limited additional capacity for the force main that runs to the river, and required NPDES permit modification. In-situ technologies, specifically air sparge (AS) and soil vapor extraction (SVE), were considered to be feasible.

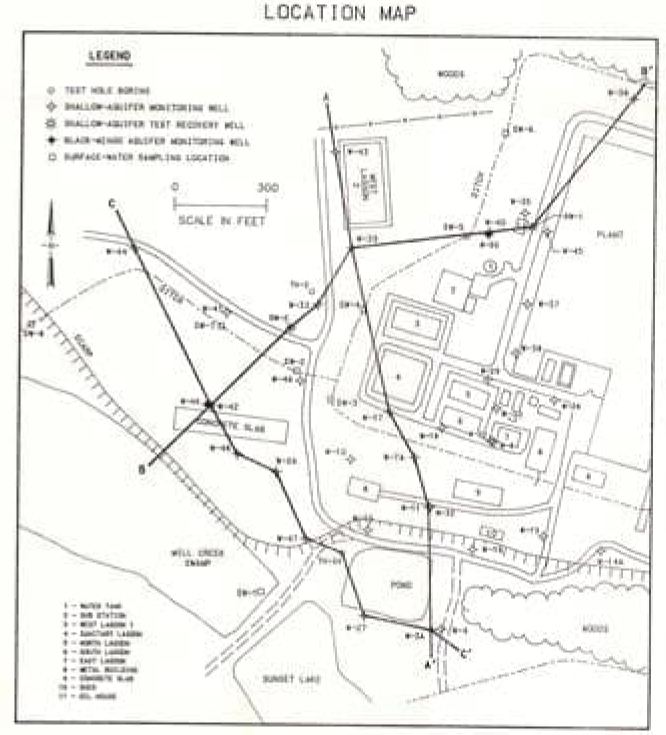
Pertinent excerpts from this report are included below.



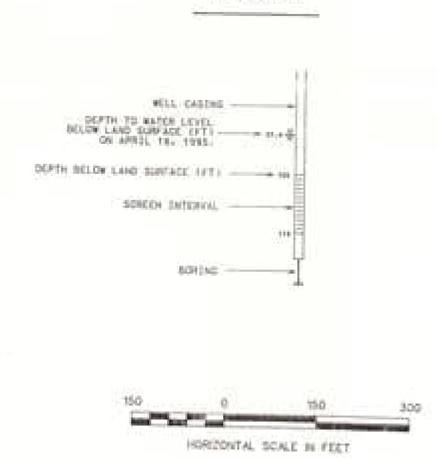




LOCATION MAP



LEGEND



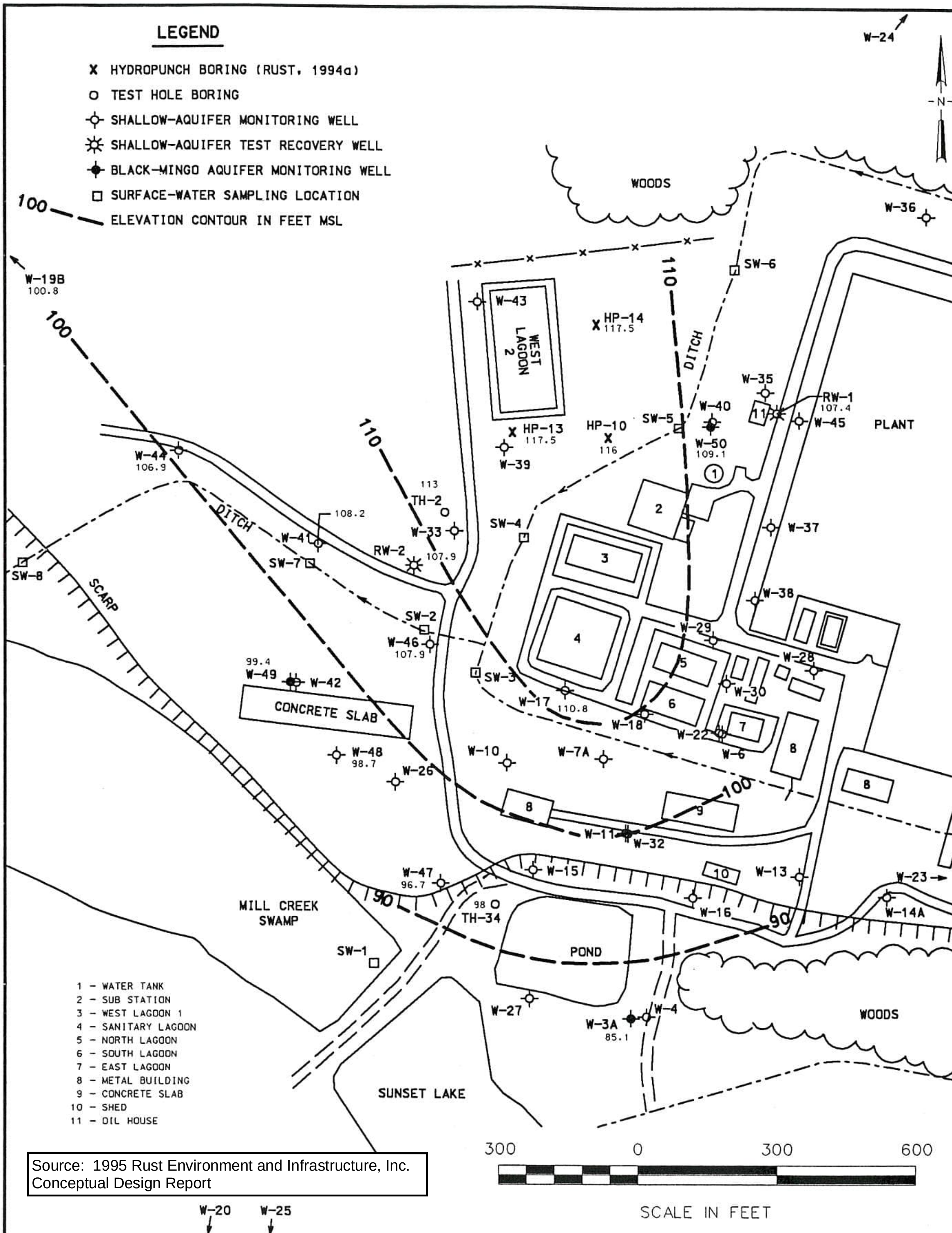
Source: 1995 Rust Environment and Infrastructure, Inc. Conceptual Design Report

REV.NO.	DESCRIPTION	DATE

FIGURE 3-1
HYDROGEOLOGIC CROSS-SECTIONS

RUST ENVIRONMENT & INFRASTRUCTURE

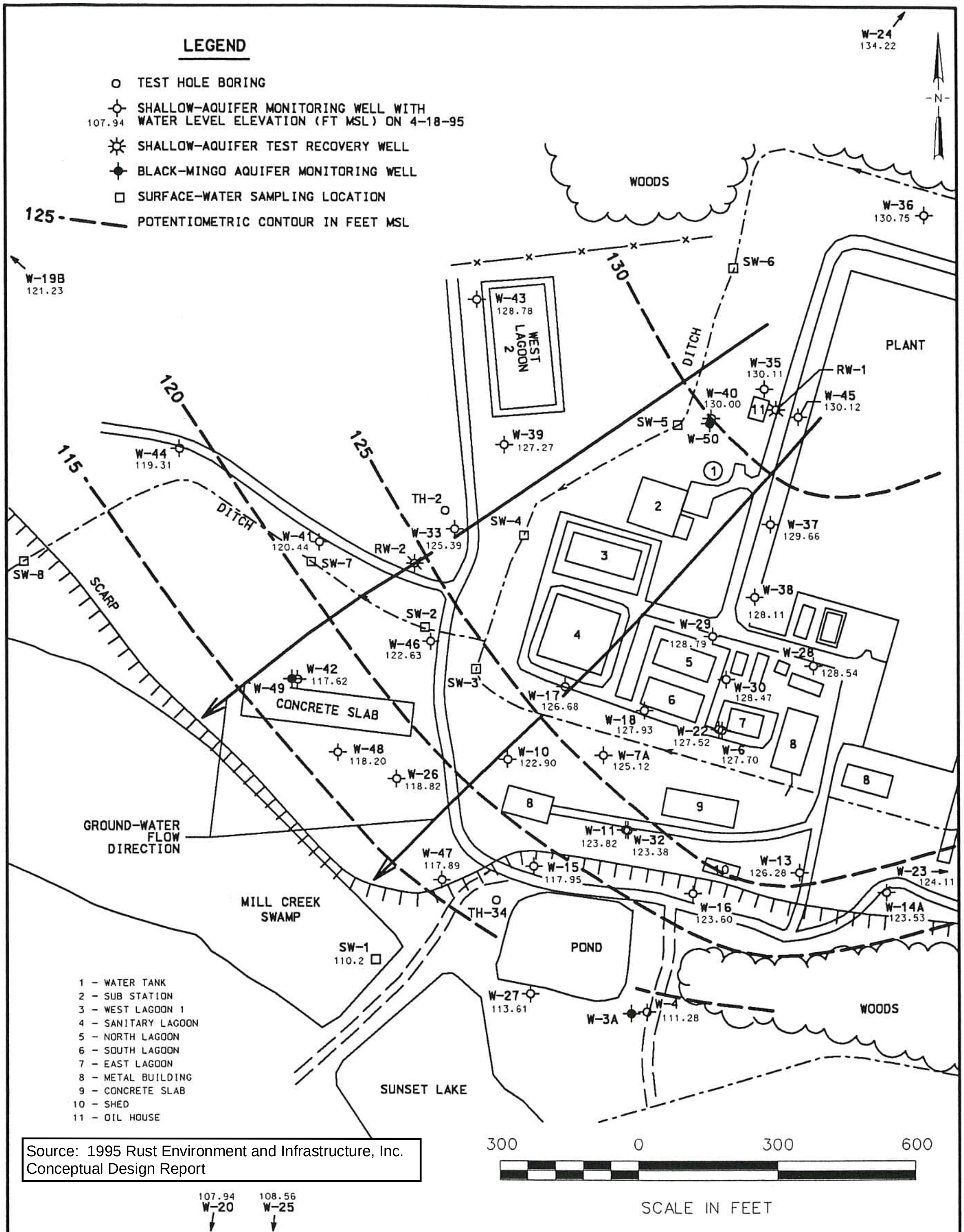
SCALE: AS SHOWN	DRAWN BY: WJG	CHECKED BY: DPS
JOB NO. 33143.500	DATE: 7/95	SHEET 1 OF 1



WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 33143.500

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-2
STRUCTURE CONTOUR MAP OF THE
TOP OF THE BLACK MINGO FORMATION

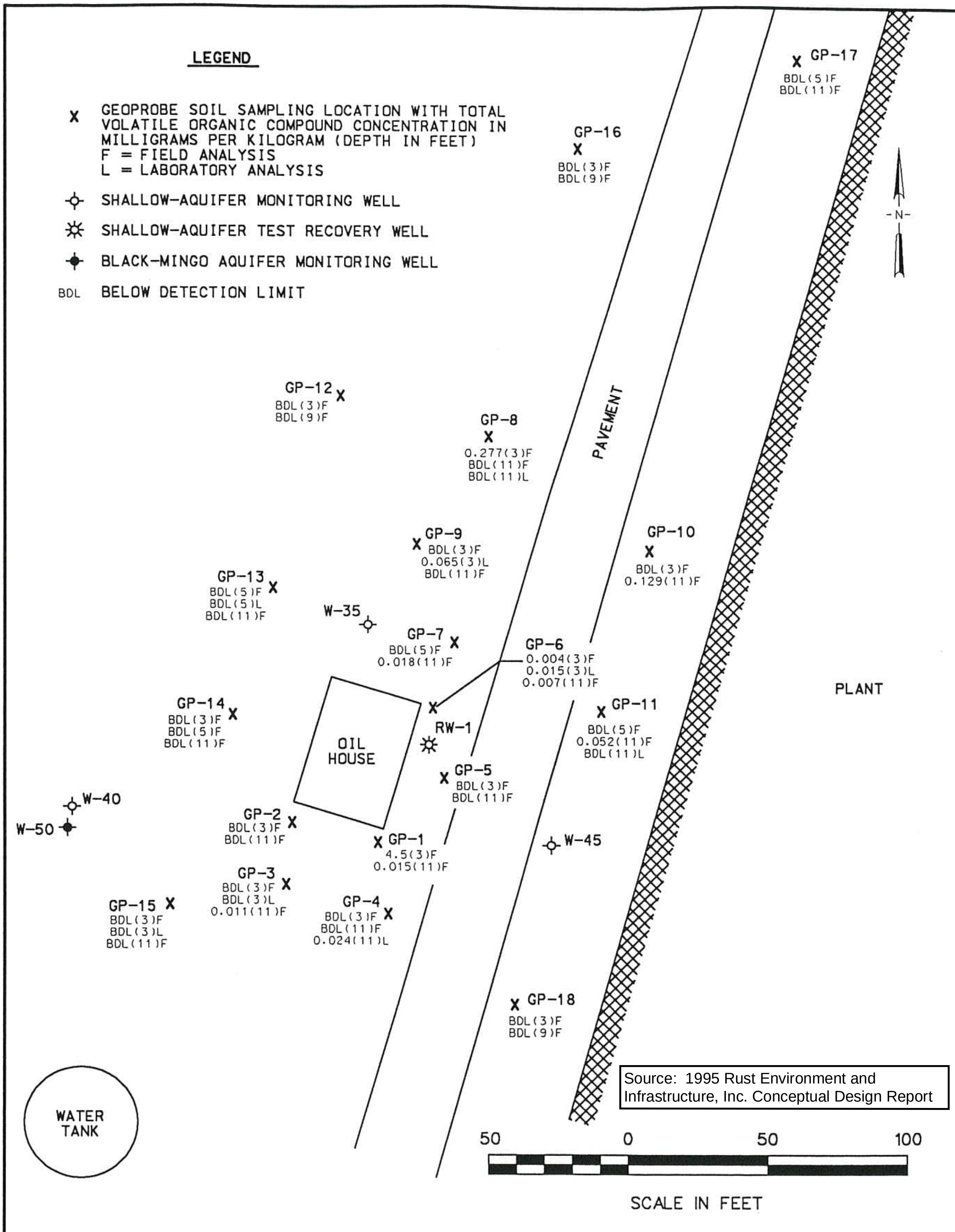


Source: 1995 Rust Environment and Infrastructure, Inc. Conceptual Design Report

WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 33143.500

RUST ENVIRONMENT & INFRASTRUCTURE

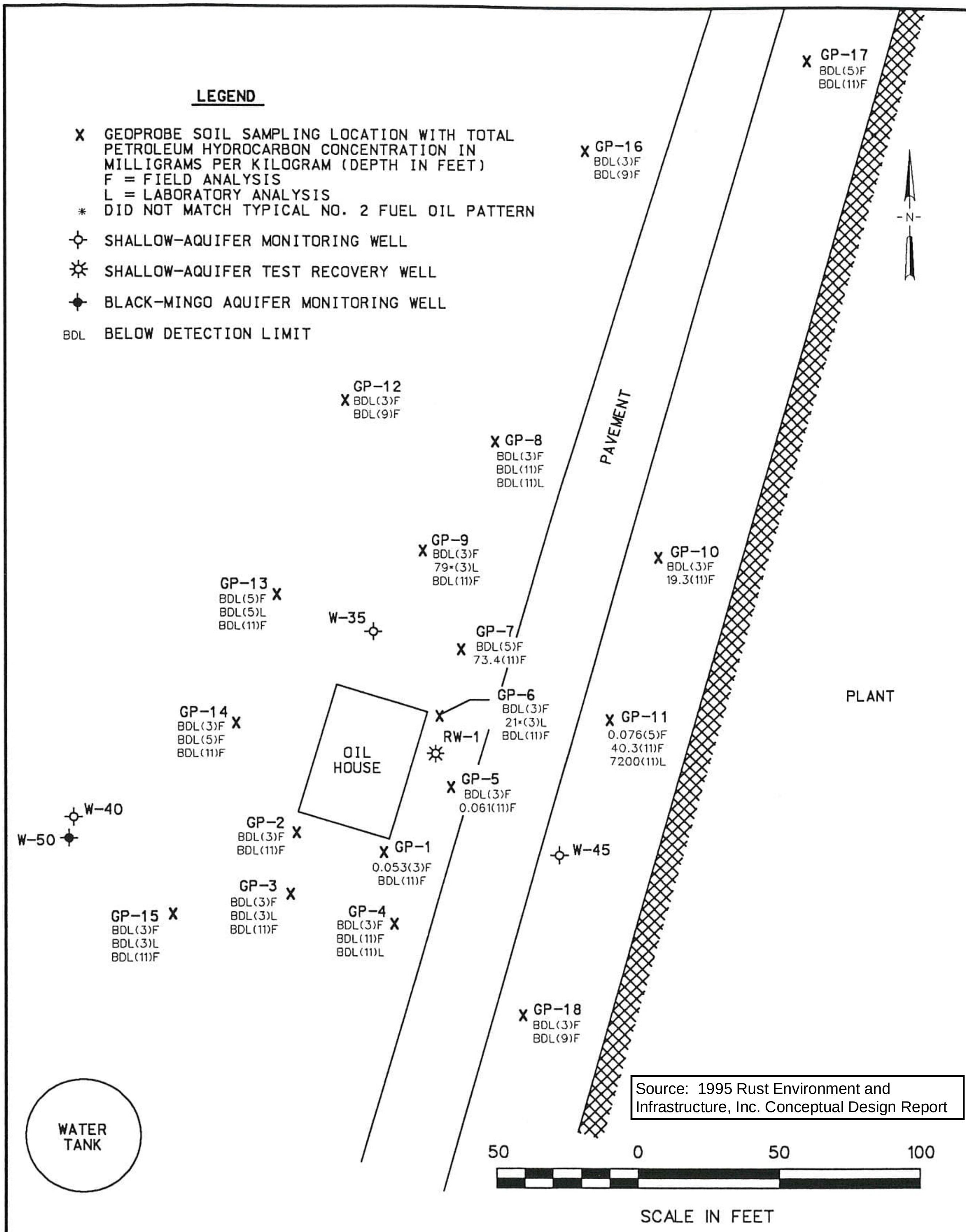
FIGURE 3-3
SHALLOW AQUIFER POTENTIOMETRIC MAP
APRIL 18, 1995



WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 33143.500

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-4
MAP OF VOLATILE ORGANIC COMPOUND CONCENTRATIONS DETECTED IN GEOPROBE SOIL SAMPLES



WESTINGHOUSE ELECTRIC CORPORATION, COLUMBIA, SOUTH CAROLINA, PROJECT NO. 33143.500

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3-5
MAP OF TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS DETECTED IN GEOPROBE SOIL SAMPLES

TABLE 3-2

SUMMARY OF PARAMETERS DETECTED IN GEOPROBE SOIL SAMPLES

Westinghouse Commercial Nuclear Fuel Division
Columbia, South Carolina

Project No. 33143.500

				Volatile Organic Compounds (VOCs)								
		Total Diesel Range		Acetone	Tetrachloroethene		Trichloroethene		1,2-Dichloroethene (Total)		Total VOCs	
Geoprobe Location	Sample Depth (Feet)	Field (mg/kg)	Laboratory (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)
GP-1	3	0.053	NA	NA	4.1	NA	0.356	NA	0.014	NA	4.5	NA
GP-1	11	< 0.025	NA	NA	0.015	NA	< 0.002	NA	< 0.005	NA	0.015	NA
GP-2	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-2	11	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-3	3	< 0.025	< 10	< 0.010	< 0.002	< 0.005	< 0.002	< 0.005	< 0.005	< 0.005	BDL	BDL
GP-3	11	< 0.025	NA	NA	0.011	NA	< 0.002	NA	< 0.005	NA	0.011	NA
GP-4	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-4	11	< 0.025	< 10	0.012	< 0.002	0.012	< 0.002	< 0.005	< 0.005	< 0.005	BDL	0.024
GP-5	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-5	11	0.061	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-6	3	< 0.025	21 *	0.015	0.004	< 0.005	< 0.002	< 0.005	< 0.005	< 0.005	0.004	0.015
GP-6	11	< 0.025	NA	NA	< 0.002	NA	0.002	NA	0.005	NA	0.007	NA
GP-7	5	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-7	11	73.4	NA	NA	0.007	NA	0.005	NA	0.006	NA	0.018	NA
GP-8	3	< 0.025	NA	NA	0.274	NA	0.003	NA	< 0.005	NA	0.277	NA
GP-8	11	< 0.025	< 10	< 0.010	< 0.002	< 0.005	< 0.002	< 0.005	< 0.005	< 0.005	BDL	BDL
GP-9	3	< 0.025	79 *	0.051	< 0.002	0.014	< 0.002	< 0.005	< 0.005	< 0.005	BDL	0.065
GP-9	11	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-10	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-10	11	19.3	NA	NA	0.129	NA	< 0.002	NA	< 0.005	NA	0.129	NA

Source: 1995 Rust Environment and Infrastructure, Inc.
Conceptual Design Report

TABLE 3-2

SUMMARY OF PARAMETERS DETECTED IN GEOPROBE SOIL SAMPLES

Westinghouse Commercial Nuclear Fuel Division
Columbia, South Carolina

Project No. 33143.500

				Volatile Organic Compounds (VOCs)								
		Total Diesel Range		Acetone	Tetrachloroethene		Trichloroethene		1,2-Dichloroethene (Total)		Total VOCs	
Geoprobe Location	Sample Depth (Feet)	Field (mg/kg)	Laboratory (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)	Field (mg/kg)	Laboratory (mg/kg)
GP-11	5	0.076	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-11	11	40.3	7200	< 12.5	< 0.002	< 6.25	< 0.002	< 6.25	0.052	< 6.25	0.052	BDL
GP-12	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-12	9	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-13	5	< 0.025	< 10	< 0.010	< 0.002	< 0.005	< 0.002	< 0.005	< 0.005	< 0.005	BDL	BDL
GP-13	11	< 0.025	NA		< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-14	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-14	5	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-14	11	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-15	3	< 0.025	< 10	< 0.010	< 0.002	< 0.005	< 0.002	< 0.005	< 0.005	< 0.005	BDL	BDL
GP-15	11	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-16	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-16	9	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-17	5	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-17	11	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-18	3	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA
GP-18	9	< 0.025	NA	NA	< 0.002	NA	< 0.002	NA	< 0.005	NA	BDL	NA

Notes: mg/kg = Milligrams per kilogram.
Field analyses performed by Microseeps.
Laboratory analyses performed by IEA, Inc.
* = Did not match typical No. 2 Fuel Oil pattern.
BDL = Below Detection Limit.
NA = Not analyzed.

WCP03T05.WK4

Source: 1995 Rust Environment and Infrastructure, Inc.
Conceptual Design Report

TABLE 3-3

HISTORICAL SUMMARY OF ORGANIC PARAMETERS
DETECTED IN MONITORING WELL SAMPLES

Westinghouse Commercial Nuclear Fuel Division
Columbia, South Carolina

Project No. 33143.500

			Volatile Organic Compounds (VOCs)						
Well Number	Sample Date	No. 2 Fuel Oil (mg/L)	Benzene (mg/L)	Ethyl-benzene (mg/L)	Tetrachloro-ethene (mg/L)	Trichloro-ethene (mg/L)	1,2-DCE (Total) (mg/L)	Vinyl Chloride (mg/L)	Total VOCs (mg/L)
W-3A	03/05/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/14/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	18	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	06/29/95	20	NA	NA	NA	NA	NA	NA	NA
W-4	04/05/95	2.8	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-6	04/04/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-7A	03/04/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/15/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	4.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-10	03/03/95	6.2	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	6.4	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-11	04/05/95	2.2	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-14A	03/05/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/15/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	1.3	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-15	03/03/95	4.0	< 0.005	< 0.005	0.042	< 0.005	< 0.005	< 0.010	0.042
	04/05/95	7.0	< 0.005	< 0.005	0.058	0.008	< 0.005	< 0.010	0.066
W-16	04/05/95	1.2	< 0.005	< 0.005	0.100	0.017	0.017	< 0.010	0.134
W-17	12/02/93	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	02/09/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	4.2	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-18	04/04/95	2.1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-19B	04/05/95	< 0.50	< 0.005	< 0.005	0.014	0.010	< 0.005	< 0.010	0.024
W-20	04/04/95	0.89	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-22	04/04/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-23	04/06/95	5.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-24	03/04/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/14/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/03/95	2.6	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-25	04/04/95	5.9	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-26	12/02/93	NA	< 0.050	< 0.050	1.600	0.100	< 0.050	< 0.100	1.700
	02/07/94	NA	< 0.050	< 0.050	< 0.050	< 0.050	2.100 E	0.760	2.860 E
	03/03/95	13	< 0.010	< 0.010	< 0.010	0.015	0.260	0.280	0.555
	04/06/95	26	< 0.010	< 0.010	< 0.010	0.011	0.220	0.200	0.431
W-27	03/05/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/14/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/05/95	3.3	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-28	04/05/95	0.64	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-29	04/05/95	1.9	< 0.005	< 0.005	0.021	< 0.005	< 0.005	< 0.010	0.021
W-30	03/04/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/15/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/04/95	1.4	< 0.005	< 0.005	0.006	0.006	< 0.005	< 0.010	0.012
W-32	04/05/95	3.2	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL

Source: 1995 Rust Environment and Infrastructure, Inc.
Conceptual Design Report

TABLE 3-3

HISTORICAL SUMMARY OF ORGANIC PARAMETERS
DETECTED IN MONITORING WELL SAMPLES

Westinghouse Commercial Nuclear Fuel Division
Columbia, South Carolina

Project No. 33143.500

Well Number	Sample Date	No. 2 Fuel Oil (mg/L)	Volatile Organic Compounds (VOCs): Benzene (mg/L)	Ethyl-benzene (mg/L)	Tetrachloro-ethene (mg/L)	Trichloro-ethene (mg/L)	1,2-DCE (Total) (mg/L)	Vinyl Chloride (mg/L)	Total VOCs (mg/L)
W-33	03/05/92	NA	< 0.005	< 0.005	0.230	0.110	< 0.005	< 0.010	0.340
	04/14/92	NA	< 0.005	< 0.005	0.210	0.097	< 0.005	< 0.010	0.307
	02/09/94	NA	< 0.025	< 0.025	0.830	0.140	0.035	< 0.050	1.005
	04/05/95	3.6	< 0.005	< 0.005	0.100	0.034	< 0.005	< 0.010	0.134
W-35	03/04/92	NA	< 0.010	< 0.010	0.110	0.010	0.030	< 0.020	0.150
	04/15/92	NA	< 0.025	< 0.025	0.270	< 0.025	0.070	< 0.050	0.340
	02/09/94	NA	< 0.025	< 0.025	0.920	0.120	0.290	< 0.050	1.330
	10/14/94	2.2	<0.012	<0.0125	0.340	0.042	0.120	< 0.025	0.502
	04/04/95	1.9	< 0.010	< 0.010	0.190	0.018	0.042	< 0.020	0.250
W-36	03/04/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/14/92	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	02/07/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/04/95	1.4	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-37	12/02/93	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	02/09/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	10/14/94	3.8	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/04/95	0.57	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-38	02/09/94	NA	< 0.005	< 0.005	0.010	0.006	< 0.005	< 0.010	0.016
	04/04/95	0.52	< 0.005	< 0.005	0.014	< 0.005	< 0.005	< 0.010	0.014
W-39	02/07/94	NA	< 0.050	< 0.050	1.500	0.120	< 0.050	< 0.100	1.620
	04/04/95	2.1	< 0.020	< 0.020	0.470	0.063	< 0.020	< 0.040	0.533
W-40	10/26/93	NA	< 0.005	< 0.005	0.110	0.021	< 0.005	< 0.010	0.131
	02/09/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	10/14/94	0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/06/95	< 0.50	< 0.010	< 0.010	0.310	0.120	< 0.010	< 0.020	0.430
W-41	02/07/94	NA	< 0.050	< 0.050	1.100	0.230	< 0.050	< 0.100	1.330
	04/03/95	4.3	< 0.025	< 0.025	0.910	0.100	< 0.025	< 0.050	1.010
W-42	02/07/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	10/14/94	0.64	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	03/03/95	2.6	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/04/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-43	02/07/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/03/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-44	02/07/94	NA	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	04/03/95	1.4	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-45	03/08/94	9.9	0.013	0.005	0.012	< 0.005	0.140	< 0.010	0.170
	10/14/94	25	0.012	< 0.005	0.008	< 0.005	0.130	< 0.010	0.150
	04/04/95	88	0.005	< 0.005	0.008	< 0.005	0.060	< 0.010	0.073
W-46	04/04/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-47	04/04/95	0.60	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-48	04/04/95	< 0.50	< 0.005	< 0.005	0.880	0.170	1.100	0.550	2.700
W-49	04/04/95	< 0.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
W-50	04/06/95	10	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.010	BDL
	06/29/95	< 0.50	NA	NA	NA	NA	NA	NA	NA
RW-1	04/04/95	< 0.50	< 0.005	< 0.005	0.049	0.009	< 0.005	< 0.010	0.058
RW-2	04/04/95	< 0.50	< 0.005	< 0.005	0.150	0.045	< 0.005	< 0.010	0.195

Notes: mg/L = Milligrams per liter.
1,2-DCE = 1,2-Dichloroethene.
BDL = Below Detection Limit.
NA = Not analyzed.
E = Concentration exceeded calibration range.

Source: 1995 Rust Environment and Infrastructure, Inc.
Conceptual Design Report

1996 Rust Environment and Infrastructure, Inc. Pilot Test Report

Rust conducted a pilot test in 1996 to assess the effectiveness of an AS/SVE system for remediation of CVOCs. One AS test well, three AS piezometers, one SVE test well, and three SVE piezometers were constructed in the vicinity of monitoring well W-26 for the pilot test. Air sparging and soil vapor extraction were tested separately initially, and then in combination. The results of the tests were positive for application of both technologies, simultaneously. The pilot test results were presented in the *Pilot Test Report* (Rust, 1996). The pilot testing indicated that AS/SVE was a viable remedial option for CVOCs at the site. The site installed and implemented an AS/SVE remediation system from 1997-2011.

2011 AECOM Source Investigation Report

AECOM performed a source investigation in the WWTP area in 2011. The source investigation included groundwater sampling from 20 DPT borings and wastewater sampling from five lagoons. The groundwater and wastewater samples were analyzed for fluoride and nitrate. The results of the source investigation were presented in the *Source Investigation Report* (AECOM, 2011).

The report indicated that fluoride and nitrate concentrations in groundwater exceeded MCLs in the vicinity of the North, South, and East Lagoons and surrounding WWTP facilities. The report concluded that there was no clear evidence that the wastewater lagoons were a continuing source of fluoride in groundwater because the fluoride concentrations in wastewater lagoon samples were up to 10 times less than the elevated concentrations in groundwater samples. The report concluded that groundwater had been impacted by nitrate from wastewater seepage from one or more of these lagoons since nitrate in groundwater samples were up to one half of the concentration in wastewater samples from the North and South Lagoons.

Pertinent excerpts from this report are included below.

N

Legend

- Shallow Aquifer Monitoring Well Location
- Deep Aquifer Monitoring Well Location
- Surface Water Sample Location
- Soil Boring Location
- 0.5 Fluoride Concentration (mg/L)
- Fluoride Isoconcentration Contour (mg/L)

Note:
Groundwater samples from the monitoring wells were collected in December 2010 or April 2011.

100 50 0 100 Feet

1:1,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2011 AECOM Source Investigation Report

AECOM

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FLUORIDE IN GROUNDWATER
UPPER SHALLOW AQUIFER

WESTINGHOUSE ELECTRIC CORPORATION
COLUMBIA, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60158741	RJS	JUNE 2011	FIGURE 4

N

Legend

- Shallow Aquifer Monitoring Well Location
- Deep Aquifer Monitoring Well Location
- Surface Water Sample Location
- Soil Boring Location
- 0.05 Fluoride Concentration (mg/L)
- Fluoride Isoconcentration Contour (mg/L)

Note:
Groundwater samples from the monitoring wells were collected in December 2010 or April 2011.

100 50 0 100 Feet

1:1,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2011 AECOM Source Investigation Report

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FLUORIDE IN GROUNDWATER
LOWER SHALLOW AQUIFER

WESTINGHOUSE ELECTRIC CORPORATION
COLUMBIA, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60158741	RJS	JUNE 2011	FIGURE 5

Legend

- Shallow Aquifer Monitoring Well Location
- Deep Aquifer Monitoring Well Location
- Surface Water Sample Location
- Soil Boring Location
- 0.13 Nitrate Concentration (mg/L)
- Nitrate Isoconcentration Countuor (mg/L)

Note:
Groundwater samples from the monitoring wells were collected in December 2010 or April 2011.

100 50 0 100 Feet

1:1,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2011 AECOM Source Investigation Report

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NITRATE IN GROUNDWATER
UPPER SHALLOW AQUIFER

WESTINGHOUSE ELECTRIC CORPORATION
COLUMBIA, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60158741	RJS	JUNE 2011	FIGURE 6

Legend

- Shallow Aquifer Monitoring Well Location
- Deep Aquifer Monitoring Well Location
- Surface Water Sample Location
- Soil Boring Location
- 0.13 Nitrate Contentration (mg/L)
- Nitrate Isoconcentration Contour (mg/L)

Note:
Groundwater samples from the monitoring wells were collected in December 2010 or April 2011.

100 50 0 100
Feet
1:1,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2011 AECOM Source Investigation Report

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NITRATE IN GROUNDWATER
LOWER SHALLOW AQUIFER

WESTINGHOUSE ELECTRIC CORPORATION
COLUMBIA, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60158741	RJS	JUNE 2011	FIGURE 7

2014 AECOM Preliminary Baseline Risk Assessment

As discussed in below, DHEC requested submittal of a Baseline Risk Assessment (BRA) in addition to the Remedial Investigation (RI) Report in 2013. A Preliminary Baseline Risk Assessment (PBRA) was performed in 2013 and AECOM submitted the *Preliminary Baseline Risk Assessment* in February 2014 (AECOM, 2014). The PBRA presented the initial steps of the human health risk assessment (HHRA) and the ecological risk assessment (ERA) and was intended to decide if additional steps in the BRA process were needed to complete the BRA.

For the HHRA, cis-1,2-DCE, PCE, TCE, and gross alpha were conservatively retained at chemicals of potential concern (COPCs) in groundwater. The screening level exceeded for each VOC was its EPA Regional Screening Level for Tap Water, which was derived to be protective of regular long-term use of water for drinking and bathing. Gross alpha exceeded its MCL, which is protective of similar uses. Because site groundwater is not used for these purposes under current conditions and is unlikely to be used for such purposes in the future, this screening was very conservative. PCE was identified as a vapor intrusion COPC in groundwater for the current commercial/industrial exposure scenario.

The Ecological risk summary of the PBRA concluded that there were no preliminary chemicals of potential ecological concern (COPECs) in surface water or sediment that warranted retention as COPECs at the site.

2015 AECOM Remedial Investigation Report

On March 13, 2013, DHEC issued a letter indicating that reports from 2010 through 2011 had been reviewed. The letter indicated that future assessments and remedial actions would be evaluated in accordance with the EPA *Guidance for Conducting RIs and Feasibility Studies under CERCLA* (EPA, 1988). The letter acknowledged that the fluoride, nitrate, and VOC plumes had been delineated and that fluoride and nitrate sources had been identified. The letter further indicated that Gross Beta and Gross Alpha trends and sources were not identified; VOC concentrations had been increasing since the AS/SVE system had been turned off for two years, and that “most of the referenced reports submitted to date consist primarily of data without maps or interpretation”. Therefore, DHEC requested submittal of a comprehensive RI Report for the CFFF site consistent with EPA guidance. A BRA was also requested.

During subsequent discussions between CFFF and DHEC, it was decided that the RI work would consist primarily of summarizing investigation data from 1980 to 2011 along with limited new work. The new work completed in 2013 consisted of collection of 10 sediment samples (SED-1 through SED-10) for analysis of VOCs, nitrate, fluoride, gross alpha, and gross beta at locations coinciding with previous surface water samples (SW-1 through SW-10), a comprehensive round of water level measurements in site monitoring wells and surveying the site monitoring wells.

The historical investigation results and new results were presented in the *Remedial Investigation Report* (AECOM, 2015). The majority of the RI report was a summary of investigation results performed through 2012. Numerous tables and figures from the previous investigations described above were included in the 2015 RI Report. DHEC and the CFFF agreed that data tables and isoconcentration maps for COPCs would include data from 2004 to present.

The sediment sampling results from July 2013 indicated that PCE was detected in one sediment sample (SED-7) in the tributary downstream. No other CVOCs were detected in sediment samples. Sediment sample SED-7 was located near the previously documented PCE groundwater plume. Gross alpha was detected in one sediment sample (SED-5) at a concentration of 377 picocuries per gram (pCi/g). Gross alpha in the remaining sediment samples ranged from non-detect to 23.40 pCi/g. Gross beta was detected in sediment sample SED-10 at a concentration of 295 pCi/g, with the remaining gross beta concentrations ranging from 15.7 pCi/g to 52.1 pCi/g.

PCE was detected in surface water samples SW-7, SW-8, and SW-10 in 2008 at concentrations ranging from 1.6 micrograms per liter (µg/L) to 9.2 µg/L. One surface water sample (SW-8) from the stormwater ditch near the confluence with Upper Sunset Lake exceeded the MCL for PCE. A resample of SW-8 in 2009 confirmed the exceedance of the MCL at a concentration of 14 µg/L. it was suspected that the PCE detected at location SW-8 was the result of PCE impacted groundwater discharging to the ditch.

Pertinent excerpts from this report are included below.

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

400 200 0 400 Feet

1:4,800

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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SITE MAP

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 1-3

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Comprehensive Sample and Site Map from Surveyed Data 08-2013.mxd

Source: 2015 AECOM Remedial Investigation Report

AECOM

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WATER TABLE SURFACE MAP
JUNE 6, 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 3-7

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Water Table Surface 06-2013.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 116.35 Black Mingo Aquifer Water Level Elevation (Ft msl) on June 6, 2013
- Potentiometric Contours of the Black Mingo Aquifer
- Inferred Groundwater Flow Direction

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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POTENTIOMETRIC SURFACE MAP
BLACK MINGO AQUIFER
JUNE 6, 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 3-8

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Deep Water Table Surface 06-2013.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 1.78 Flouride Concentration (mg/L)
- Fluoride Isoconcentration Contour (mg/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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FLUORIDE IN GROUNDWATER
DECEMBER 2004

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-5

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Fluoride in Groundwater 12-2004.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 1.2 Flouride Concentration (mg/L)
- Flouride Isoconcentration Contour (mg/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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FLOURIDE IN GROUNDWATER
AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-6

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Flouride in Groundwater 12-2008.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 1.96 Fluoride Concentration (mg/L)
- Fluoride Isoconcentration Contour (mg/L)

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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FLUORIDE IN GROUNDWATER
OCTOBER 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-9

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Fluoride in Groundwater 10-2013.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 27.70 Nitrate Concentration (mg/L)
- Nitrate Isoconcentration Contour (mg/L)

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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NITRATE IN GROUNDWATER
DECEMBER 2004

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-10

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Nitrate in Groundwater 12-2004.mxd

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water Sampling Locations
- Ditch
- 3.6 Nitrate Concentration (mg/L)
- Nitrate Isoconcentration Contour (mg/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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NITRATE IN GROUNDWATER AND SURFACE WATER DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-11

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Nitrate in Groundwater 12-2008.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 3.5 Nitrate Concentration (mg/L)
- Nitrate in Groundwater Contour (mg/L)

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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NITRATE IN GROUNDWATER
OCTOBER 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-14

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Nitrate in Groundwater 10-2013.mxd

N

Legend

	Shallow Aquifer Monitoring Well Location
	Black Mingo Aquifer Monitoring Well Location
	Surface Water/Sediment Sampling Locations
	Ditch
2.0	Gross Alpha Concentration (pCi/L)
	Gross Alpha Isoconcentration Contour (pCi/L)
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300
Feet
1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM
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GROSS ALPHA IN GROUNDWATER
DECEMBER 2004

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-15

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Alpha in Groundwater 12-2004.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch

0.6	Gross Alpha Concentration (pCi/L)
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300
Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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GROSS ALPHA IN GROUNDWATER
AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-16

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Alpha in Groundwater 12-2008.mxd

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 0.16 Gross Alpha Concentration (pCi/L)
- Gross Alpha Isoconcentration (pCi/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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GROSS ALPHA IN GROUNDWATER
OCTOBER 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-17

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Alpha in Groundwater 10-2013.mxd

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 4.0 Gross Beta Concentration (pCi/L)
- Gross Beta Isoconcentration Contour (pCi/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM
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GROSS BETA IN GROUNDWATER
DECEMBER 2004

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-18

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Beta in Groundwater 12-2004.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 1.6 Gross Beta Concentration (pCi/L)
- Gross Beta Isoconcentration Contour (pCi/L)

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:
Concentrations are adjusted for pottasium-40.

300 150 0 300
Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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ADJUSTED GROSS BETA IN GROUNDWATER AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-19

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Beta in Groundwater 12-2008.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch
- 2.93 Gross Beta Concentration (pCi/L)
- Gross Beta Isoconcentration Contour (pCi/L)
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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GROSS BETA IN GROUNDWATER
OCTOBER 2013

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-20

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Gross Beta in Groundwater 10-2013.mxd

N

Legend

	Shallow Aquifer Monitoring Well Location
	Black Mingo Aquifer Monitoring Well Location
	Surface Water/Sediment Sampling Locations
	Ditch
1.6	PCE Concentration (µg/L)
	PCE Isoconcentration Contour (µg/L)
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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PCE IN GROUNDWATER AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-25

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\PCE in Groundwater 12-2008.mxd

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM

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TCE IN GROUNDWATER AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-26

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\TCE in Groundwater 12-2008.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch

2.0	1,2-DCE Concentration (µg/L)
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

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1,2-DCE IN GROUNDWATER AND SURFACE WATER
DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-27

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\DCE in Groundwater 12-2008.mxd

N

Legend

- Shallow Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Surface Water/Sediment Sampling Locations
- Ditch

<2.0	Vinyl Chloride Concentration (µg/L)
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2015 AECOM Remedial Investigation Report

AECOM
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VINYL CHLORIDE IN GROUNDWATER AND SURFACE WATER DECEMBER 2008

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60302740	RJS	December 2013	FIGURE 4-28

Path: L:\Group\earth\ATLANTA Cadd Files\101948 Westinghouse\GIS\Maps\Vinyl Chloride in Groundwater 12-2008.mxd

Table 4-6
Summary of Analytical Results in Surface Water
Westinghouse Columbia Fuel Fabrication Facility
Hopkins, South Carolina
AECOM Project No. 60302740

Well	Sample Date	Tetrachloro-ethene ug/L	Trichloro-ethene Ug/L	cis-1,2-dichloro-ethene Ug/L	Vinyl Chloride Ug/L	Fluoride mg/L	NH3(N) mg/L	NO3 mg/L	Gross Alpha pCi/L	Gross Beta pCi/L	Potassium mg/L	Potassium 40 mg/L	Adjusted Gross Beta pCi/L
		MCL=5	MCL=5	MCL=70	MCL=2	MCL=4		MCL=10	MCL=15	MCL=50*			MCL=50*
SW-1	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	<5.0	<5.0	<5.0	<10.0	**0.4**	**0.1**	<0.02	NA	NA	NA	NA	NA
	Dec-08	<1.0	<1.0	<1.0	<2.0	**12.1**	<1.00	<0.10	**2.28**	**3.77**	<5.0	NA	NA
SW-2	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	**100.0**	**8.0**	<5.0	<10.0	**0.7**	**0.1**	**1.9**	NA	NA	NA	NA	NA
	Dec-08	<1.0	<1.0	<1.0	<2.0	**2.5**	<1.00	**0.2**	**1.04**	**1.90**	<5.0	NA	NA
	Jul-13	NA	NA	NA	NA	<0.5	<1.00		**3.38**	<2.02	NA	NA	NA
SW-3	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	<5.0	<5.0	<5.0	<10.0	**0.2**	**0.4**	**0.2**	NA	NA	NA	NA	NA
	Dec-08	<1.0	<1.0	<1.0	<2.0	**1.4**	<1.00	**0.1**	**1.12**	**5.76**	<5.0	NA	NA
SW-4	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	**120.0**	**8.0**	<5.0	<10.0	**1.1**	14.0	**8.0**	NA	NA	NA	NA	NA
	Dec-08	<1.0	<1.0	<1.0	<2.0	**2.6**	<1.00	**5.3**	**164.00**	**26.50**	<5.0	NA	NA
SW-5	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	**24.0**	<5.0	<5.0	<10.0	**0.8**	**14.0**	**8.0**	NA	NA	NA	NA	NA
	Dec-08	<1.0	<1.0	<1.0	<2.0	**0.8**	<1.00	**3.1**	**192.00**	**38.40**	<5.0	NA	NA
SW-6	**Feb-94**	<5.0	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Apr-95	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	Dec-08	<1.0	<1.0	<1.0	<2.0	**0.5**	<1.00	**0.1**	**1.60**	**0.00**	<5.0	NA	NA
SW-7	**Apr-95**	**130.0**	**20.0**	<5.0	<10	**0.8**	**1.7**	**5.9**	NA	NA	NA	NA	NA
	Dec-08	**3.8**	<1.0	<1.0	<2.0	**4.7**	**5.7**	**3.6**	**2.78**	**4.88**	<5.0	NA	NA

Source: 2015 AECOM Remedial Investigation Report

Table 4-6
Summary of Analytical Results in Surface Water
Westinghouse Columbia Fuel Fabrication Facility
Hopkins, South Carolina
AECOM Project No. 60302740

Well	Sample Date	Tetrachloro-ethene ug/L	Trichloro-ethene Ug/L	cis-1,2-dichloro-ethene Ug/L	Vinyl Chloride Ug/L	Fluoride mg/L	NH3(N) mg/L	NO3 mg/L	Gross Alpha pCi/L	Gross Beta pCi/L	Potassium mg/L	Potassium 40 mg/L	Adjusted Gross Beta pCi/L
		MCL=5	MCL=5	MCL=70	MCL=2	MCL=4		MCL=10	MCL=15	MCL=50*			MCL=50*
SW-8	**Apr-95**	**120.0**	**27.0**	<5.0	<10	**0.6**	**0.8**	**8.8**	NA	NA	NA	NA	NA
	Dec-08	**9.2**	<1.0	<1.0	<2.0	**4.4**	<1.00	**1.3**	NA	NA	NA	NA	NA
	Mar-09	**14.0**	<2.0	NA	<2.0	NA	NA	NA	**2.24**	**3.97**	NA	NA	NA
SW-9	**Dec-08**	<1.0	<1.0	<1.0	<2.0	**12.1**	<1.00	<0.10	**1.84**	**4.02**	<5.0	NA	NA
SW-10	**Dec-08**	**1.6**	<1.0	<1.0	<2.0	**10.3**	**8.8**	**19.4**	**1.47**	**50.00**	**7.10**	**5.82**	**44.18**
Pond	**Jul-13**	NA	NA	NA	NA	**7.3**	**2.7**		<1.07	4.99	NA	NA	NA
Causeway	**Jul-13**	NA	NA	NA	NA	<0.5	<1.00		<1.50	<4.24	NA	NA	NA
Spillway	**Jul-13**	NA	NA	NA	NA	<0.5	**2.2**		<1.07	4.99	NA	NA	NA

Notes:

mg/L: Milligrams per liter
pCi/L: Picocuries per liter
MCL: Maximum contaminant level
Bold: The analyte was detected by the laboratory
Bold and Shaded: The analyte concetration exceeded the EPA MCL
NA: Not available
NS: Not sampled

Source: 2015 AECOM Remedial Investigation Report

Table 4-7
Summary of Analytical Results in Sediment
Westinghouse Columbia Fuel Fabrication Facility
Hopkins, South Carolina
AECOM Project No. 60302740

Sample	Sample Date	Acetone ug/kg	2-Butanone (MEK) ug/kg	1,2-Dichloro-benzene ug/kg	Methyl Acetate ug/kg	Tetrachloro-ethene ug/kg	Toluene ug/kg	Fluoride mg/kg	Nitrate mg/kg	Gross Alpha pCi/g	Gross Beta pCi/g
SED-1	**07/18/13**	**240.0**	48.0	<12.0	<12.0	<12.0	<12.0	**4.3**	<0.39	**12.10**	**25.90**
SED-2	**07/18/13**	**34.0**	<9.4	<4.7	<4.7	<4.7	<4.7	**12.0**	<0.24	**23.40**	**25.40**
SED-3	**07/18/13**	**59.0**	**13.0**	<6.3	<6.3	<6.3	<6.3	**2.1**	<0.27	**13.20**	**23.50**
SED-4	**07/18/13**	<22.0	<11.0	<5.4	<5.4	<5.4	<5.4	**66.0**	**0.30**	**13.80**	**30.40**
SED-5	**07/18/13**	**400.0**	**41.0**	**13.0**	<7.5	<7.5	<7.5	**18.0**	<0.31	**377.00**	**52.10**
SED-6	**07/18/13**	<19.0	<9.4	<4.7	<4.7	<4.7	<4.7	**2.2**	**0.33**	**3.79**	**15.70**
SED-7	**07/18/13**	<20.0	<10.0	<5.0	<5.0	**30.0**	<5.0	**1.7**	**8.40**	**9.05**	**25.20**
SED-8	**07/18/13**	<21.0	<10.0	<5.1	<5.1	<5.1	<5.1	<1.3	**0.46**	<3.03	**21.80**
SED-9	**07/18/13**	**170.0**	**36.0**	<6.9	**21.0**	<6.9	**11.0**	**7.0**	<0.29	**10.30**	**20.70**
SED-10	**07/18/13**	**570.0**	**110.0**	<34.0	<34.0	<34.0	<34.0	**220.0**	**0.97**	**7.55**	**295.00**

Notes:
- mg/kg: Milligrams per kilogram
- ug/kg: Micrograms per kilogram
- pCi/g: Picocuries per gram
- Bold: The analyte was detected by the laboratory

Source: 2015 AECOM Remedial Investigation Report

2017 AECOM CVOC Field Screening Report

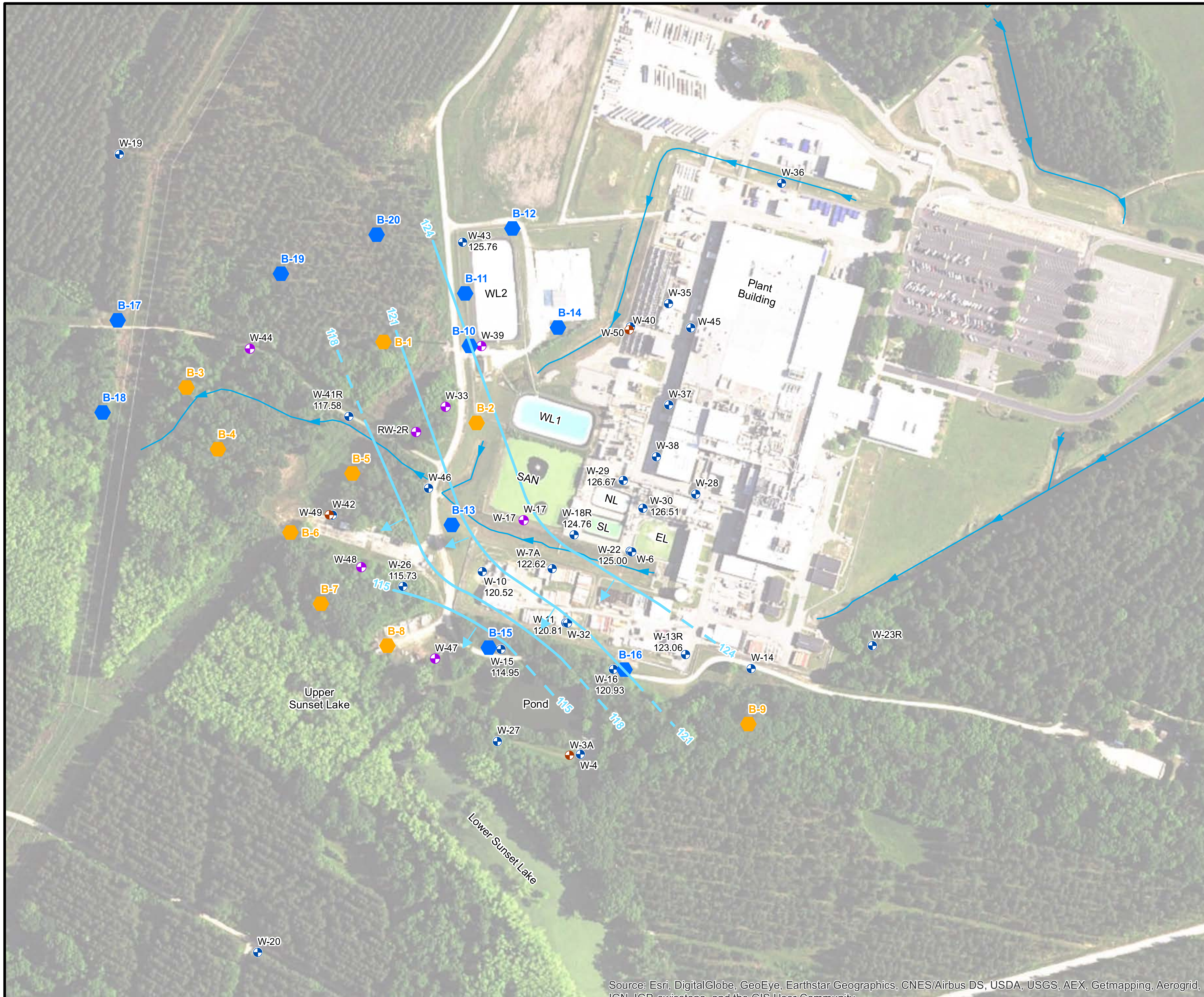
On September 15, 2015, following review of the 2015 RI Report, DHEC issued a letter indicating that regulatory oversight of the CVOC impact to groundwater would be managed by the State Remediation Section of the Bureau of Land and Waste Management (BLWM) and that groundwater monitoring and reporting for the WWTP area would be managed by the Bureau of Water. In the letter, DHEC requested that a work plan be submitted to install three new monitoring wells in specific areas of the CVOC impact. The letter also requested that a second work plan for long-term groundwater monitoring be submitted after the new wells were installed and sampled. In a follow-up letter dated September 30, 2015, the DHEC BLWM recommended that groundwater investigation by field screening be performed prior to installing new monitoring wells to allow for more appropriate well locations and screening intervals.

After the September 30, 2015 letter, DHEC indicated to CFFF that sites managed under the BLWM at DHEC were going to be required to enter a Voluntary Cleanup Contract (VCC). Therefore, CFFF and DHEC began the process of developing a VCC for the CVOC impact in late 2015. CFFF entered into VCC-16-4948-RP with DHEC on August 23, 2016. The *Additional Groundwater Investigation for CVOCs Work Plan* was submitted on October 4, 2016 to conduct additional groundwater screening (AECOM, 2016).

In December 2016, AECOM installed nine sonic groundwater screening borings at the site. Groundwater from these borings were screened using the AQR Color-Tec® system, and samples from multiple depth intervals from each boring were submitted to an South Carolina certified laboratory for confirmatory analyses for VOCs. The *Work Plan Addendum, Additional Groundwater Investigation for CVOCs* (AECOM, 2017) was submitted to DHEC in April 2017 for additional borings that were screened using a low-level membrane interface probe (LLMIP) and hydraulic profiling tool (HPT). Eleven LLMIP borings were drilled in October 2017. Based on the results of the LLMIP screening, confirmatory groundwater samples were collected from one to two intervals at six LLMIP boring locations using a DPT drill rig.

In accordance with its National Pollution Discharge Elimination System permit and Special Nuclear Material SNM-1107 license, CFFF collected groundwater samples from 20 monitoring wells in October 2017. The results of the field screening and groundwater sampling were included in the *CVOC Field Screening Report* (AECOM, 2017).

The report concluded that there were two CVOC plumes at the site, recommended the installation of 10 new monitoring wells and proposed a long-term groundwater monitoring plan. Pertinent excerpts from this report are included below.



N

Legend

- DPT Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- Potentiometric Line Contour Interval = 3ft
- Direction of Groundwater Flow

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
124.76	Groundwater Elevation

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2017 AECOM CVOC Field Screening Report

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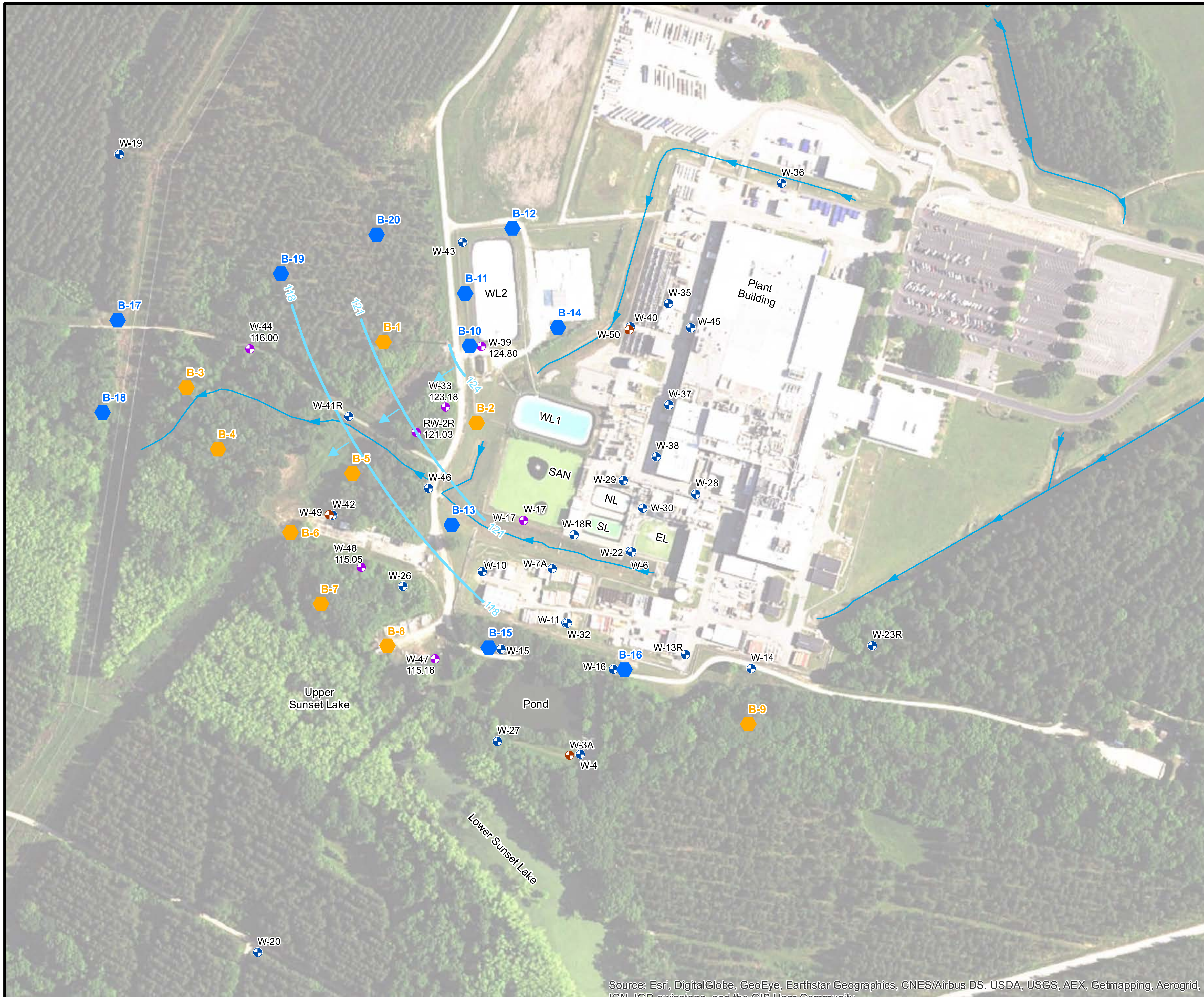
Potentiometric Surface Map - Shallow Water Table

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 3

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\GroundwaterElevation_Shallow.mxd



Legend

- DPT Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- Potentiometric Line Contour Interval = 3ft
- Direction of Groundwater Flow

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
115.05	Groundwater Elevation

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2017 AECOM CVOC Field Screening Report

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Potentiometric Surface Map - Intermediate Water Table

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 4

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\GroundwaterElevation_Intermediate.mxd

N

Legend

- DPT Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
560	Tetrachloroethene (PCE) Concentration in ug/L*
39'	Groundwater Sample Collection Depth in Feet*

Source: 2017 AECOM CVOC Field Screening Report

300 150 0 300
Feet
1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

* Samples taken in December 2016 and October 2017

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PCE in Groundwater

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 5

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\PCE_InGroundwater_Dec2016AndOct2017.mxd

N

Legend

- DPT Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch

EL East Lagoon
NL North Lagoon
SL South Lagoon
SAN Sanitary Lagoon
WL1 West Lagoon 1
WL2 West Lagoon 2
77 Trichloroethene (TCE) Concentration in ug/L*
39' Groundwater Sample Collection Depth in Feet*

* Samples taken in December 2016 and October 2017

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2017 AECOM CVOC Field Screening Report

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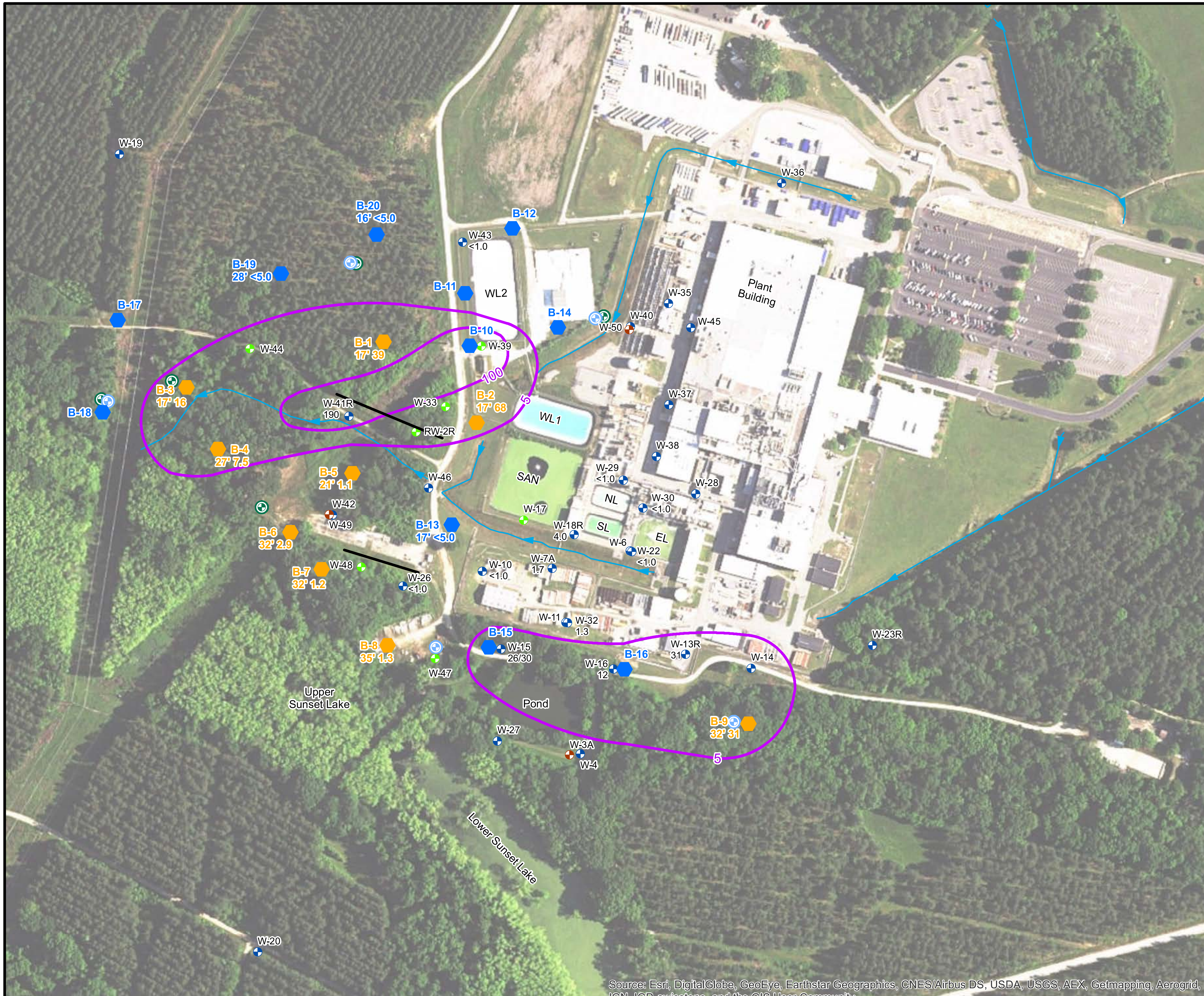
TCE in Groundwater

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 6

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\TCE_InGroundwater_Dec2016AndOct2017.mxd



N

Legend

- Proposed Shallow Monitoring Wells
- Proposed Intermediate Monitoring Wells
- Sonic Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- AS/SVE System Transect Lines
- PCE Plume

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
560	Tetrachloroethene (PCE) Concentration in ug/L*
39'	Groundwater Sample Collection Depth in Feet*

Source: 2017 AECOM CVOC Field Screening Report

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

* Samples taken in December 2016 and October 2017

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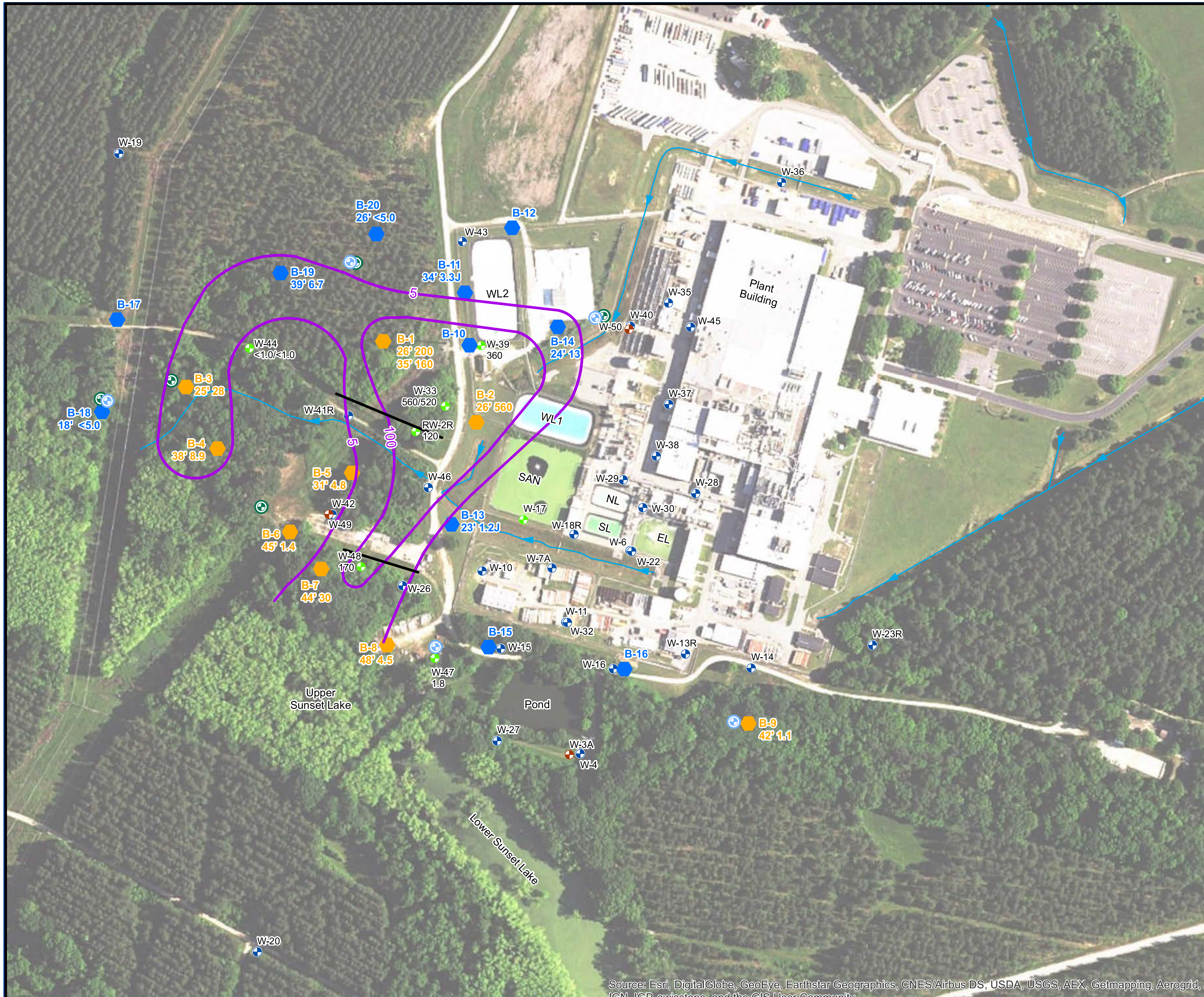
PCE Plume Map - Shallow Water Table

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 7

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\PCE_PlumeMap_ShallowWaterTable.mxd Date: 12/5/2017



Legend

- Proposed Shallow Monitoring Wells
- Proposed Intermediate Monitoring Wells
- Sonic Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- AS/SVE System Transect Lines
- PCE Plume
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2
- 560 Tetrachloroethene (PCE) Concentration in ug/L*
- 39' Groundwater Sample Collection Depth in Feet*

Source: 2017 AECOM CVOC Field Screening Report

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

* Samples taken in December 2016 and October 2017

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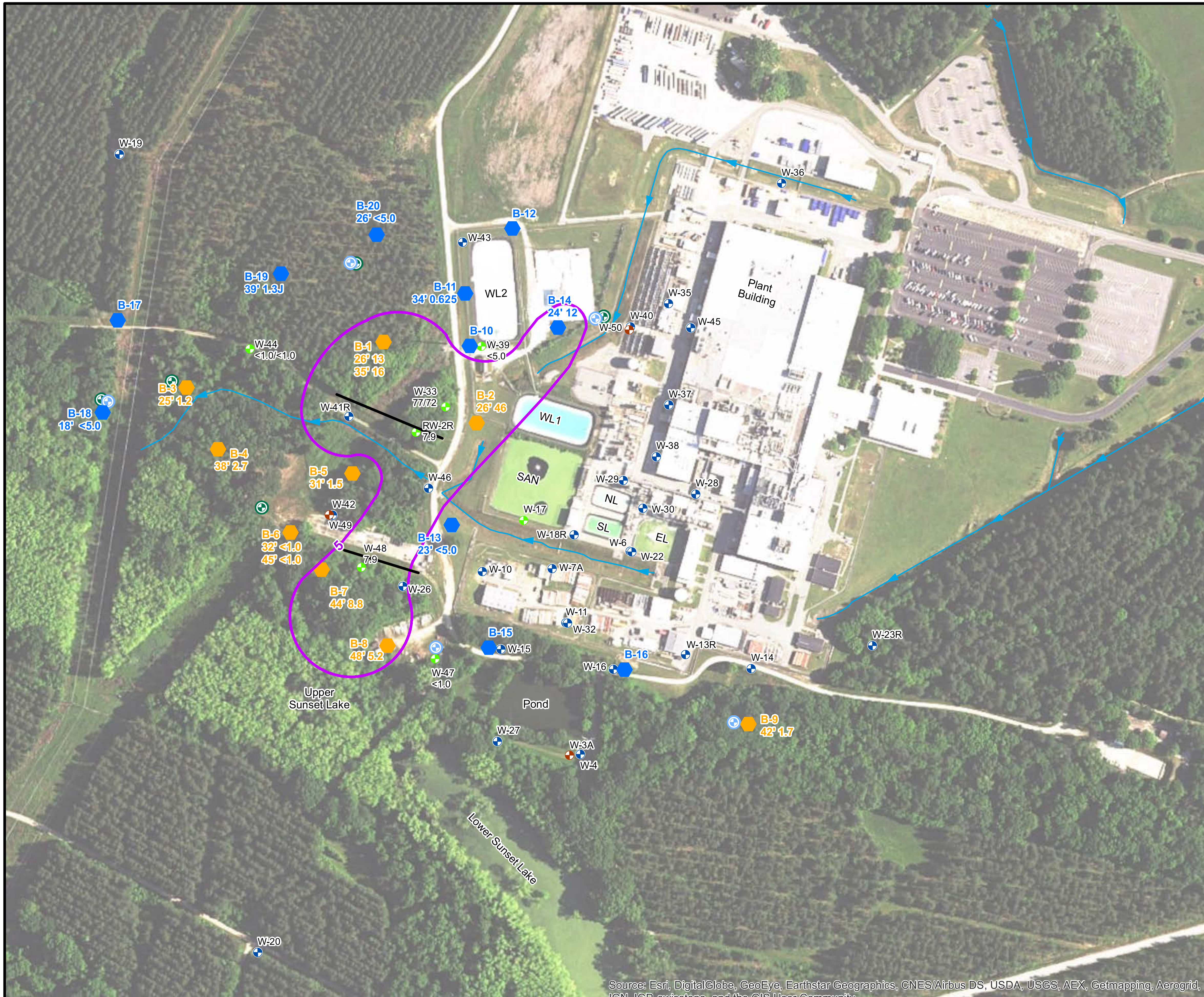
PCE Plume Map - Intermediate Water Table

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	**FIGURE 8**

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\PCE_PlumeMap_IntermediateWaterTable.mxd Date: 12/5/2017



Legend

- Proposed Shallow Monitoring Wells
- Proposed Intermediate Monitoring Wells
- Sonic Boring Locations
- LLMIP Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- AS/SVE System Transect Lines
- TCE Plume

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
77	Trichloroethene (TCE) Concentration in ug/L*
39'	Groundwater Sample Collection Depth in Feet*

* Samples taken in December 2016 and October 2017

300 150 0 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2017 AECOM CVOC Field Screening Report

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TCE Plume Map - Intermediate Water Table

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60528361	KPM	November 2017	FIGURE 9

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\TCE_PlumeMap_IntermediateWaterTable.mxd Date: 12/7/2017

Table 1
Westinghouse Columbia Fuel Fabrication Facility
Summary of Groundwater Elevation Data

Well Number	Date Measured	Screen Interval (ft bgs)	Top of Casing Elevation (ft NAVD-88)	Depth to Water (ft btoc)	Groundwater Elevation (ft NAVD-88)
W-7A	10/12/17	13.0-18.0	135.01	12.39	122.62
W-10	10/12/17	18.5-23.5	136.77	16.25	120.52
W-13R	10/12/17	15.5-18.5	135.89	12.83	123.06
W-15	10/13/17	13.5-18.5	127.85	12.90	114.95
W-16	10/13/17	15.5-18.5	124.87	3.94	120.93
W-18R	10/12/17	12.5-17.5	136.99	12.23	124.76
W-22	10/12/17	13.4-17.8	136.48	11.48	125.00
W-24	10/13/17	10.1-15.1	141.84	11.25	130.59
W-26	10/13/17	25.5-30.5	141.98	26.25	115.73
W-29	10/12/17	10.0-15.1	138.50	11.83	126.67
W-30	10/12/17	10.2-15.2	138.76	12.25	126.51
W-32	10/12/17	17.5-22.5	140.46	19.65	120.81
W-33	10/12/17	15.1-20.7	139.10	15.92	123.18
W-39	10/13/17	12.0-22.0	141.10	16.23	124.87
W-41R	10/12/17	14.0-24.0	133.66	16.08	117.58
W-43	10/13/17	10.5-20.5	141.22	15.46	125.76
W-44	10/12/17	16.0-26.0	134.53	18.53	116.00
W-47	10/13/17	34.3-44.8	141.81	26.95	114.86
W-48	10/13/17	30.7-41.3	142.36	27.31	115.05
RW-2R	10/12/17	19.0-29.2	139.69	18.66	121.03

Notes:
ft bgs = feet below ground surface
ft btoc = feet below top of casing
Elevations are in feet above mean sea level based on the North American Vertical Datum of 1988 (NAVD-88)
ND = not detected
NM = not measured
N/A = not applicable

Source: 2017 AECOM CVOC Field Screening Report

Table 2
Westinghouse Columbia Fuel Fabrication Facility
Summary of Detected Chlorinated Compounds

Boring/Well ID	Sample Date	Screening Depth (ft)	Color-Tec Results (ppm)		Laboratory Analysis Results (ug/L)							
			Tetrachlororethene (PCE)	Trichlorethene (TCE)	Tetrachlororethene (PCE)	Trichlorethene (TCE)	cis-1, 2-Dichloroethene	trans-1, 2-Dichloroethene	Vinyl Chloride	Chloroform	Bromodichloromethane (BCM)	Dibromochloromethane (DBCM)
B-1	12/13/2016	13-17	1	< 1	**39**	1.8	< 5	< 5	< 2	< 1	< 1	< 1
	12/13/2016	22-26	< 1	0.5	**200**	**13**	< 5	< 5	< 2	< 1	< 1	< 1
	12/13/2016	31-35	1.5	0.5	**160**	**16**	< 1	< 1	< 2	< 1	< 1	<1
B-2	12/13/2016	13-17	< 1	< 1	**68**	2.4	< 5	< 5	< 2	< 1	< 1	< 1
	12/13/2016	22-26	4	3	**560**	**46**	9.3	< 5	< 10	< 5	< 5	< 5
B-3	12/14/2016	13-17	< 1	< 1	**16**	1.3	< 1	< 1	< 2	1.2	< 1	< 1
	12/14/2016	21-25	< 1	< 1	**28**	1.2	< 1	< 1	< 2	< 1	< 1	< 1
B-4	12/15/2016	23-27	< 1	< 1	**7.5**	1.2	< 1	< 1	< 2	4	2.3	< 1
	12/15/2016	34-38	< 1	< 1	**8.9**	2.7	< 5	< 5	< 2	< 1	< 1	< 1
B-5	12/15/2016	17-21	< 1	< 1	1.1	< 1	< 1	< 1	< 2	4.2	2.8	< 1
	12/15/2016	27-31	< 1	< 1	4.8	1.5	< 1	< 1	< 2	1.3	< 1	< 1
B-6	12/14/2016	28-32	< 1	< 1	2.9	< 1	< 1	< 1	< 2	5.4	3.4	< 1
	12/14/2016	41-45	< 1	< 1	1.4	< 1	< 1	< 1	< 2	6.9	3.7	1.1
B-7	12/16/2016	28-32	< 1	< 1	1.2	< 1	< 1	< 1	< 2	5.2	2.6	< 1
	12/16/2016	40-44	< 1	< 1	**30**	**8.8**	45	< 1	< 2	5.2	1.2	< 1
B-8	12/16/2016	31-35	< 1	< 1	1.3	< 1	< 1	< 1	< 2	6.1	3	< 1
	12/16/2016	44-48	< 1	< 1	4.5	**5.2**	8	1.5	**2.3**	< 1	< 1	< 1
B-9	12/19/2016	28-32	< 1	< 1	**31**	**6.6**	1.7	< 1	< 2	1.6	< 1	< 1
	12/19/2016	38-42	< 1	< 1	1	1.7	< 5	< 5	< 2	1.3	< 1	< 1
B-11	10/12/2017	30-34	NA	NA	3.3 J	0.62 J	< 5	< 5	< 2	< 5	< 5	< 5
B-13	10/12/2017	13-17	NA	NA	< 5	< 5	< 5	< 5	< 2	< 5	< 5	< 5
	10/12/2017	19-23	NA	NA	1.2 J	< 5	< 5	< 5	< 2	< 5	< 5	< 5
B-14	10/12/2017	20-24	NA	NA	**13**	12	1.0 J	< 5	< 2	< 5	< 5	< 5
B-18	10/11/2017	14-18	NA	NA	< 5	< 5	< 5	< 5	< 2	< 5	< 5	< 5
B-19	10/11/2017	24-28	NA	NA	< 5	< 5	< 5	< 5	< 2	< 5	< 5	< 5
	10/11/2017	35-39	NA	NA	**6.7**	1.3 J	< 5	< 5	< 2	< 5	< 5	< 5
B-20	10/12/2017	12-16	NA	NA	<5	< 5	< 5	< 5	< 2	< 5	< 5	< 5
	10/12/2017	22-26	NA	NA	< 5	< 5	< 5	< 5	< 2	< 5	< 5	< 5
RW-2R	10/12/2017	19.2-29.2	NA	NA	**120**	**7.9**	< 1	< 1	< 1	< 1	< 1	< 1
W-7A	10/12/2017	13-18	NA	NA	1.7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-10	10/12/2017	18.5-23.5	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-13R	10/12/2017	15.5-18.5	NA	NA	**31**	2.5	1.1	< 1	< 1	< 1	< 1	< 1
W-15	10/13/2017	13.5-18.5	NA	NA	**26**	3.2	2.4	< 1	< 1	< 1	< 1	< 1
W-15 DUP	10/13/2017	13.5-18.5	NA	NA	**30**	3.6	2.6	< 1	< 1	< 1	< 1	< 1
W-16	10/13/2017	15.5-18.5	NA	NA	**12**	3	2.6	< 1	< 1	< 1	< 1	< 1
W-18	10/12/2017	12.5-17.5	NA	NA	4	< 1	< 1	< 1	< 1	2.6	< 1	< 1
W-22	10/12/2017	13.4-17.8	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-24	10/13/2017	10.1-15.1	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-26	10/13/2017	10.1-15.1	NA	NA	< 1	< 1	4.1	< 1	< 1	< 1	< 1	< 1
W-29	10/12/2017	10.1-15.1	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-30	10/12/2017	10.2-15.2	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-32	10/12/2017	17.5-22.5	NA	NA	1.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-33	10/12/2017	15.7-20.7	NA	NA	**560**	**77**	< 5	< 5	< 5	< 5	< 5	< 5
W-33 DUP	10/12/2017	15.7-20.7	NA	NA	**520**	**72**	< 5	< 5	< 5	< 5	< 5	< 5
W-39	10/13/2017	12-22	NA	NA	**360**	< 5	< 5	< 5	< 5	< 5	< 5	< 5
W-41R	10/12/2017	14-24	NA	NA	**190**	**13**	< 1	< 1	< 1	< 1	< 1	< 1
W-43	10/13/2017	10.5-20.5	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-44	10/12/2017	16.0-26.0	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-44 DUP	10/12/2017	16.0-26.0	NA	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-47	10/13/2017	34.8-44.8	NA	NA	1.8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
W-48	10/13/2017	31.3-41.3	NA	NA	**170**	**7.9**	3.3	< 1	< 1	< 1	< 1	< 1
MCL			N/A	N/A	5	5	70	100	2	N/A	N/A	N/A

Source: 2017 AECOM CVOC Field Screening Report

O:\60528361 Westinghouse 2017\500A-Deliverables\503 LLMIP Screening Report\Tables\SummaryofDetectedCompounds_Westinghouse_2016_2017.xlsx

2018 AECOM Contaminated Wastewater Line Assessment Report

In October 2008, a breach was discovered in the below ground, gravity drain Contaminated Wastewater (CWW) line at a joined connection point along the western side of the plant building. Samples of effluent water from the line and soils corresponding to the depth of the CWW line near the break were collected by CFFF personnel. These samples identified radionuclides in the process wastewater and subsurface soils. In 2011, CFFF personnel discovered breaches at two locations of the CWW line underneath the manufacturing building floor. Soil and wastewater samples were collected by CFFF near one of the breaches. These samples identified radionuclides in soil and process wastewater at the break. The second 2011 breach location could not be sampled due to plant infrastructure. The CWW piping beneath the floor was abandoned and replaced with new above ground PVC piping at this time.

Although CFFF had not detected evidence of releases from these incidents in existing monitoring wells or from its environmental monitoring program (including surface water and sediment), in 2018, Westinghouse voluntarily initiated assessment activities to further evaluate the effects of these releases on soil and/or groundwater. This investigation included the installation of nine DPT borings to collect vadose zone soil and groundwater samples in July 2018 at locations approximately 25 feet west of the former CWW line to collect vadose zone soil and groundwater samples. The 25-foot offset was necessitated by the presence of multiple underground utilities in the immediate area of the former CWW line that would not allow safe use of mechanical equipment. The DPT groundwater samples were turbid, causing anomalously high U concentrations to be detected. Therefore, temporary wells (TMW-1 through TMW-9) that could be developed to obtain non-turbid groundwater samples were installed adjacent to the DPT boring locations in September 2018. Nine hand auger soil borings were installed adjacent to the CWW line.

The Uranium (U) concentrations in groundwater samples from the temporary wells were significantly lower from the temporary wells than samples from DPT borings. U exceeded its MCL in two temporary monitoring wells (TMW-5 and TMW-6, currently monitoring wells W-55 and W-56). U in groundwater was concluded to be present in the upper 5-6 feet of the surficial aquifer groundwater because nearby monitoring well W-37 which is screened deeper in the upper zone of the surficial aquifer was not impacted with U above the MCL.

CVOCs PCE and cis-1,2-DCE were detected in groundwater at concentrations below MCLs in two temporary wells (TMW-2 and TMW-3, currently monitoring wells W-52 and W-53, respectively). VC was detected in groundwater from temporary well TMW-3 (W-53) at a concentration exceeding the MCL for VC. Nitrate was detected in two temporary wells (TMW-8 and TMW-9, currently monitoring wells W-58 and W-59) at concentrations exceeding its MCL. Nitrate concentrations in groundwater were believed to be related to operations of the nearby WWTP. Fluoride and Tc-99 were also detected in the nine temporary wells at concentrations below their respective MCLs. Westinghouse retained these temporary wells to serve as building monitoring system wells within the overall groundwater monitoring well network. The temporary wells were renamed as permanent wells W-51 through W-59.

Vadose zone soil analytical results indicated that U above the free releasable limit (11 PPM U) was present in soils at two locations adjacent to the CWW line at concentrations of 12.57 PPM and 15.03 PPM. The U source appeared to be related to one of the CWW line breaches.

The report recommended additional groundwater assessment to further define the horizontal extent of the U identified in the immediate area of the CWW Line and development of a Conceptual Site Model to identify potential exposure pathways.

The results of the investigation were presented in the *Contaminated Wastewater Line Assessment Report* (AECOM, 2018a). Pertinent excerpts from this report are included below.

Table 1
Westinghouse Columbia Fuel Fabrication Facility
Contaminated Wastewater Line Assessment
Soil Uranium Analytical Results

Boring	Sample Date	Sample Collection Method	Boring Depth (feet)	Sample Interval (Feet)	U233/34 (pCi/g)	U235/36 (pCi/g)	U238 (pCi/g)	Total U (pCi/g)	U (ppm)	U234 (µg/g)	U235 (µg/g)	U238 (µg/g)	Total U (µg/g)
					Isotopic Uranium (Alpha Spec)					Isotopic Uranium (ICPMS)			
Boring #1	7/17/2018	DPT	8	7-8	0.985	0.247	0.84	2.072	0.74	NA	NA	NA	NA
Boring #2	7/17/2018	DPT	8	7-8	0.629	0.126	0.527	1.282	0.46	NA	NA	NA	NA
Boring #3	7/17/2018	DPT	8	7-8	0.701	0.115	0.735	1.551	0.55	NA	NA	NA	NA
Boring #4	7/17/2018	DPT	8	7-8	0.661	0.142	0.706	1.509	0.54	NA	NA	NA	NA
Boring #5	7/18/2018	DPT	8	7-8	0.845	0.0356U	0.635	1.5156	0.54	NA	NA	NA	NA
Boring #6	7/18/2018	DPT	8	7-8	0.871	0.0905	0.951	1.9125	0.68	NA	NA	NA	NA
Boring #7	7/18/2018	DPT	8	7-8	0.754	0.0553U	0.805	1.6143	0.58	NA	NA	NA	NA
Boring #8	7/18/2018	DPT	8	7-8	0.638	0.191	0.85	1.679	0.60	NA	NA	NA	NA
Boring #9	7/18/2018	DPT	5	4-5	2.15	0.176	2.05	4.376	1.56	NA	NA	NA	NA
CWW-HA-B11	9/26/2018	Hand Auger	8	7-8	0.297	0.0767U	0.374	0.7477	0.27	<0.00207	0.00424J	0.596	0.612
CWW-HA-B12	9/26/2018	Hand Auger	3.7	3.5-3.7	0.671	-0.0142U	0.826	1.4828	0.53	<0.00216	0.00768J	0.946	0.927
CWW-HA-B13	9/26/2018	Hand Auger	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CWW-HA-B14	9/26/2018	Hand Auger	8	7-8	0.966	0.0522U	0.677	1.6952	0.61	<0.00224	0.00467J	0.68	0.681
CWW-HA-B15	9/27/2018	Hand Auger	2	1-2	1.79	0.108U	0.897	2.795	1.00	<0.00238	0.0326	2.66	2.7
CWW-HA-B16	9/27/2018	Hand Auger	8	7-8	4.4	0.203U	1.34	5.943	2.12	<0.00216	0.0519	2.15	2.17
CWW-HA-B17	9/27/2018	Hand Auger	8	7-8	8.92	0.413	3.05	12.383	4.42	<0.00208	0.164	7.95	7.96
CWW-HA-B18	9/27/2018	Hand Auger	8	7-8	28.2	1.32	5.68	**35.2**	**12.57**	0.014	1.71	54.5	53.5
CWW-HA-B19	9/27/2018	Hand Auger	8	7-8	32.4	1.77	7.92	**42.09**	**15.03**	0.00355J	0.473	15.3	15.1

Notes:
U - Uranium
pCi/g - picocuries per gram
ppm - parts per million
µg/g - micrograms per gram
ICPMS - inductively coupled plasma mass spectometry
DPT - Direct Push Technology
U (analytical data notation) - Analyte was analyzed for, but was not detected above the method detection limit, minimum detectable activity, minimum detectable concentration or limit of detection
J - value is estimated
NS - not sampled
BOLD values exceed the uranium "free releasable" limit of 30 pCi/g or 11 ppm U.

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

Table 2
Westinghouse Columbia Fuel Fabrication Facility
Contaminated Wastewater Line Assessment
Groundwater Uranium Analytical Results

Boring	Sample Date	Sample Collection Method	Boring Depth (feet bls)	Screened Interval (feet bls)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	U233/34 (pCi/L)	U235/36 (pCi/L)	U238 (pCi/L)	Total U (pCi/L)	U234 (µg/L)	U235 (µg/L)	U238 (µg/L)	U (µg/L)	U233/34 (pCi/L)	U235/36 (pCi/L)	U238 (pCi/L)	Total U (pCi/L)	U234 (µg/L)	U235 (µg/L)	U238 (µg/L)	U (µg/L)
							Unfiltered Isotopic Uranium (Alpha Spec)				Unfiltered Isotopic Uranium (ICPMS)				Field filtered Isotopic Uranium (Alpha Spec)				Field filtered Isotopic Uranium (ICPMS)			
Boring #1	7/17/2018	DPT	15	11-15	1,100	831	41.1	2.47	50.8	94.37	<0.010	0.233	32.2	**32.44**	NA	NA	NA	NA	NA	NA	NA	NA
Boring #2	7/17/2018	DPT	15	11-15	373	699	13.6	0.717U	12.4	26.72	<0.010	0.0632	7.51	7.58	NA	NA	NA	NA	NA	NA	NA	NA
Boring #3	7/17/2018	DPT	15	11-15	314	414	9.05	0.00968U	14.5	23.56	<0.010	0.0471	6.14	6.20	NA	NA	NA	NA	NA	NA	NA	NA
Boring #4	7/17/2018	DPT	15	11-15	388	470	47.1	3.82	26	76.92	<0.010	0.398	32.7	**33.11**	NA	NA	NA	NA	NA	NA	NA	NA
Boring #5	7/18/2018	DPT	15	11-15	48,400	17,800	40,700	2,180	9,390	52,270	6.69	735	22400	**23,141.69**	NA	NA	NA	NA	NA	NA	NA	NA
Boring #6	7/18/2018	DPT	15	11-15	16,400	5,755	14,000	782	2,950	17,732	2.3	260	7970	**8,232.30**	NA	NA	NA	NA	NA	NA	NA	NA
Boring #7	7/18/2018	DPT	15	11-15	252	262	23.7	2.27	13	38.97	<0.010	0.281	17.2	17.49	NA	NA	NA	NA	NA	NA	NA	NA
Boring #8	7/18/2018	DPT	15	11-15	2,845	1,635	1,230	63.2	297	1,590	0.135	16.1	523	**539.24**	NA	NA	NA	NA	NA	NA	NA	NA
Boring #9	7/18/2018	DPT	15	11-15	4,795	2,020	2,670	145	603	3,418	0.349	43	1410	**1,453.35**	NA	NA	NA	NA	NA	NA	NA	NA
W-37	8/5/2018	PMW	20.5	15.5-20.5	4.75	5.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
W-38	8/5/2018	PMW	21	15-20	2.03U	4.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
W-45	8/5/2018	PMW	16	6-16	18.9	8.02	12.8	0.404	3.35	16.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CWW-TMW-01	9/25/2018	TMW	15	10-15	0.529U	2.98U	0.274U	0.058U	0.182U	0.51	<0.010	<0.010	0.0752J	0.08	0.258U	0.0612U	0.196U	0.32	<0.010	<0.010	<0.067	<0.087
CWW-TMW-02	9/24/2018	TMW	15	10-15	0.896U	0.854U	0.188U	0.188	0.172U	0.55	<0.010	<0.010	<0.067	<0.087	0.115U	0.142U	0.164U	0.26	<0.010	<0.010	<0.067	<0.087
CWW-TMW-03	9/24/2018	TMW	15	10-15	0.871U	3.85	0.185U	0.0365U	0.0218U	0.24	<0.010	<0.010	<0.067	<0.087	0.115U	0.157U	0.0835U	0.27	<0.010	<0.010	<0.067	<0.087
CWW-TMW-04	9/24/2018	TMW	15	10-15	-0.489U	1.55U	0.139U	0.171U	0.196U	0.51	<0.010	<0.010	0.0761J	0.08	0.395	0.287	0.242U	0.68	<0.010	<0.010	0.0767J	0.08
CWW-TMW-05	9/24/2018	TMW	15	10-15	283	32.5	230	14.3	53	297.30	0.0426J	4.53	138	**142.57**	202	13.4	43	215.40	0.0355J	4.39	133	**137.43**
CWW-TMW-06	9/25/2018	TMW	15	10-15	346	42	271	16.2	63.2	350.40	0.0426J	4.83	152	**156.87**	254	15.2	57	269.20	0.0374J	4.67	147	**151.71**
CWW-TMW-07	9/25/2018	TMW	15	10-15	11.5	0.498U	5.18	0.196U	1.22	6.60	<0.010	0.117	3.8	3.92	7.58	0.329	1.16	7.91	<0.010	0.115	3.48	3.61
CWW-TMW-08	9/25/2018	TMW	15	10-15	5.39	4.05	1.12	0.348	0.572	2.04	<0.010	0.0234J	0.8	0.82	1.2	0.0854U	0.317	1.29	<0.010	0.0228J	0.812	0.85
CWW-TMW-09	9/25/2018	TMW	15	10-15	25.5	7.42	18.5	1.36	4.66	24.52	<0.010	0.346	11.3	11.65	20.5	1.27	5.5	21.77	<0.010	0.322	10.2	10.53

Notes:
U - uranium
bls - below land surface
pCi/L - picocuries per liter
µg/L - micrograms per liter
ICPMS - inductively coupled plasma mass spectometry
NA - not analyzed
DPT - direct push technology
PMW - permanent monitoring well
TMW - temporary monitoring well
U (analytical data notation) - Analyte was analyzed for, but was not detected above the method detection limit, minimum detectable activity, minimum detectable concentration or limit of detection
J - value is estimated
BOLD values exceed the uranium maximum contaminant level of 30 ug/L

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

Table 3
Westinghouse Columbia Fuel Fabrication Facility
Contaminated Wastewater Line Assessment
Non-uranium Groundwater Detections

Boring	Sample Date	Sample Collection Method	Boring Depth (feet)	Screened Interval (feet)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	cis-1,2-Dichloroethene (µg/L)	Vinyl Chloride (µg/L)	2-Methylnaphthalene (µg/L)	Acenapthene (µg/L)	Fluorene (µg/L)	Phenanthrene (µg/L)	Ammonia (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Technetium 99 (pCi/L)	Technetium 99 (pCi/L)
					VOCs				SVOCs							UF	FF
CWW-TMW-01	9/25/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	0.21	0.331	0.027	-3.01U	11.2U
CWW-TMW-02	9/24/2018	DPT	15	10-15	<1.0	<1.0	2.6	<1.0	<0.80	<0.80	<0.80	<0.80	0.108	0.871	0.67	1.54U	2.78U
CWW-TMW-03	9/24/2018	DPT	15	10-15	2.0	<1.0	33.0	**2.1**	4.4	1.1	1.8	1.9	0.382	0.108	2.1	-6.8U	1.09U
CWW-TMW-04	9/24/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	0.0559	0.348	2.2	11.9U	1.75U
CWW-TMW-05	9/24/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	0.0817	0.14	5.1	8.9U	5.14U
CWW-TMW-06	9/25/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	0.146	0.163	6.5	7.18U	9.92U
CWW-TMW-07	9/25/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	0.0465J	0.125	6.2	-2.29U	2.22U
CWW-TMW-08	9/25/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	19	0.174	**17**	-1.18U	2.66U
CWW-TMW-09	9/25/2018	DPT	15	10-15	<1.0	<1.0	<1.0	<1.0	<0.80	<0.80	<0.80	<0.80	3.93	0.698	**26**	13.8U	-2.17U
MCL					5	5	70	2	N/A	N/A	N/A	N/A	N/A	4	10	900	900

Notes:
µg/L - micrograms per liter
mg/L - miligrams per liter
pCi/L - picocuries per liter
VOCs - volatile organic compounds
SVOCs - semivolatile organic compounds
UF - unfiltered
FF - field filtered
DPT - direct push technology
U - analyte was analyzed for, but was not detected above the method detection limit, minimum detectable activity, minimum detectable concentration or limit of detection
BOLD values exceed the maximum contaminant level
N/A - Not Applicable
SVOC samples were collected on 10/8/18 and 10/9/18

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

N

Legend

- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch
- CWW Line Study Area

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:2,780

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

AECOM

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Site Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 2

Path: O:\60577539 Westinghouse Radionuclide Assessment\900-Work\920-GIS_Surveying\JL_Updates_20181102\CWWLine_SiteMap_20181106.mxd

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

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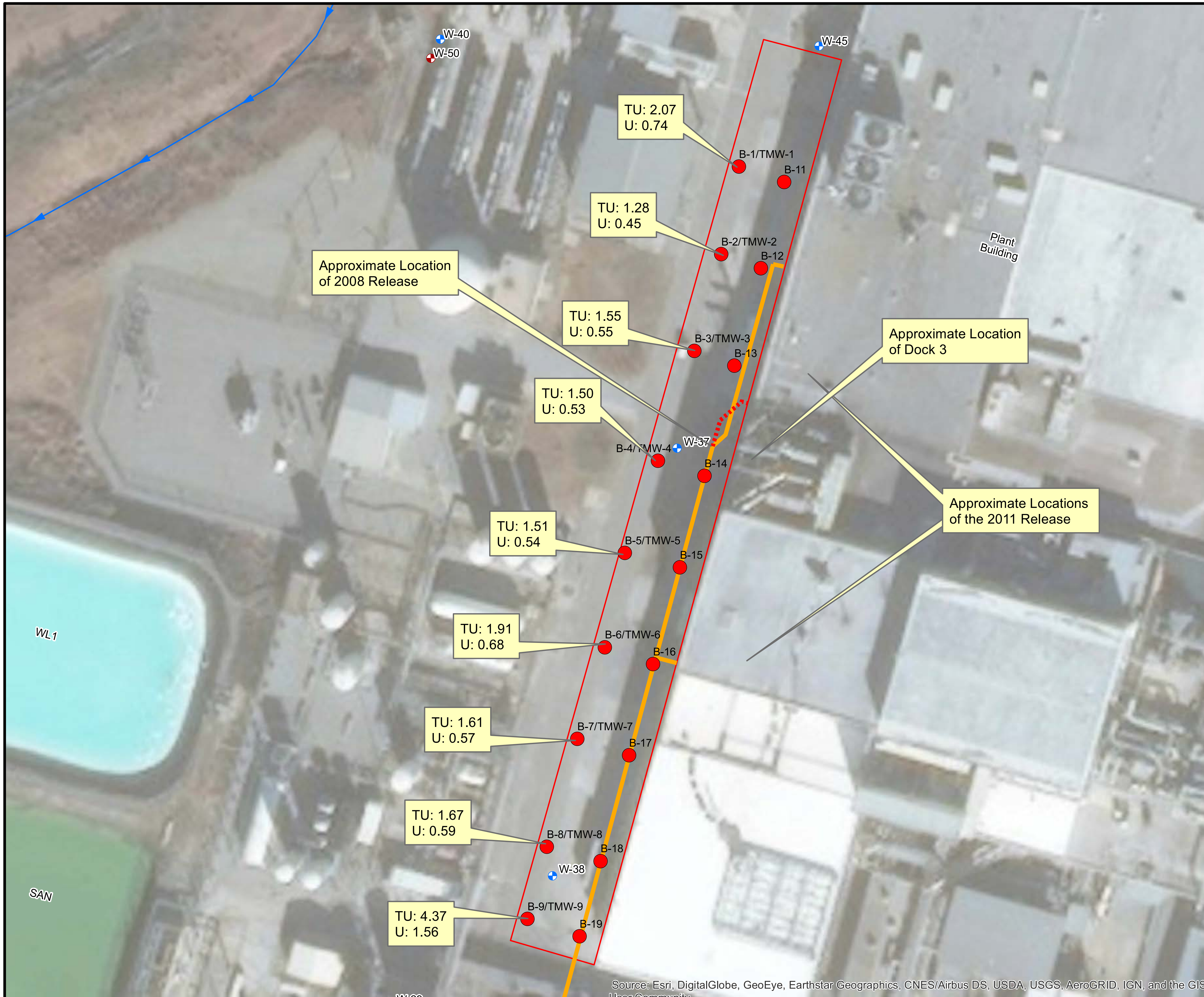
CWW Line Study Area Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 3

Path: O:\60577539 Westinghouse Radionuclide Assessment\900-Work\920-GIS_Surveying\JL_Updates_20181102\Updated Westinghouse Figure 3_20181106.mxd



Legend

- Study Area
- Boring Locations
- Black Mingo Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Shallow Aquifer Monitoring Well Location
- Contaminated Wastewater Line
- Former Contaminated Wastewater Line
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
TU	Total Uranium in PCi/g
U	Total Uranium in PPM

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Soil Samples Collected on 7/17/18 & 7/18/18

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

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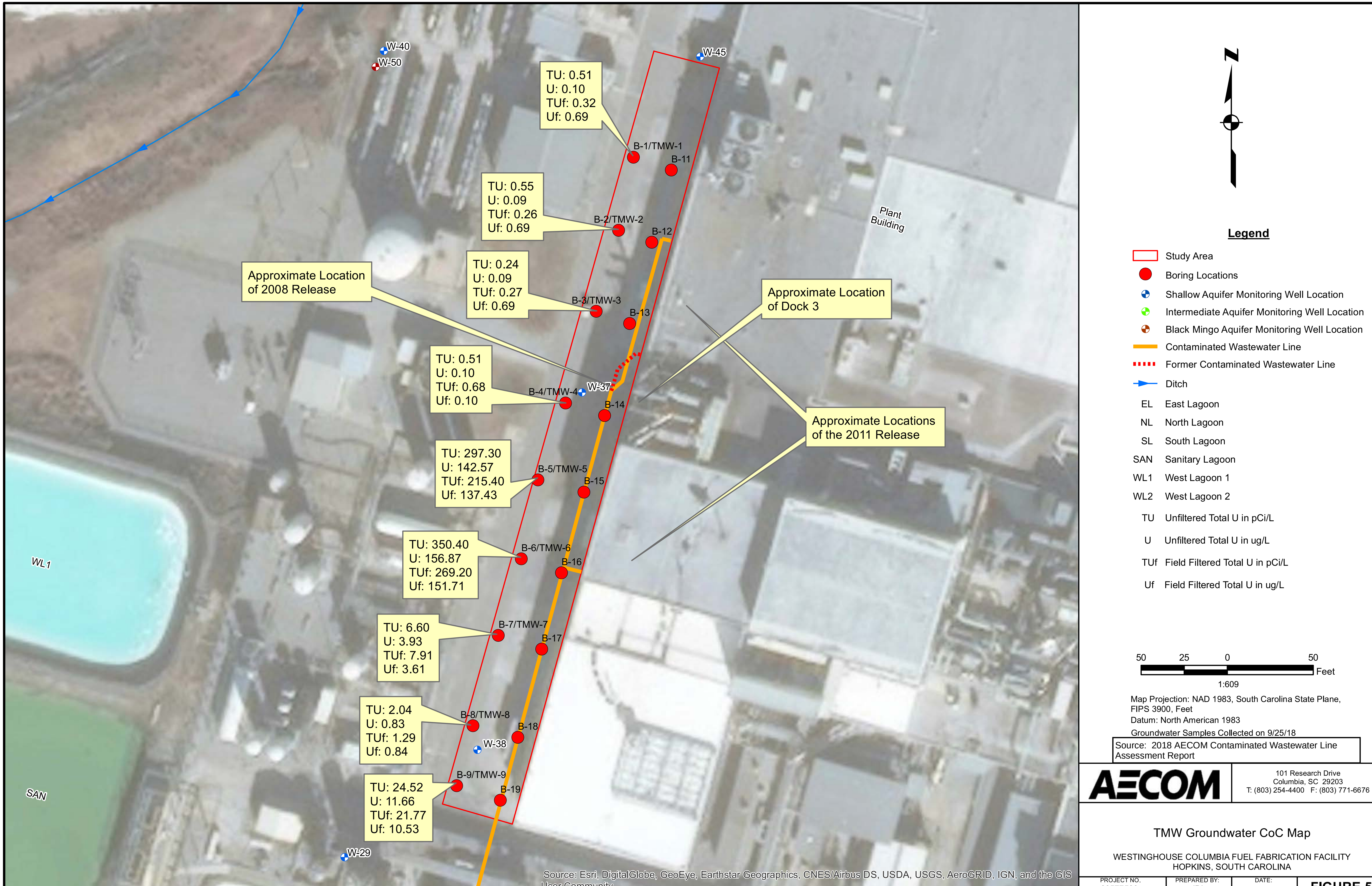
DPT Soil CoC Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 4

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\CCWLine\Updated Westinghouse Figure 4_20181106.mxd



Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet
Datum: North American 1983
Groundwater Samples Collected on 9/25/18

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

AECOM

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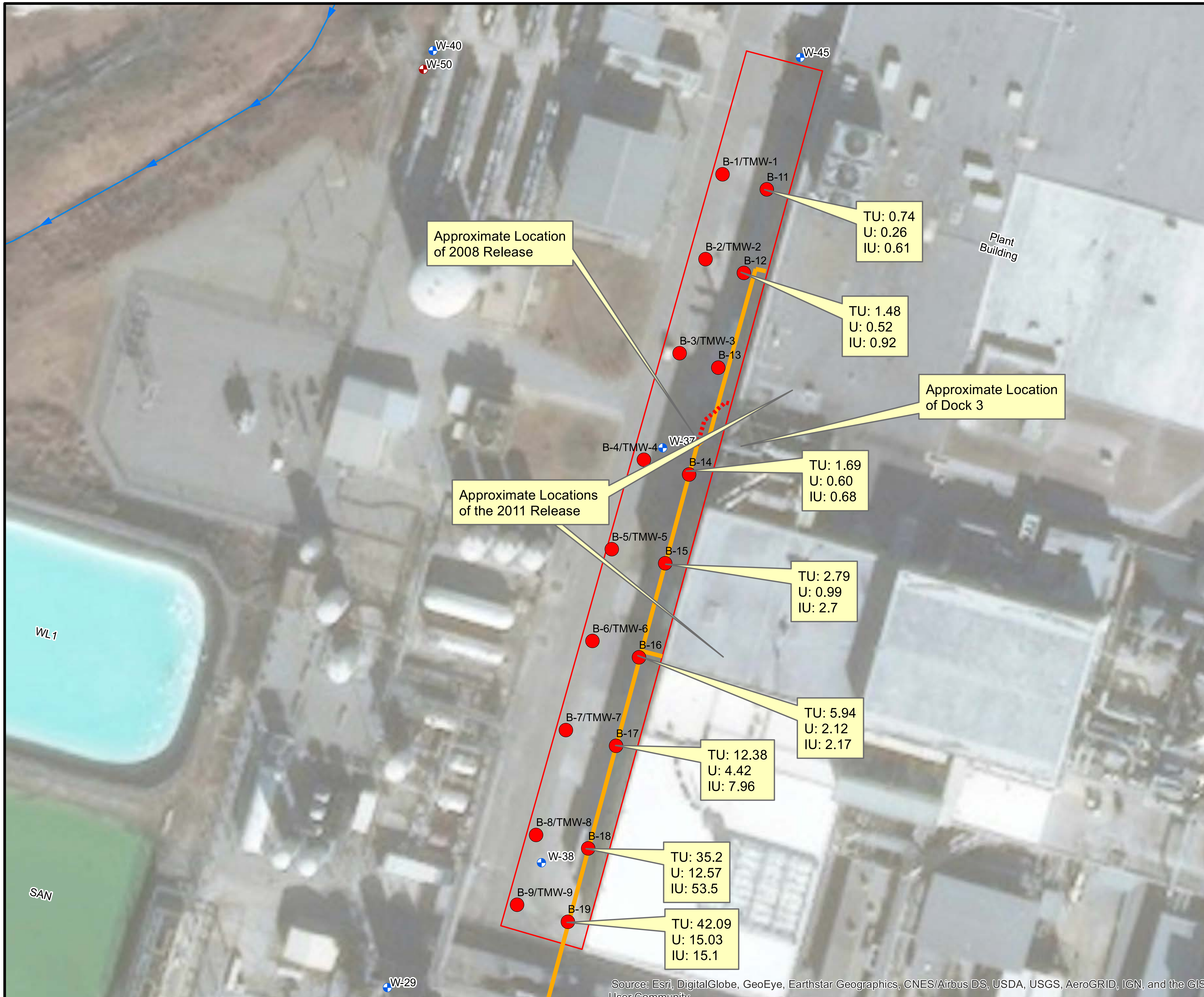
TMW Groundwater CoC Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 5

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\CCWLine\Updated Westinghouse Figure 6_20181106.mxd



N

Legend

- Study Area
- Boring Locations
- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Contaminated Wastewater Line
- Former Contaminated Wastewater Line
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2
TU	Total Uranium in PCi/g
U	Total Uranium in PPM
IU	ICPMS Total Uranium in ug/g

50 25 0 50 Feet

1:590

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Soil Samples Collected on 9/24/18 & 9/25/18

Source: 2018 AECOM Contaminated Wastewater Line Assessment Report

AECOM

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Hand Auger Boring Soil CoC Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 6

Path: O:\60528361 Westinghouse 2017\900-Work\920-GIS_Surveying\CCWLine\Updated Westinghouse Figure 7_20181106.mxd

2018 AECOM HF Spiking Station #2 Assessment Report

CFFF uses two spiking stations within the manufacturing plant where hydrofluoric acid (HF) is mixed with uranyl nitrate for the conversion process. The spiking stations are located within the Chemical Area operable unit. A release of low pH liquid containing U was documented in 2018 at HF Spiking Station #2 (HFSS#2).

During routine inspection of HFSS #2, liquid was discovered on top of a polypropylene liner within the concrete berm containing the station. Upon removal of the polypropylene liner, a hole the size of a quarter was noticed in the epoxy coating over the concrete in the spiking station. Westinghouse personnel obtained subsurface soils directly below this hole to a depth of 67 inches below the concrete surface for analysis by the CFFF Chemical Lab. As documented in the 5-day Notification of HF Spiking Station #2 Dike Leak letter (Westinghouse, 2018), U, fluoride and low pH were detected in the subsurface soils. Based upon the information in the 5-day notification letter, DHEC responded with a letter requesting that CFFF define the extent of soil impacted by this release.

A field investigation was performed by AECOM in August 2018 and September 2018 to collect soil samples beneath HFSS#2. Hand auger borings were installed to collect soil samples for radiological and chemical analyses.

Based upon the analytical results of the soil samples, the following conclusions were reached:

- Some of the soil below the concrete floor within the HFSS#2 area was impacted with fluoride, nitrate, and U, and had localized areas of low pH (<5 standard units);
- Except for soil from one borehole, soil did not contain U concentrations above the releasable limit below 7-8 feet within the HFSS#2 footprint. Note that the floor of the manufacturing plant is elevated 4 feet above ground surface.; and
- U below the concrete floor exists outside of the HFSS#2 footprint but did not appear to be associated with the HFSS#2 release.

The results of the investigation were presented in the *HF Spiking Station #2 Assessment Report* (AECOM, 2018b). Pertinent excerpts from this report are included below.

Table 1
Westinghouse Columbia Fuel Fabrication Facility
HF Spiking Station #2 Assessment
Soil Analytical Results

Sample Location	Date Collected			Reported Values (ICPMS)				PPM	Alpha Spec				Liquid Scint		
		F mg/kg	Nitrate mg/kg	U234 ug/kg	U235 ug/kg	U238 ug/kg	Total U ug/kg	Total U mg/kg	U233/34 pCi/g	U235/36 pCi/g	U238 pCi/g	Total U pCi/g	Tc-99 pCi/g	pH	% moisture
HF-B1-(1-2)	8/20/2018	7.62	NA	<10.3	134	4,350	4,484	4.48	4.92	0.281	2.5	7.70	3.85	6.84	7.41
HF-B1-(3-4)	8/20/2018	143	NA	985	108,000	2,890,000	**2,998,985**	**2,999**	7,420	375	1,310	**9,105**	14.6	4.59	7.27
HF-B1-(5-6)	8/20/2018	374	NA	1,000	115,000	3,120,000	**3,236,000**	**3,236**	8,750	402	1,640	**10,792**	6.24	4.04	7.66
HF-B1-(7-8)	9/6/2018	341	717	954	106,000	2,750,000	**2,856,954**	**2,857**	5,650	267	1,030	**6,947**	24.7	3.76	9.77
HF-B1-(9-10)	9/6/2018	5.21	351	72.7	4,910	122,000	**126,983**	**127**	417	22.1	73.4	**512.5**	0.685	4.18	11.9
HF-B1-(11-12)	9/6/2018	0.4J	104	20.5	3,600	91,100	**94,721**	**94.7**	316	17.8	61.3	**395.1**	4.91	4.78	12.6
HF-B2-(1-2)	8/20/2018	12.0	NA	<10.2	230	8,440	8,670	8.67	12.6	0.638	2.96	16.20	14.7	8.84	4.75
HF-B3-(1-2)	8/20/2018	22.0	NA	<9.46	16.1	665	681.1	0.68	1.49	0.195	0.811	2.50	-16.8	4.23	1.04
HF-B3-(3-4)	8/20/2018	50.4	NA	70.8	8,210	196,000	**204,281**	**204**	745	36.1	121	**902**	-2.68	4.29	0.876
HF-B3-(4.5-5)	8/20/2018	118	NA	36.6	4,360	115,000	**119,397**	**119**	311	13.6	51.5	**376**	-1.24	5.19	1.46
HF-B4-(1-2)	8/21/2018	10.8	NA	112	13,600	429,000	**442,712**	**443**	793	43.6	173	**1,009**	15.5	5.30	1.02
HF-B4-(3-4)	8/21/2018	10.8	NA	132	16,600	512,000	**528,732**	**529**	999	54.5	224	**1,277**	5.15	5.30	1.27
HF-B4-(5-5.5)	8/21/2018	22.8	NA	33.2	3,800	109,000	**112,833**	**113**	237	9.91	49.8	**296**	2.51	5.18	2.01
HF-B5-(1-2)	8/21/2018	6.27	NA	4.7J	577	20,400	**20,977**	**21.0**	17.1	1.02	4.59	22.71	-1.15	8.01	4.58
HF-B6-(1-2)	8/21/2018	0.514J	NA	<10.3	12.4J	941	953	0.95	1.31	-0.00756	1.00	2.31	3.23	6.66	7.83
HF-B6-(3-4)	8/21/2018	0.915J	NA	<10.1	8.29J	915	923	0.92	0.945	-0.0102	0.700	1.65	19.0	4.72	7.88
HF-B6-(5-6)	8/21/2018	<1.11	NA	<11.0	9.74J	1,170	1,180	1.18	1.16	0.114	0.912	2.19	3.57	5.92	10.3
HF-B6-(7-8)	9/6/2018	<1.10	29.4	<10.6	28.0	1,090	1,118	1.12	1.28	0.0785	0.444	1.80	13.5	6.18	9.27
HF-B6-(9-10)	9/6/2018	<1.14	16.8	<11.2	10.3J	909	919	0.92	0.907	0.0969	0.548	1.55	16.5	6.18	13.0
HF-B6-(11-12)	9/6/2018	<1.13	12.7	<11.1	13.9J	1,030	1044	1.04	1.43	0.142	1.28	2.85	2.94	5.97	12.4
HF-B7-(1-2)	8/21/2018	4.48	NA	<9.84	185	6,340	6,525	6.53	9.68	0.597	2.70	12.98	15.4	8.92	2.14
HF-B8-(1-2)	8/21/2018	5.30	NA	31.2	4,210	131,000	**135,241**	**135**	12.8	0.422	2.79	16.01	12.7	9.30	3.86
HF-B9-(1-2)	8/21/2018	0.414J	NA	<10.3	14.1J	1,170	1,184	1.18	1.68	0.146	0.999	2.83	10.7	5.75	7.36
HF-B9-(3-4)	8/21/2018	305	NA	466	53,000	1,410,000	**1,463,466**	**1,463**	3690	202	637	**4,529**	23.1	4.04	7.23
HF-B9-(5-6)	8/21/2018	111	NA	64.7	7,680	183,000	**190,745**	**191**	478	28.3	81.1	**587**	7.95	3.95	11.5
HF-B9-(7-8)	9/6/2018	<1.12	167	<11.1	24.0	1,240	1,264	1.26	1.65	0.0806	0.728	2.46	11.0	5.81	10.8
HF-B9-(9-10)	9/6/2018	<1.12	43.9	<11.1	17.3	1,060	1,077	1.08	1.56	0.147	0.576	2.28	-3.91	6.15	11.2
HF-B9-(11-12)	9/6/2018	<1.15	19.3	<11.3	80.4	2,970	3,050	3.05	6.6	0.527	2.25	9.38	2.81	6.02	13.4
HF-B10-(1-2)	8/21/2018	13.3	NA	53.9	7,020	217,000	**224,074**	**224**	430	23.4	96.9	**550**	16.1	6.40	5.09
HF-B10-(3-4)	8/21/2018	17.6	NA	181	22,300	669,000	**691,481**	**691**	1460	74.7	290	**1,825**	6.99	4.55	2.11
HF-B11-(1-2)	8/22/2018	47.6	NA	12.2	1,470	44,900	**46,382**	**46.4**	80.0	4.52	17.1	**101.6**	20.5	4.48	1.18
HF-B11-(3-4)	8/22/2018	295	NA	400	46,600	1,250,000	**1,297,000**	**1,297**	3,300	175	618	**4,093**	3.24	4.13	3.16
HF-B11-(5-6)	8/22/2018	1180	NA	1,680	192,000	5,600,000	**5,793,680**	**5,794**	12,500	630	2,320	**15,450**	-1.18	3.65	13.3
HF-B11-(7-8)	9/7/2018	497	729	1,550	152,000	3,910,000	**4,063,550**	**4,064**	6,650	343	1,170	**8,163**	13.9	4.06	11.9
HF-B11-(9-10)	9/7/2018	2.59	188	<10.6	286	8,180	8,466	8.47	11.4	0.523	2.78	14.70	11.5	5.83	11.9
HF-B11-(11-12)	9/7/2018	<1.13	34.6	<10.9	323	8,620	8,943	8.94	36.0	2.06	7.19	**45.25**	-1.17	5.64	12.2
HF-B12-(1-2)	8/22/2018	43.6	NA	399	85,600	10,100,000	**10,185,999**	**10,186**	5,170	249	841	**6,260**	0.935	6.86	2.71
HF-B12-(3-4)	8/22/2018	467	NA	1,010	119,000	2,750,000	**2,870,010**	**2,870**	5,900	291	978	**7,169**	19.4	4.17	4.42

Source: 2018 AECOM HF Spiking Station #2 Assessment Report

Table 1
Westinghouse Columbia Fuel Fabrication Facility
HF Spiking Station #2 Assessment
Soil Analytical Results

Sample Location	Date Collected			Reported Values (ICPMS)				PPM	Alpha Spec				Liquid Scint		
		F mg/kg	Nitrate mg/kg	U234 ug/kg	U235 ug/kg	U238 ug/kg	Total U ug/kg	Total U mg/kg	U233/34 pCi/g	U235/36 pCi/g	U238 pCi/g	Total U pCi/g	Tc-99 pCi/g	pH	% moisture
HF-B13-(1-2)	9/12/2018	<1.09	70.8	<10.5	11.4	1,140	1,151	1.15	1.17	0.353	1.16	2.683	11.7	6.18	8.69
HF-B13-(3-4)	9/12/2018	0.99J	67.0	<10.8	10.3J	985	1,000	1.00	0.689	0.178	1.11	1.98	-7.42	4.67	7.83
HF-B13-(5-6)	9/12/2018	<1.09	57.4	<10.5	11J	1,090	1,101	1.10	1.39	0.427	0.981	2.80	-1.48	5.50	8.70
HF-B13-(7-8)	9/12/2018	<1.12	33.6	<11.0	8.28J	914	922	0.92	1.43	0.452	0.581	2.46	0.736	5.05	11.9
HF-B13-(9-10)	9/12/2018	<1.14	29.0	<10.9	7.34J	759	766	0.77	1.38	0.203	1.04	2.62	-0.00596	4.52	12.9
HF-B13-(11-12)	9/12/2018	<1.14	14.6	<10.5	13.8J	824	838	0.84	1.48	0.540	1.14	3.16	2.49	5.22	12.8
HF-B14-(1-2)	9/12/2018	<1.01	6.90	<9.86	4.85	346	341	0.34	0.709	0.205	0.454	1.37	7.11	5.88	1.31
HF-B14-(3-4)	9/12/2018	2.51	8.34	12.3	1,340	33,200	**34,552**	**34.55**	94.4	5.00	18.7	**118.1**	-0.389	5.09	1.17
HF-B14-(5-5.3)	9/12/2018	139	57.8	58.2	6,160	168,000	**174,218**	**174**	366	21.3	69.8	**457**	-2.65	4.64	1.82
HF-B15-(1-2)	9/12/2018	1.18	24.7	<9.42	7.7J	479	487	0.49	1.59	0.280	0.390	2.26	6.64	8.17	0.958
HF-B15-(3-4)	9/12/2018	201	382	529	116,000	3,260,000	**3,376,529**	**3,377**	4,760	268	989	**6,017**	31.6	4.46	6.88
HF-B15-(5-6)	9/12/2018	288	384	531	119,000	3,450,000	**3,569,531**	**3,570**	6,560	416	1,480	**8,456**	-6.56	4.41	7.97
HF-B15-(7-8)	9/12/2018	0.80J	111	10.1J	1,160	31,100	**32,270**	**32.27**	101	6.84	23.7	**132**	10.4	5.12	9.61
HF-B15-(9-10)	9/12/2018	<1.15	40.1	<11.0	34.4	1,580	1,614	1.61	8.04	0.359	2.03	10.43	-1.57	5.1	12.9
HF-B15-(11-12)	9/12/2018	<1.14	14.5	6.01J	642	19,500	**20,148**	**20.15**	23.8	2.14	6.52	**32.46**	3.30	5.29	14.1
HF-B16-(1-2)	9/7/2018	33.7	236	86.7	9,690	284,000	**293,777**	**294**	450	23.2	99.1	**572**	13.2	4.26	5.77
HF-B16-(3-4)	9/7/2018	122	114	1,230	140,000	3,660,000	**3,801,230**	**3,801**	7,980	409	1,420	**9,809**	17.2	4.53	8.38
Free Releasable Uranium Limit		N/A	N/A	N/A	N/A	N/A	11000	11	N/A	N/A	N/A	30	N/A	N/A	N/A

Notes:

ICPMS - Inductively coupled plasma mass spectometry
PPM - units converted to parts per million
F - Fluoride
mg/kg - milligrams per kilogram
U - Uranium
ug/kg - micrograms per kilogram
pCi/L - Picocuries per liter
NA - Not analyzed
J - Concentratoin is above the method detection limit but below the reporting limit
BOLD values indicates concentration above the free releasable soil limit (11,000 ug/kg or 30 pCi/g)
N/A - Not applicable

Source: 2018 AECOM HF Spiking Station #2 Assessment Report

N

Legend

- Shallow Aquifer Monitoring Well Location
- Intermediate Aquifer Monitoring Well Location
- Black Mingo Aquifer Monitoring Well Location
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

300 150 0 300 Feet

1:2,780

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2018 AECOM HF Spiking Station #2 Assessment Report

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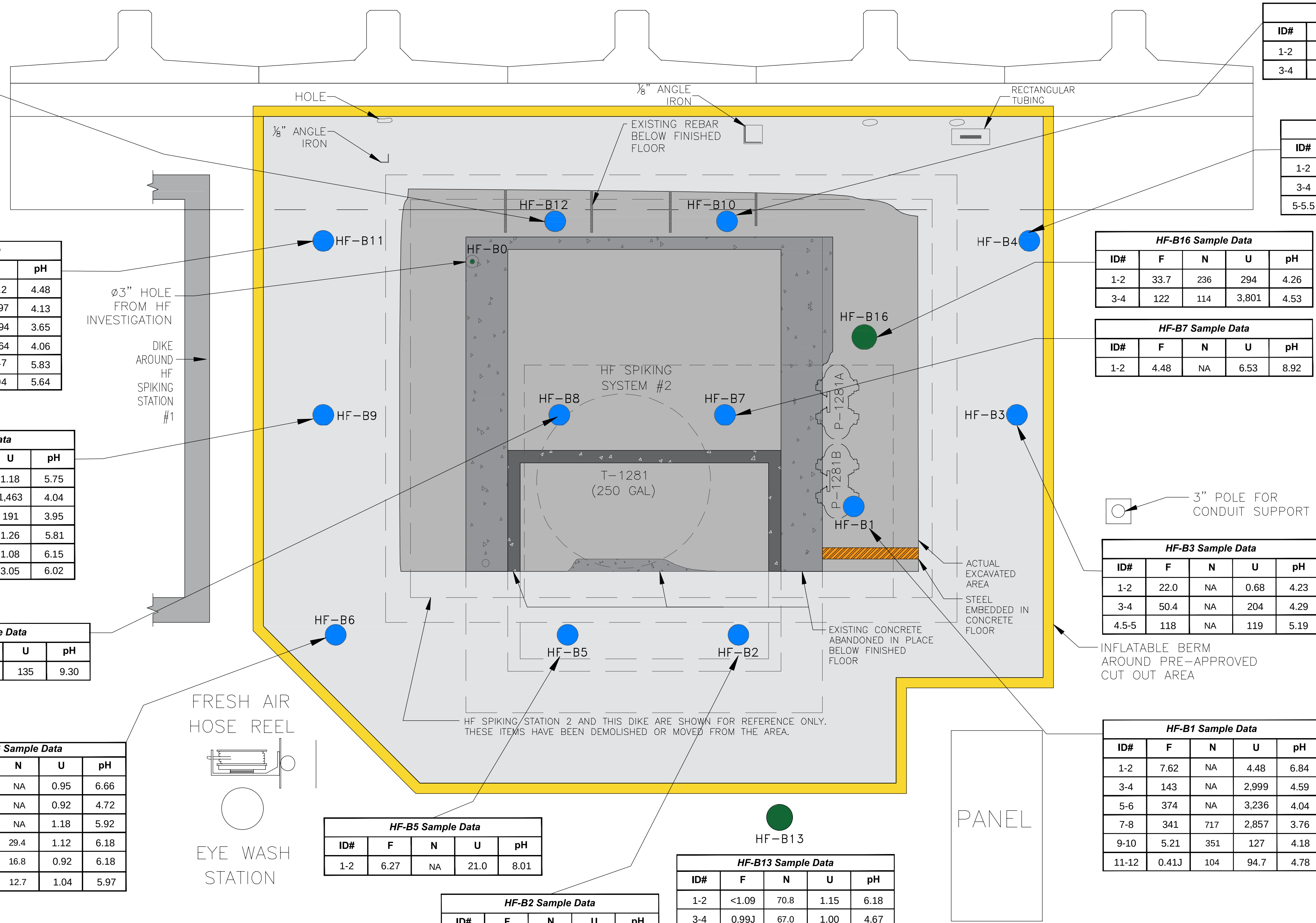
Site Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60577539	JDL	November 2018	FIGURE 2

Path: O:\60577539 Westinghouse Radionuclide Assessment\900-Work\920-GIS_Surveying\JL_Updates_20181102\CWWLine_SiteMap_20181106.mxd



HF-B12 Sample Data

ID#	F	N	U	pH
1-2	43.6	NA	10,186	6.86
3-4	467	NA	2,870	4.17

HF-B10 Sample Data

ID#	F	N	U	pH
1-2	13.3	NA	224	6.40
3-4	17.6	NA	691	4.55

HF-B4 Sample Data

ID#	F	N	U	pH
1-2	10.8	NA	443	5.30
3-4	10.8	NA	529	5.30
5-5.5	22.8	NA	113	5.18

HF-B11 Sample Data

ID#	F	N	U	pH
1-2	47.6	NA	46.2	4.48
3-4	295	NA	1,297	4.13
5-6	1180	NA	5,794	3.65
7-8	497	729	4,064	4.06
9-10	2.59	188	8.47	5.83
11-12	<1.13	34.6	8.94	5.64

HF-B16 Sample Data

ID#	F	N	U	pH
1-2	33.7	236	294	4.26
3-4	122	114	3,801	4.53

HF-B14 Sample Data

ID#	F	N	U	pH
1-2	<1.01	6.90	0.34	5.88
3-4	2.51	8.34	34.55	5.09
5-5.3	139	57.8	174	4.64

HF-B7 Sample Data

ID#	F	N	U	pH
1-2	4.48	NA	6.53	8.92

HF-B9 Sample Data

ID#	F	N	U	pH
1-2	0.414J	NA	1.18	5.75
3-4	305	NA	1,463	4.04
5-6	111	NA	191	3.95
7-8	<1.12	167	1.26	5.81
9-10	<1.12	43.9	1.08	6.15
11-12	<1.15	19.3	3.05	6.02

HF-B3 Sample Data

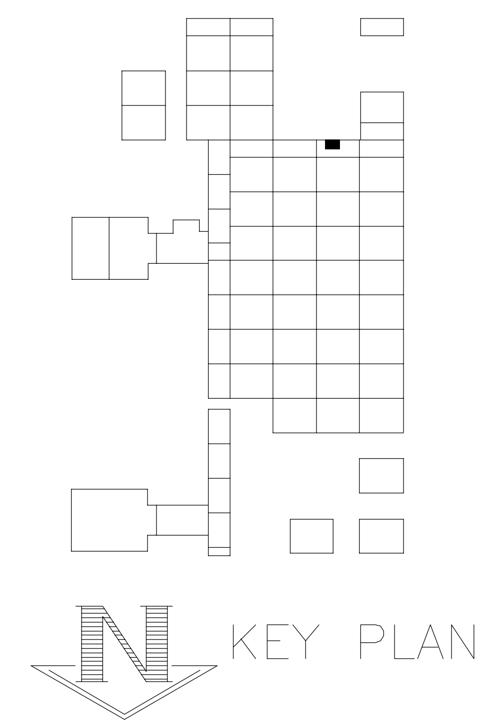
ID#	F	N	U	pH
1-2	22.0	NA	0.68	4.23
3-4	50.4	NA	204	4.29
4.5-5	118	NA	119	5.19

HF-B8 Sample Data

ID#	F	N	U	pH
1-2	5.30	NA	135	9.30

HF-B1 Sample Data

ID#	F	N	U	pH
1-2	7.62	NA	4.48	6.84
3-4	143	NA	2,999	4.59
5-6	374	NA	3,236	4.04
7-8	341	717	2,857	3.76
9-10	5.21	351	127	4.18
11-12	0.41J	104	94.7	4.78



HF-B6 Sample Data

ID#	F	N	U	pH
1-2	0.514J	NA	0.95	6.66
3-4	0.915J	NA	0.92	4.72
5-6	<1.11	NA	1.18	5.92
7-8	<1.10	29.4	1.12	6.18
9-10	<1.14	16.8	0.92	6.18
11-12	<1.13	12.7	1.04	5.97

HF-B5 Sample Data

ID#	F	N	U	pH
1-2	6.27	NA	21.0	8.01

HF-B13 Sample Data

ID#	F	N	U	pH
1-2	<1.09	70.8	1.15	6.18
3-4	0.99J	67.0	1.00	4.67
5-6	<1.09	57.4	1.10	5.50
7-8	<1.12	33.6	0.92	5.05
9-10	<1.14	29.0	0.77	4.52
11-12	<1.14	14.6	0.84	5.22

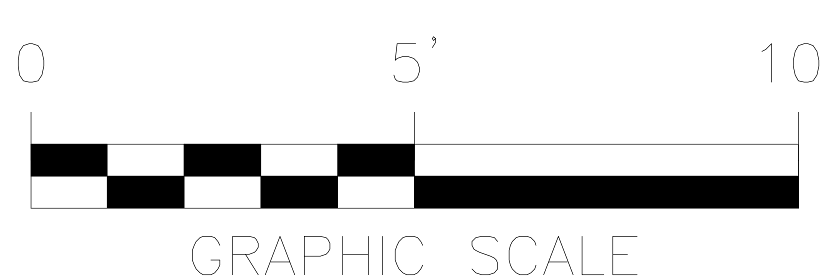
HF-B2 Sample Data

ID#	F	N	U	pH
1-2	12.0	NA	8.67	8.84

Source: 2018 AECOM HF Spiking Station #2 Assessment Report

LEGEND

SYMBOL	DESCRIPTION
● (blue)	Soil sampling locations from DHEC work plan.
● (green)	Additional soil sampling locations.
F	Fluoride Concentration in mg/Kg
N	Nitrate Concentration in mg/Kg
U	Uranium Concentration in mg/Kg
NA	Not analyzed
J	Concentration is above the method detection limits but below the reporting limit



HF-B15 Sample Data

ID#	F	N	U	pH
1-2	1.18	24.7	0.49	8.17
3-4	201	382	3,377	4.46
5-6	288	384	3,570	4.41
7-8	0.80J	111	32.27	5.21
9-10	<1.15	40.1	1.61	5.1
11-12	<1.14	14.5	20.15	5.29

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Figure 3

HF Spiking Station #2 Soil CoC Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY: HGM	CHECKED BY: JG	APPROVED BY: JG
60577539	DATE: NOVEMBER 6, 2018	DATE: NOVEMBER 6, 2018	SHEET: 1 OF 1

2018 Leidos Technical Basis Document for Spiking Station #2

In 2018 Leidos prepared *Technical Basis Document - Site-Specific Clean-up Levels for Uranium in Soil at HF Spiking Station #2 at the Westinghouse Columbia Fuel Fabrication Facility (WCFFF*) (Ledios, 2018) “to establish pre-decommissioning target cleanup levels or residual U in soil originating from HF Spiking Station #2”. The intent was to establish levels to protect workers, achieve as low as reasonably achievable exposure to radiation, and prevent leaching of U to groundwater.

The Technical Basis Document (TBD) indicated that the target cleanup level is based on the reasonable maximum exposure (RME) industrial worker scenario. The RESRAD-ONSITE Version 7.2 computer model was used to calculate potential risk and dose for U.

The TBD concluded that the subsurface soil and the concrete floor provide a barrier between industrial workers and U in soil. The dose-based target cleanup level for U was calculated at 41,667 ppm. Soil sampling results were below this limit. For future risk scenarios, the Comprehensive Environmental Response, Compensation, and Liability Act target cleanup levels range from 149 ppm (CR=10^{-6}) to 14,920 ppm (CR=10^{-4}). During sampling, U exceeded 149 ppm for CR=10^{-6} but was less than to 14,920 ppm for CR=10^{-4}. The TBD indicated that since subsurface activity in this area is unlikely, and a protective cover is provided by the concrete floor slab, excavation of impacted soi is not warranted. The TBD did recommend routine groundwater monitoring for ongoing evaluation of the effectiveness of the protective cover of the floor slab.

2019 AECOM CVOC Assessment Report

The previous *CVOC Field Screening Report* (AECOM, 2017) recommended the installation of additional monitoring wells. Nine monitoring wells were installed in October and November 2018. The entire monitoring well network, including the new wells were sampled in October and November 2018. The groundwater analytical results indicated that there are PCE and TCE groundwater plumes in the upper and lower zones of the surficial aquifer west of the plant building and in the upper zone of the surficial aquifer south of the plant building.

The report concluded that the plumes in the western site area appeared to emanate from the vicinity of West Lagoon II and from a source(s) between the plant building and the lagoon. TCE concentrations in the western plume were above the MCL in the upper and lower portions of the surficial aquifer, but concentrations of TCE above its MCL occurred primarily in the lower zone of the surficial aquifer. A groundwater sample from the lower zone of the surficial aquifer monitoring well W-19B contained PCE above its MCL. This well is in an area of the site where there were no known historical operations. Groundwater from the lower zone of surficial aquifer monitoring well W-60 between West Lagoon II and monitoring well W-19B was not impacted with PCE; therefore, the source of the impact in monitoring well W-19B remained unknown.

A second, smaller CVOC plume was located in the southern portion of the site near the bluff and the Gator Pond. PCE concentrations above the MCL within this plume appeared to be within the upper surficial aquifer only based on previous groundwater screening results (AECOM, 2017). The source area(s) for this plume were unknown, as there are no known processes in this area that currently use PCE or used PCE in the past. PCE concentrations in this plume were an order of magnitude lower than the PCE concentrations in the plume described above and did not appear to point to any particular potential source area.

The results of the investigation were presented in the *CVOC Assessment Report* (AECOM, 2019). Pertinent excerpts from this report are included below.

Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch

EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

N

0 150 300
Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

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Site Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 2

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure2_SiteFigure.mxd

Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch
- Potentiometric Line (C.I. = 4 feet)
- Direction of Groundwater Flow

129.19	Groundwater Elevation
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:

Based upon data collected on November 26, 2018

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

N

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

AECOM

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Upper Surficial Aquifer Potentiometric Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 3

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure3_upperWT_GWpot.mxd

Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch
- Potentiometric Line (C.I. = 4 feet)
- Direction of Groundwater Flow

128.36	Groundwater Elevation
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:

Based upon data collected on November 26, 2018

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

N

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

AECOM

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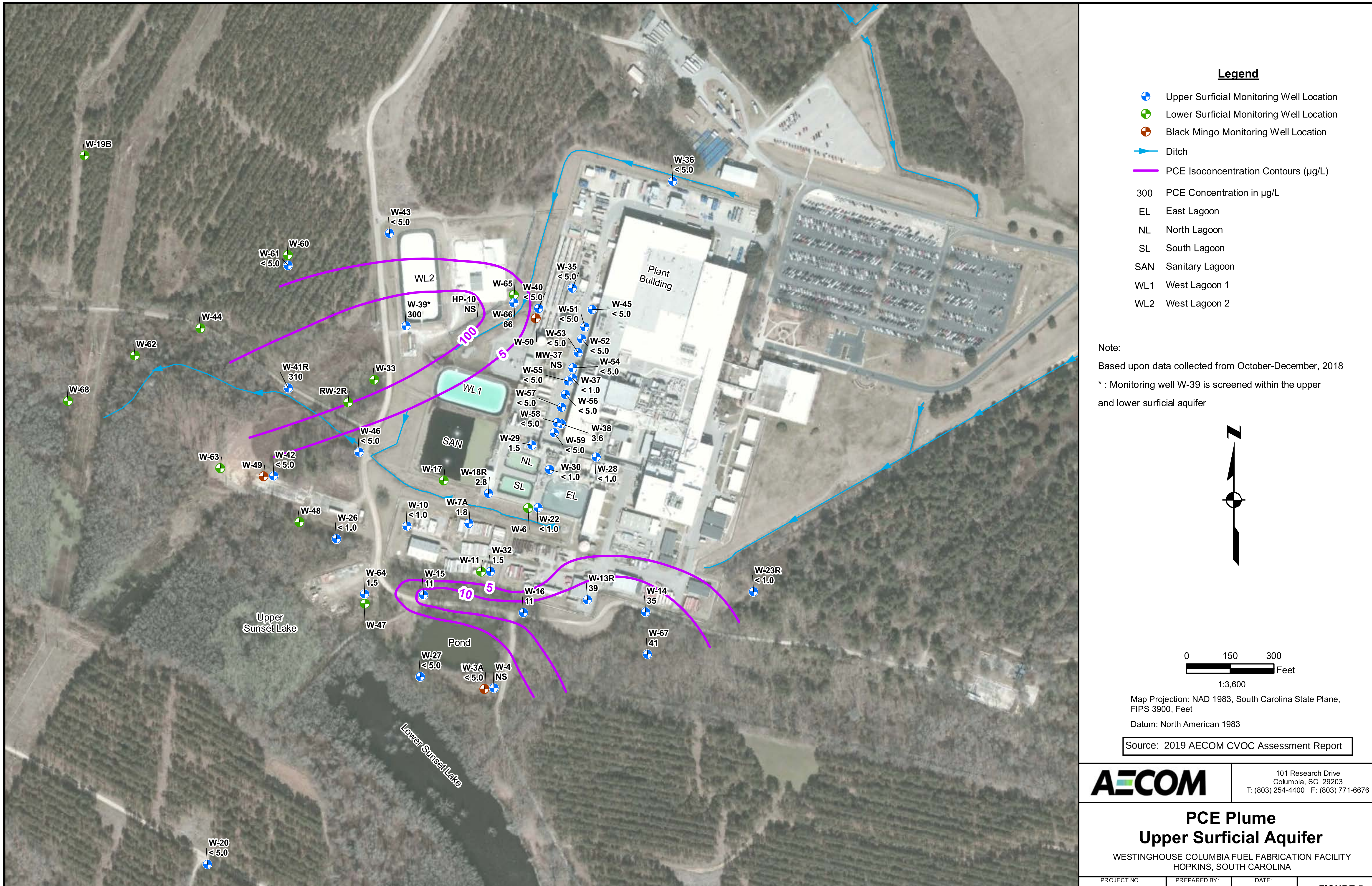
Lower Surficial Aquifer Potentiometric Map

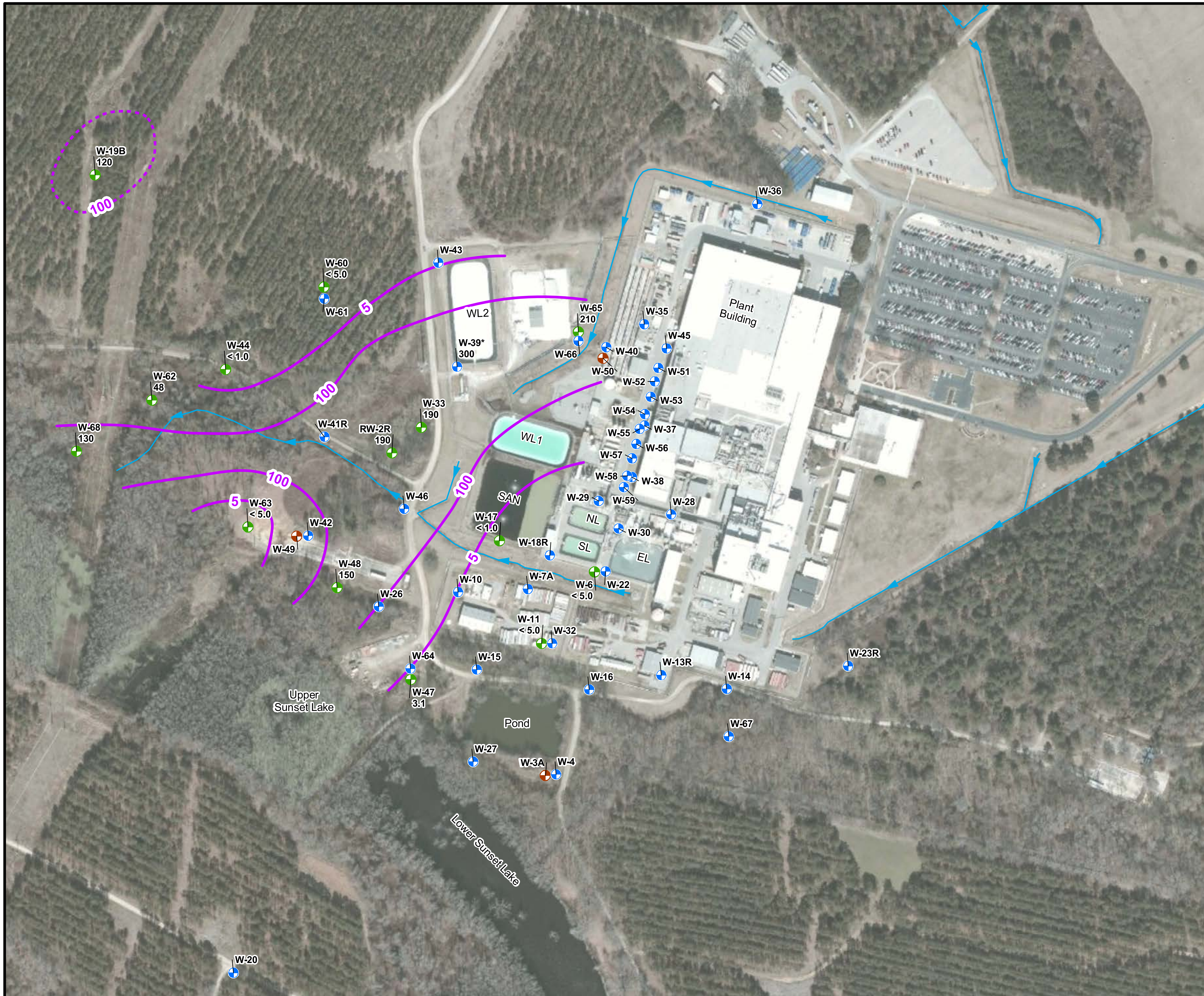
WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 4

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure4_lowerWT_GWpot.mxd



Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure5_pce_upperWT.mxd



Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch
- PCE Isoconcentration Contours (µg/L) (Dashed where inferred)

210	PCE Concentration in µg/L
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:

Based upon data collected from October-December, 2018

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

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PCE Plume
Lower Surficial Aquifer

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 6

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure6_pce_lowerWT.mxd

Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch
- TCE Isoconcentration Contours (µg/L)
- 5.3 TCE Concentration in µg/L
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon 1
- WL2 West Lagoon 2

Note:

Based upon data collected from October-December, 2018

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

N

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

AECOM

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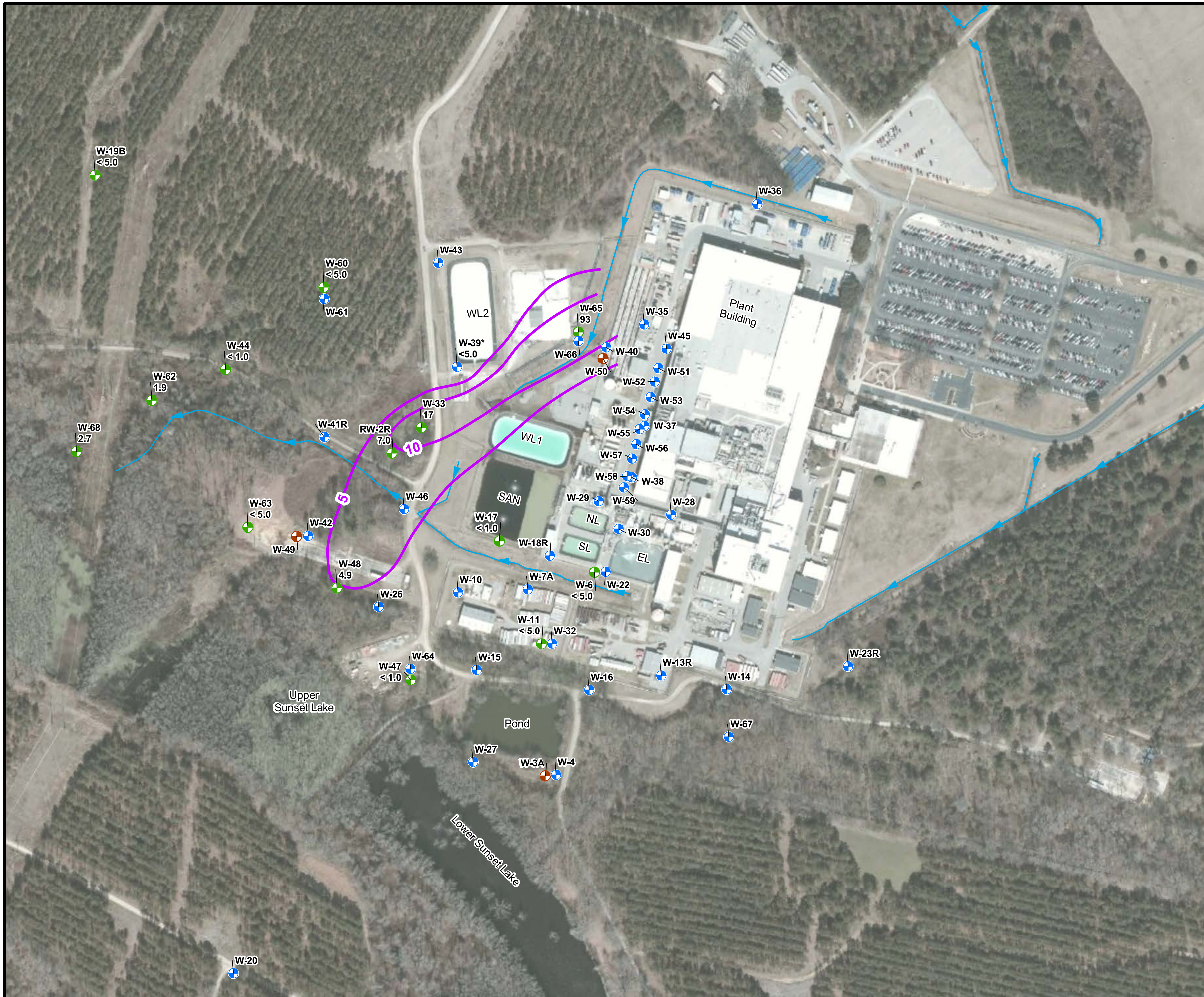
T: (803) 254-4400 F: (803) 771-6676

TCE Plume
Upper Surficial Aquifer

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 7

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure7_tce_upperWT.mxd



Legend

- Upper Surficial Monitoring Well Location
- Lower Surficial Monitoring Well Location
- Black Mingo Monitoring Well Location
- Ditch
- TCE Isoconcentration Contours (µg/L)

93	TCE Concentration in µg/L
EL	East Lagoon
NL	North Lagoon
SL	South Lagoon
SAN	Sanitary Lagoon
WL1	West Lagoon 1
WL2	West Lagoon 2

Note:

Based upon data collected from October-December, 2018

* : Monitoring well W-39 is screened within the upper and lower surficial aquifer

N

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2019 AECOM CVOC Assessment Report

AECOM

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TCE Plume
Lower Surficial Aquifer

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60585917	LJG	January 2019	FIGURE 8

Path: M:\EnvDataViz\Westinghouse\mxd\January2019\figure8_tce_lowerWT.mxd

Table 1
Summary of Groundwater Elevation Data
Westinghouse Columbia Fuel Fabrication Facility
AECOM Project No. 60585917

Well Number	Date Measured	Screen Interval (ft bgs)	Ground Surface Elevation (ft)	Top of Casing Elevation (ft)	Depth to Water (ft btoc)	Groundwater Elevation (ft)
W-3A	11/26/18	72.5-82.5	117.64	120.08	4.66	115.42
W-4	11/26/18	10.0-12.0	116.50	116.09	3.41	112.68
W-6	11/26/18	23.5-28.5	136.96	136.46	9.65	126.81
W-7A	11/26/18	13.0-18.0	132.94	135.06	10.58	124.48
W-10	11/26/18	18.5-23.5	136.89	136.81	15.27	121.54
W-11	11/26/18	25.5-28.5	138.45	140.76	17.17	123.59
W-13R	11/26/18	15.5-18.5	136.38	136.13	11.00	125.13
W-14	11/26/18	23.5-28.5	136.22	137.83	15.65	122.18
W-15	11/26/18	13.5-18.5	126.67	127.90	11.25	116.65
W-16	11/26/18	15.5-18.5	125.64	124.93	NM	NM
W-17	11/26/18	23.5-28.0	137.57	139.27	13.57	125.70
W-18R	11/26/18	12.5-17.5	137.15	136.71	10.90	125.81
W-19B	11/26/18	30.0-40.5	140.58	142.85	25.72	117.13
W-20	11/26/18	11.5-16.3	113.27	116.16	5.77	110.39
W-22	11/26/18	13.4-17.8	137.08	136.51	9.70	126.81
W-23R	11/26/18	15.0-20.0	137.45	140.47	19.10	121.37
W-24	11/26/18	10.1-15.1	139.83	141.94	7.62	134.32
W-25	11/26/18	22.9-27.7	114.70	114.70	5.05	109.65
W-26	11/26/18	25.5-30.5	140.59	142.21	24.82	117.39
W-27	11/26/18	14.1-18.9	120.22	121.87	9.43	112.44
W-28	11/26/18	9.8-14.7	136.98	138.88	11.30	127.58
W-29	11/26/18	10.0-15.1	136.96	138.61	10.95	127.66
W-30	11/26/18	10.2-15.2	136.87	138.81	11.30	127.51
W-32	11/26/18	17.0-22.5	138.33	140.61	17.93	122.68
W-33	11/26/18	15.1-20.7	138.06	139.33	15.02	124.31
W-35	11/26/18	16.0-21.0	136.59	139.07	10.40	128.67
W-36	11/26/18	15.0-20.0	134.16	136.29	7.10	129.19
W-37	11/26/18	15.5-20.5	136.58	139.04	10.71	128.33
W-38	11/26/18	15.0-20.0	136.71	136.51	8.70	127.81
W-39	11/26/18	12.0-22.0	139.08	141.15	15.02	126.13
W-40	11/26/18	5.0-15.0	136.42	139.26	10.60	128.66
W-41R	11/26/18	14.0-24.0	131.02	133.81	15.32	118.49
W-42	11/26/18	20.0-30.0	137.83	140.96	24.02	116.94
W-43	11/26/18	10.5-20.5	138.09	141.33	12.65	128.68
W-44	11/26/18	16.0-26.0	131.93	134.86	18.24	116.62
W-45	11/26/18	6.0-16.0	137.20	140.02	11.55	128.47
W-46	11/26/18	15.5-25.5	132.39	134.74	13.20	121.54

Source: 2019 AECOM CVOC Assessment Report

Table 1
Summary of Groundwater Elevation Data
Westinghouse Columbia Fuel Fabrication Facility
AECOM Project No. 60585917

Well Number	Date Measured	Screen Interval (ft bgs)	Ground Surface Elevation (ft)	Top of Casing Elevation (ft)	Depth to Water (ft btoc)	Groundwater Elevation (ft)
W-47	11/26/18	34.3-44.8	140.70	141.90	25.46	116.44
W-48	11/26/18	30.7-41.3	139.74	142.56	25.55	117.01
W-49	11/26/18	105.0-115.0	137.82	140.25	26.33	113.92
W-50	11/26/18	114.5-124.5	136.79	139.58	21.35	118.23
W-51	11/26/18	10.0-15.0	136.67	136.51	7.97	128.54
W-52	11/26/18	10.0-15.0	136.71	136.19	7.80	128.39
W-53	11/26/18	10.0-15.0	136.83	136.54	8.13	128.41
W-54	11/26/18	10.0-15.0	136.79	136.52	8.20	128.32
W-55	11/26/18	10.0-15.0	136.90	136.63	8.38	128.25
W-56	11/26/18	10.0-15.0	136.83	136.68	8.50	128.18
W-57	11/26/18	10.0-15.0	136.90	136.73	8.74	127.99
W-58	11/26/18	10.0-15.0	136.85	136.37	8.92	127.45
W-59	11/26/18	10.0-15.0	136.10	136.42	8.70	127.72
W-60	11/26/18	32.0-37.0	137.25	140.20	22.46	117.74
W-61	11/26/18	13.0-23.0	137.34	140.60	17.39	123.21
W-62	11/26/18	19.0-24.0	125.63	128.38	13.49	114.89
W-63	11/26/18	37.0-42.0	138.78	141.02	25.85	115.17
W-64	11/26/18	21.0-31.0	140.15	142.75	25.76	116.99
W-65	11/26/18	26.5-31.5	138.17	140.95	12.59	128.36
W-66	11/26/18	12.0-22.0	138.01	140.91	12.36	128.55
W-67	11/26/18	21.0-31.0	132.60	135.26	16.76	118.50
W-68	11/26/18	13.0-18.0	113.40	116.53	5.36	111.17
RW-2R	11/26/18	19.0-29.2	136.98	139.93	17.91	122.02

Notes:
ft bgs = feet below ground surface
ft btoc = feet below top of casing
ft = elevations are in feet above mean sea level based on the North American Vertical Datum of 1988 (NAVD-88)
NM = not measured due to well obstruction

Source: 2019 AECOM CVOC Assessment Report

Table 2
Summary of Detected Chlorinated Compounds
Westinghouse Columbia Fuel Fabrication Facility
AECOM Project No. 60585917

Well ID	Sample Date	Screened Interval (ft bgs)	Tetrachlororethene (PCE)	Trichchlorethene (TCE)	cis-1, 2-Dichloroethene	trans-1, 2-Dichloroethene	Vinyl Chloride
RW-2R	10/16/2018	19.2-29.2	**190**	**7**	< 1	< 1	< 1
W-3A	11/29/2018	72.5-82.5	< 5	< 5	< 5	< 5	< 2
W-3A DUP	11/29/2018	72.5-82.5	< 5	< 5	< 5	< 5	< 2
W-4	NS	10.0-12.0	NS	NS	NS	NS	NS
W-6	11/5/2018	23.5-28.5	< 5	< 5	< 5	< 5	< 2
W-7A	10/19/2018	13.0-18.0	1.8	< 1	< 1	< 1	< 1
W-10	10/19/2018	18.5-23.5	< 1	< 1	< 1	< 1	< 1
W-11	11/5/2018	25.5-28.5	< 5	< 5	< 5	< 5	< 2
W-13R	10/19/2018	15.5-18.5	**39**	3.1	1.4	< 1	< 1
W-14	10/18/2018	23.5-28.5	**35**	**5.3**	< 1	< 1	< 1
W-15	10/15/2018	13.5-18.5	**11**	2.0	1.2	< 1	< 1
W-16	10/18/2018	15.5-18.5	**11**	2.9	3.2	< 1	< 1
W-17	10/25/2018	23.5-28.0	< 1	< 1	< 1	< 1	< 1
W-18R	10/23/2018	12.5-17.5	2.8	< 1	< 1	< 1	< 1
W-19B	10/3/2018	30.0-40.5	**83**	1.7	< 1	< 1	< 1
W-19B	11/4/2018	30.0-40.5	**120**	< 5	< 5	< 5	< 2
W-20	10/30/2018	11.5-16.3	< 5	< 5	< 5	< 5	< 2
W-20 DUP	10/30/2018	11.5-16.3	< 5	< 5	< 5	< 5	< 2
W-22	10/23/2018	13.4-17.8	< 1	< 1	< 1	< 1	< 1
W-23R	10/18/2018	15.0-20.0	< 1	< 1	< 1	< 1	< 1
W-24	10/16/2018	10.1-15.1	< 1	< 1	< 1	< 1	< 1
W-25	NS	22.9-27.7	NS	NS	NS	NS	NS
W-26	10/16/2018	10.1-15.1	< 1	< 1	1.1	< 1	< 1
W-27	10/29/2018	14.1-18.9	< 5	< 5	< 5	< 5	< 2
W-27 DUP	10/29/2018	14.1-18.9	< 5	< 5	< 5	< 5	< 2
W-27	11/28/2018	14.1-18.9	< 5	< 5	< 5	< 5	< 2
W-27 DUP	11/28/2018	14.1-18.9	< 5	< 5	< 5	< 5	< 2
W-28	10/23/2018	9.8-14.7	< 1	< 1	< 1	< 1	< 1
W-29	10/23/2018	10.1-15.1	1.5	< 1	< 1	< 1	< 1
W-30	10/23/2018	10.2-15.2	< 1	< 1	< 1	< 1	< 1
W-32	10/19/2018	17.5-22.5	1.5	< 1	< 1	< 1	< 1
W-33	10/16/2018	15.7-20.7	**190**	**17**	2.0	< 1	< 1
W-35	11/1/2018	16.0-21.0	< 5	< 5	< 5	< 5	< 2
W-36	11/1/2018	15.0-20.0	< 5	< 5	< 5	< 5	< 2
W-37	10/18/2018	15.5-20.5	< 1	< 1	< 1	< 1	< 1
W-38	10/18/2018	15.0-20.0	3.6	**11**	< 1	< 1	< 1
W-39	10/25/2018	12.0-22.0	**300**	< 5	5.0	< 5	< 5
W-40	11/29/2018	5.0-15.0	< 5	< 5	< 5	< 5	< 2
W-41R	10/15/2018	14.0-24.0	**310**	**23**	< 5	< 5	< 5
W-42	11/4/2018	20.0-30.0	< 5	< 5	< 5	< 5	< 2
W-43	11/28/2018	10.5-20.5	< 5	< 5	< 5	< 5	< 2
W-43 DUP	10/29/2018	10.5-20.5	< 5	< 5	< 5	< 5	< 2
W-43	10/29/2018	10.5-20.5	< 5	< 5	< 5	< 5	< 2
W-43 DUP	11/28/2018	10.5-20.5	< 5	< 5	< 5	< 5	< 2
W-44	10/15/2018	16.0-26.0	< 1	< 1	< 1	< 1	< 1
W-45	11/4/2018	6.0-16.0	< 5	< 5	< 5	< 5	< 2
W-46	11/4/2018	15.5-25.5	< 5	< 5	< 5	< 5	< 2
W-47	10/25/2018	34.8-44.8	3.1	< 1	< 1	< 1	< 1
W-48	10/25/2018	31.3-41.3	**150**	4.9	2.2	< 1	< 1
W-49	12/13/2018	105.0-115.0	< 1	< 1	< 1	< 1	< 1
W-50	NS	114.5-124.5	NS	NS	NS	NS	NS
W-51	10/28/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-52	10/28/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-53	10/28/2018	10.0-15.0	< 5	< 5	19	< 5	< 2
W-54	10/28/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2

Source: 2019 AECOM CVOC Assessment Report

Table 2
Summary of Detected Chlorinated Compounds
Westinghouse Columbia Fuel Fabrication Facility
AECOM Project No. 60585917

Well ID	Sample Date	Screened Interval (ft bgs)	Tetrachlororethene (PCE)	Trichchlorethene (TCE)	cis-1, 2-Dichloroethene	trans-1, 2-Dichloroethene	Vinyl Chloride
W-55	10/27/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-56	10/27/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-57	10/27/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-58	10/27/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-59	10/27/2018	10.0-15.0	< 5	< 5	< 5	< 5	< 2
W-60	10/30/2018	32.0-37.0	< 5	< 5	< 5	< 5	< 2
W-61	10/30/2018	13.0-23.0	< 5	< 5	< 5	< 5	< 2
W-62	11/1/2018	19.0-24.0	**48**	1.9	< 1	< 1	< 1
W-63	10/31/2018	37.0-42.0	< 5	< 5	< 5	< 5	< 2
W-64	11/1/2018	21.0-31.0	1.5	< 1	< 1	< 1	< 1
W-65	10/31/2018	26.5-31.5	**210**	**93**	< 5	< 5	< 2
W-66	10/31/2018	12.0-22.0	**66**	< 5	< 5	< 5	< 2
W-67	11/1/2018	21.0-31.0	**41**	**8.4**	1.7	< 1	< 1
W-68	11/6/2018	13.0-18.0	**130**	2.7	< 1	< 1	< 1
MCL			5	5	70	100	2

Notes: NS - not sampled.
All Laboratory concentrations are displayed in μg/L.
Bold values exeed maximum concentration levels (MCL).

Source: 2019 AECOM CVOC Assessment Report

2019 AECOM Preliminary Human Health Risk Assessment

In 2019, CFFF requested AECOM to update the HHRA, previously completed in 2014 as described above, to assure there was no public, health, and safety impact from historic plant operations using data collected during Phase I of the RI. The Preliminary HHRA (AECOM, 2019b) comprised the initial steps of the HHRA and provided conservative screenings of recent data collected on and in the vicinity of the CFFF property. The chemicals initially identified as preliminary COPCs based on their exceedance of conservative screening values included VOCs, SVOCs, inorganics, and radionuclides in groundwater. Gross alpha and gross beta were retained as preliminary COPCs in soil, vegetation, sediment, and fish because they had no established screening values for protection of human health in these media.

Conservative groundwater screening levels (EPA Regional Screening Level for Tap Water) were exceeded, but these levels do not consider that groundwater is not used for drinking water purposes currently or will likely be used in the future. In addition, five of the volatile groundwater COPCs were identified as vapor intrusion COPCs in groundwater for a hypothetical residential exposure scenario. These scenarios were to be further evaluated to calculate the cancer risk or noncancer hazard they may pose based on reasonable maximum estimates of concentrations and potential exposures at the site in the BRA.

2019 Westinghouse Soil Baseline Activity Statistical Analysis

In 2017, CFFF personnel performed extensive environmental surface soil sampling to characterize the baseline or background radiation content in soil. Surface soil samples were collected at 82 locations along the CFFF property boundary and sent to a 3rd party environmental analytical laboratory, GEL Laboratories (GEL), for analysis by gross alpha, gross beta, and isotopic uranium (alpha spectroscopy)

The data was summarized in a report titled *CFFF Soil Baseline Activity Statistical Analysis* (Westinghouse, 2019). The report includes the sample locations and statistical analysis of the laboratory results.

The average alpha soil background activity was 22.5 picocuries per gram (pCi/g), and the average beta background activity was 22.8 pCi/g. The background activities for the summation of all U isotopes analyzed by alpha spectroscopy ranged from 1.16 to 4.41 pCi/g total U. The report concluded that the average totalized U activity of background soil sample result was dependent on the moisture content of the sample. This document provided the background subtraction value for soil samples that exceed screening levels. Additionally, the uncertainty associated with each background subtraction was included to provide a basis for confidence statements, as needed. A copy of this report is included below.

8.1 Appendix 1: Sampling Diagram

Source: 2019 Westinghouse Soil Baseline Activity Statistical Analysis

2020 Westinghouse Tc-99 Source Investigation Report

As part of its nuclear fuel production process, the CFFF uses U feedstock provided by customers in the form of UF_6 or UN. Within the feedstock, the component Tc-99 exists in residual quantities as explained below.

Tc-99 is a nuclear fission product of U. While it occurs naturally in tiny amounts within the earth's crust, it is primarily human-made and produced during nuclear reactor operations where U is irradiated with neutrons. Tc-99 was introduced into the commercial nuclear fuel cycle in 1956 when high-enriched U from U.S. Government military reactors was re-processed (e.g., down-blended) into low-enriched U fuel. Reprocessed U was used in the commercial nuclear fuel cycle until 1977; due to residual impacts, Tc-99 remains in the nuclear fuel cycle to this day.

Tc-99 is a beta particle emitter. For CFFF, gross beta concentrations in groundwater are an indication of the potential presence of Tc-99. In past groundwater well sampling and investigation, CFFF has seen an indication of the potential presence of Tc-99 (elevated gross beta) in some groundwater wells near plant operations and in the Gator Pond. These indications are more than 0.6 miles from the nearest site boundary. In 2018, CFFF began direct measurement of Tc-99 in all groundwater wells and surface water to fully characterize any potential impact.

From 2018 to the present, groundwater from two monitoring wells (W-6 and W-11) have exceeded the MCL for Tc-99. Review of environmental groundwater data collected at CFFF shows that gross beta concentrations were present in surficial aquifer groundwater monitoring wells beginning in the 1980s when the monitoring wells were first installed.

In 2020, CFFF conducted a Tc-99 source investigation that focused on the most likely sources of Tc-99 in liquid streams and process solids that could have the potential to contact the environment.

Residual quantities of Tc-99 were identified in the aqueous U manufacturing process stream. The highest Tc-99 concentration identified during this investigation sampling was 449 pCi/L, which is approximately 1/5th of the Tc-99 concentrations in groundwater from monitoring wells W-6 and W-11. The report concludes that the impact of Tc-99 in the environment occurred sometime in the past and that no significant contributions of Tc-99 impact to groundwater are presently occurring. Current site operations do not have the potential to introduce Tc-99 into the environment above its groundwater MCL (900 pCi/L).

The results of the investigation are presented in the *Technetium-99 Source Investigation Report* (Westinghouse, 2020a). Pertinent excerpts from this report are included below.

Table 1 – Phase I Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	FIGURE 1 SAMPLE ID	SAMPLE MEDIA
Contaminated Sump	T-1187/T-1189	I-1	Liquid
Wastewater from Incinerator / SOLX Aqueous Waste	T-1148/T-1149	I-2	Liquid
Solution from Conversion	T-1160B/C	I-3	Liquid
Solution from Cylinder Recertification	T-1160A	I-4	Liquid
Waterglass wastewater	T-1166	I-5	Liquid
East Lagoon	Lagoon sludge and surrounding soil	I-6	Solid

The East Lagoon has been previously identified as an area of interest, and closure of the East Lagoon is planned to be completed in 2021. While Tc-99 was identified in one area of the lagoon sludge as described in the *East Lagoon Characterization Report* included in **Attachment 3**, it is not believed that current East Lagoon operations are an ongoing source of Tc-99. As part of this Work Plan, additional samples (sludge and soil) in the East Lagoon were collected to bound the previously identified Tc-99 area and to determine if any soil potentially contained Tc-99 in the surrounding area. Additional assessment of the soils beneath the East Lagoon liner will be completed once the lagoon is emptied and the liner is removed as part of closure activities.

Table 2 provides the Phase II sample locations of the liquid and solid process streams that are down stream of the processes believed to be potential sources of Tc-99. These locations were sampled after laboratory analysis confirmed the presence of Tc-99 in the associated Phase I process stream.

Table 2 – Phase II Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	FIGURE 1 SAMPLE ID	SAMPLE MEDIA
Solution from Conversion	5 product lines, before and after bag filters(FL-x12A/B); V-1005A/B	II-1; II-2	Liquid
Scrap Cage Monitor Discharge	Scrap cage before Q-tank	II-3	Liquid
West II Lagoon	Grab sample from surface of lagoon	II-4	Liquid
Recycled Ammonia	T-19, T-20	II-5	Liquid
Waterglass Cake	Grab sample from available solids	II-6	Solid
Dewatering Plant Solids	Grab sample from available solids	II-7	Solid
CaF_2 Pile	Grab sample from CaF_2 pile	II-8	Solid

Analytical Laboratory

All samples were logged on a Chain of Custody form, stored in a sample cooler, and sealed and secured when not in the custody of the sampling crew. GEL Laboratories, LLC, was utilized for the analysis and has National Environmental Laboratory Accreditation Program (NELAP) certification, as well as all appropriate SCDHEC certifications. The analytical laboratory is capable of achieving reporting limits appropriate for characterization. The laboratory data reports contain complete documentation of the laboratory's interaction with each sample, including a case narrative, descriptions of the analyses performed, the analytical methods used, and a description of the laboratory's internal QC review process. The analytical laboratory reports are provided in **Attachment 2**.

Source: 2020 Westinghouse Tc-99 Source Investigation Report

Radiological Sample Results

The Phase I Liquid sample results are provided in Table 3.

Table 3 – Phase I Liquid Sample Results

Sample #	Sample ID	Sample Description	Gross Analyte Activity (pCi/L)				Tc-99 / U-235 Ratio
			U-234	U-235	U-238	Tc-99	
1	T-1166	Waterglass wastewater	95.2	5.1	15.5	271.0	53.0
2	T-1160A	Solution from Cylinder Recertification	23,700.0	1,070.0	3,590.0	305.0	0.29
3	T-1160B	Solution from Conversion	50,100.0	2,850.0	8,300.0	377.0	0.13
4	T-1149	Wastewater from Incinerator / SOLX Aqueous Waste	61,500.0	2,800.0	8,710.0	48.7	0.02
5	T-1189	Contaminated Sump	2,050.0	117.0	339.0	4.7	0.04

Tc-99 was identified in the greatest quantities in the liquid streams of the Waterglass wastewater, the Cylinder Recertification process solution, and the T-1160B Conversion process line. A much lower Tc-99 concentration was identified in wastewater from the Incinerator and Solvent Extraction (SOLX) aqueous waste stream, while the Tc-99 identified in the Contaminated Sump liquid was insignificant. It is also important to examine the relationship between Tc-99 and U concentrations in the samples.

Since it is known that Tc-99 arrives at CFFF in UF_6 cylinders or as UN, it is anticipated to identify U with Tc-99 in the liquid stream from cylinder recertification. This liquid stream consists of the water used to hydrostatically test the cylinders. It is also anticipated to identify Tc-99 in the Conversion process line, as the U fuel stock feed material is expected to contain Tc-99, and there has been little separation of U from the liquid stream. The liquid stream from Conversion and the liquid stream from Cylinder Recertification are both fed to the Waterglass process. The Waterglass process removes residual U in the form of Waterglass 'cake' and the wastewater is sent for ammonia recovery. The Waterglass wastewater is representative of the combined wastewaters from both Conversion and Cylinder Recertification.

It is also reasonable to identify lower levels of Tc-99 in the Incinerator and SOLX aqueous waste stream due to the expected dilution of the aqueous stream at this point. Also, the Contaminated Sump sample indicates that any U present is likely the result of superficial U within the plant interior (e.g. solid U powder or particles) that has become suspended in liquid (e.g. from housekeeping or mopping of areas where loose material is present), as no significant Tc-99 has been identified in this waste stream.

Phase I solid sampling focused on the East Lagoon. Previous East Lagoon Characterization sampling had identified Tc-99 in the sludge of the East Lagoon in one small area. The *East Lagoon Characterization Report* is provided in **Attachment 3**. Of the 16 East Lagoon characterization sample locations, Tc-99 was identified in only one sample. It is reasonable to identify Tc-99 in the lagoon sludge due to the high organic content of the material, but the identification of Tc-99 in only one of 16 samples indicates that the Tc-99 is isolated. Phase I sampling was performed to delineate the area of Tc-99 impacted sludge. Soil samples were also collected in the area immediately adjacent to the corner of the East Lagoon where Tc-99 was originally identified in the single sludge sample. The analytical results are summarized in Table 4.

Source: 2020 Westinghouse Tc-99 Source Investigation Report

Table 4 – Phase I Solid Sample Results

Sample #	Sample ID	Sample Description	Gross Analyte Activity (pCi/g)				Tc-99 / U-235 Ratio
			U-234	U-235	U-238	Tc-99	
6	EL-S-A	East Lagoon Sludge Follow up	728.0	37.7	155.0	203.0	5.38
7	EL-S-B	East Lagoon Sludge Follow up	1,360.0	61.2	262.0	52.4	0.86
8	EL-S-C	East Lagoon Sludge Follow up	11,100.0	502.0	2,100.0	19.5	0.039
9	EL-SO-D-2'	Soil adjacent to East Lagoon	1.9	0.1	1.6	0.0	0.00
10	EL-SO-D-4'	Soil adjacent to East Lagoon	0.8	0.0	0.5	0.0	0.00
11	EL-SO-D-6'	Soil adjacent to East Lagoon	0.8	0.0	0.8	1.1	25.3
12	EL-SO-E-2'	Soil adjacent to East Lagoon	1.7	0.0	0.8	0.0	0.00
13	EL-SO-E-4'	Soil adjacent to East Lagoon	3.0	0.1	1.4	0.9	6.70
14	EL-SO-E-6'	Soil adjacent to East Lagoon	3.4	0.3	1.5	0.0	0.00
15	EL-SO-F-2'	Soil adjacent to East Lagoon	2.7	0.1	1.1	0.3	3.28
16	EL-SO-F-4'	Soil adjacent to East Lagoon	1.0	0.1	0.6	0.0	0.00
17	EL-SO-F-6'	Soil adjacent to East Lagoon	0.7	0.0	0.7	0.0	0.00

Elevated Tc-99 was identified in one follow up sludge bounding sample, in residual quantities in the remaining two sludge bounding samples, and no Tc-99 was identified in the surrounding soil above the laboratory detection limit. These data, combined with the data from the *East Lagoon Characterization Report* (**Attachment 3**), confirms that the East Lagoon is not a significant source of Tc-99 in the environment. It is also reasonable to presume that the Tc-99 identified in the small area of the East Lagoon originated from the same historical surface release that introduced Tc-99 into the environment.

The Phase I sample of the Solution from Conversion confirms that Tc-99 is in fact present in the U stock feed material. The Phase II Liquid sampling focused on the Conversion lines, both before and after the bag filters, as well as other areas of interest such as the Scrap Cage discharge, the West II Lagoon surface water, and the recycled Ammonia lines that are fed back into the Conversion process. Phase II Liquid sampling was designed to detect potential differences in Tc-99 concentrations across the manufacturing process by sampling individual conversion lines, and subsequent processes. The results of this sampling are summarized in Table 5.

Table 5 – Phase II Liquid Sample Results

Sample #	Sample ID / Description	Gross Analyte Activity (pCi/L)				Tc-99/U-235 Ratio
		U-234	U-235	U-238	Tc-99	
18	CL-1 Before	513,000	21,700	75,100	58.7	0.003
19	CL-1 After	32,900	1,600	5,480	50.1	0.031
20	CL-2 Before	282,000	12,900	32,900	449.0	0.035
21	CL-2 After	96,400	4,200	11,100	73.9	0.018
22	CL-3 Before	367,000	16,800	50,700	438.0	0.026
23	CL-3 After	30,900	1,390	4,000	16.4	0.012
24	CL-4 Before	174,000	9,220	28,300	142.0	0.015
25	CL-4 After	25,900	1,170	4,190	63.7	0.054
26	Scrap Cage Monitor Discharge	20,600	1,030	3,400	201.0	0.20
27	W2	3.9	0.6	1.0	96.0	157
28	T-19 Ammonia	0.1	0.0	0.1	13.4	N/A
29	T-20 Ammonia	0.2	0.0	0.2	0.0	N/A

The wastewater stream from the Conversion lines passes through a set of bag filters before it is sent to Waterglass. Samples were collected before and after these bag filters (samples 18-25). The bag filters capture fine U particulate, which is later recovered by nitric acid washing in the Scrap Cage. The wastewater from the acid washing process in the Scrap Cage is also sent to Waterglass (sample 26). These processes are expected to contain Tc-99 originating from the UF_6 feedstock.

After processing in Waterglass, wastewater is fed to the stills to recover ammonia that is reused in the Conversion process. The still bottoms are transferred to the West Lagoons (W2, sample 27). Lower Tc-99 concentrations are reported here due to mixing with large volumes of water in the lagoon. Recycled Ammonia is recovered from the Waterglass wastewater and reused in the Conversion process (T-19, sample 26, and T-20, sample 29).

The Phase II solid samples focused on the solid products removed from the Phase I and Phase II liquids, specifically the Waterglass cake, the Solid CaF_2 removed from the West II Lagoon, and the Dewatering Sludge. Phase II solid sampling was designed to determine if some Tc-99 may possibly be retained in the manufacturing process solids. The results of this sampling are summarized in Table 6.

Table 6 – Phase II Solid Sample Results

Sample #	Sample ID / Description	Gross Analyte Activity (pCi/g)				Tc-99/U-235 Ratio
		U-234	U-235	U-238	Tc-99	
30	WG-D46035	523,000	22,300	74,700	22.1	0.001
31	Calcium Fluoride	16.3	0.7	2.4	0.5	0.67
32	Sludge Dewatering D45671	3,510	156	507	3.5	0.02

The Waterglass Cake (sample 30), and the Dewatering Plant Solids (sample 31) represent the solid material that is extracted during the U recovery process. The CaF_2 is the solid material that is dredged from the West II Lagoon (sample 31). No significant Tc-99 was identified in any of the Phase II solid

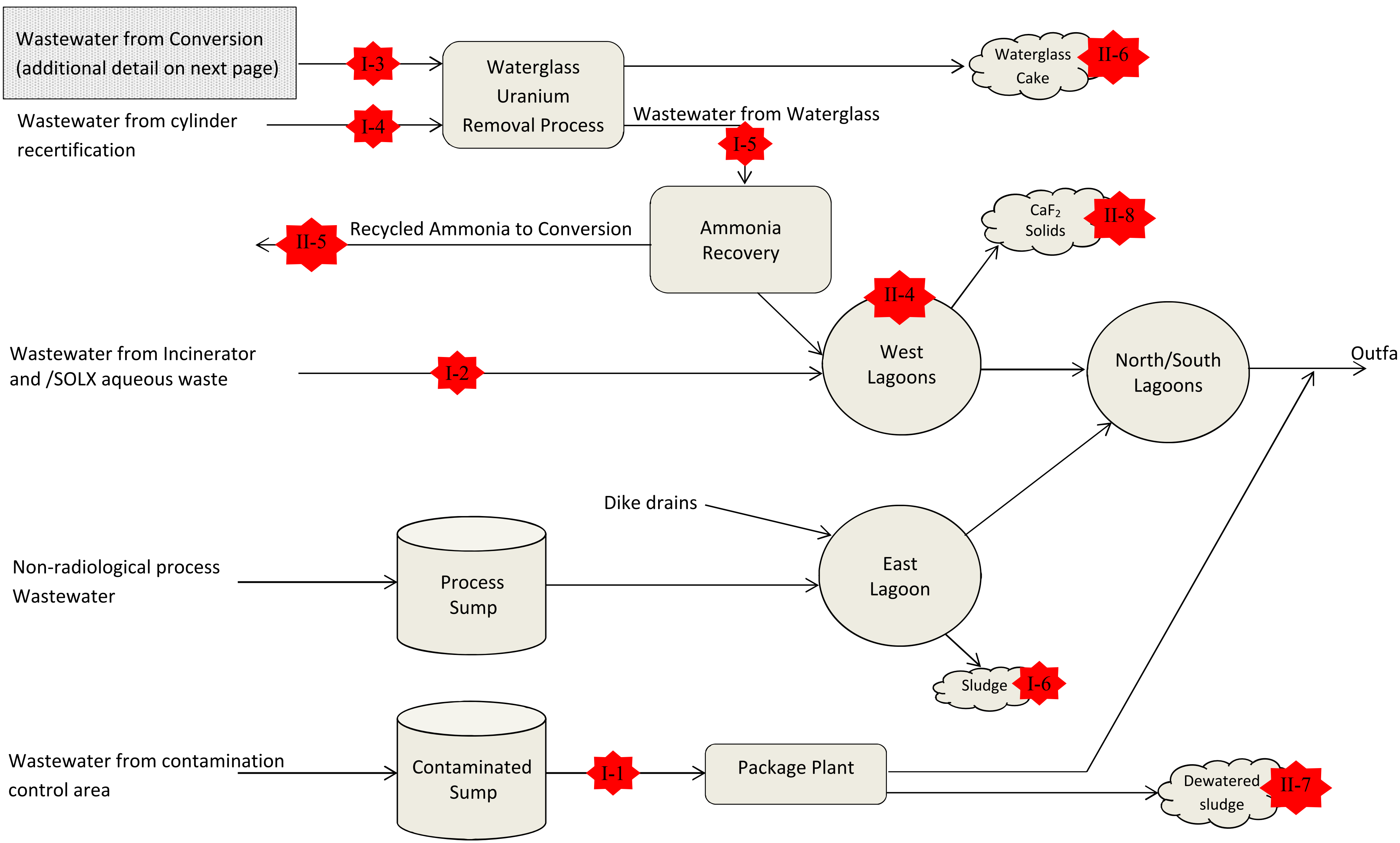
Source: 2020 Westinghouse Tc-99 Source Investigation Report

Figure 1

Aqeuous Process Flow Map

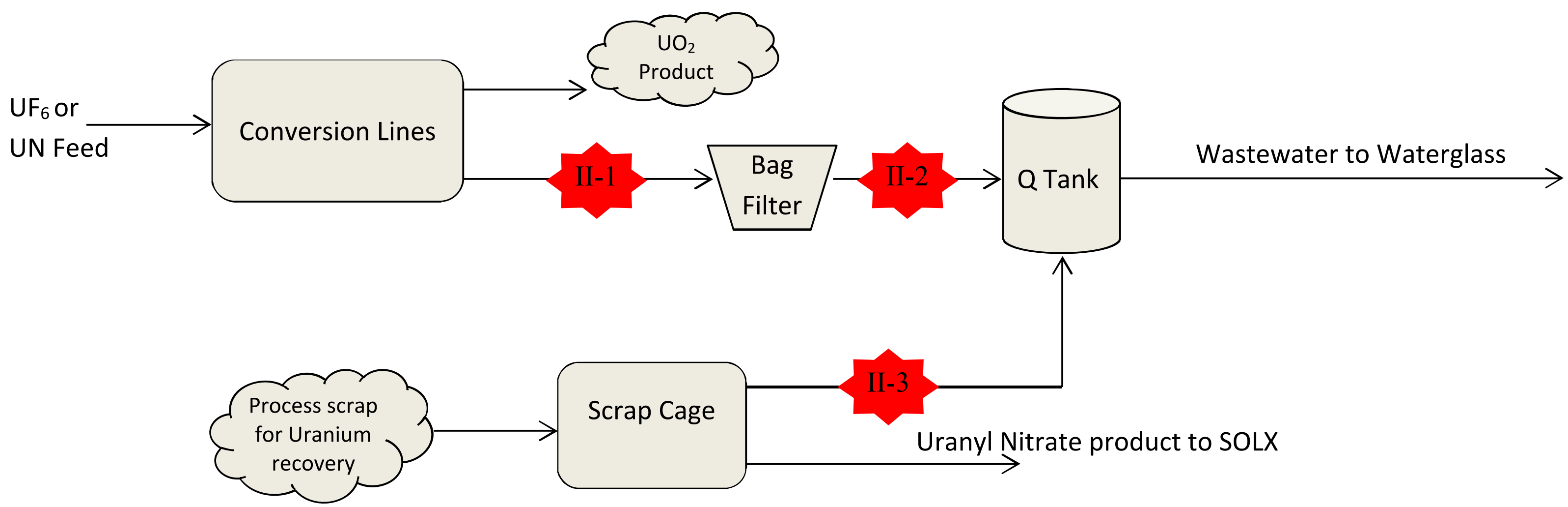
Source: 2020 Westinghouse Tc-99 Source Investigation Report

Process Map and Sample Locations



Source: 2020 Westinghouse Tc-99 Source Investigation Report

Process Map and Sample Locations



Source: 2020 Westinghouse Tc-99 Source Investigation Report

2020 AECOM HF Spiking Station #1 Assessment Report

HF Spiking Station #1 (HFSS #1) is located adjacent to HFSS #2 within the Chemical Area operable unit. Both spiking stations use the same process described in **Section 1.5.17**. To assess whether operations of HFSS#1 resulted in subsurface impacts similar to those found during the 2018 assessment beneath HFSS#2, CFFF had discussions with DHEC and decided to voluntarily investigate subslab soil quality beneath HFSS #1.

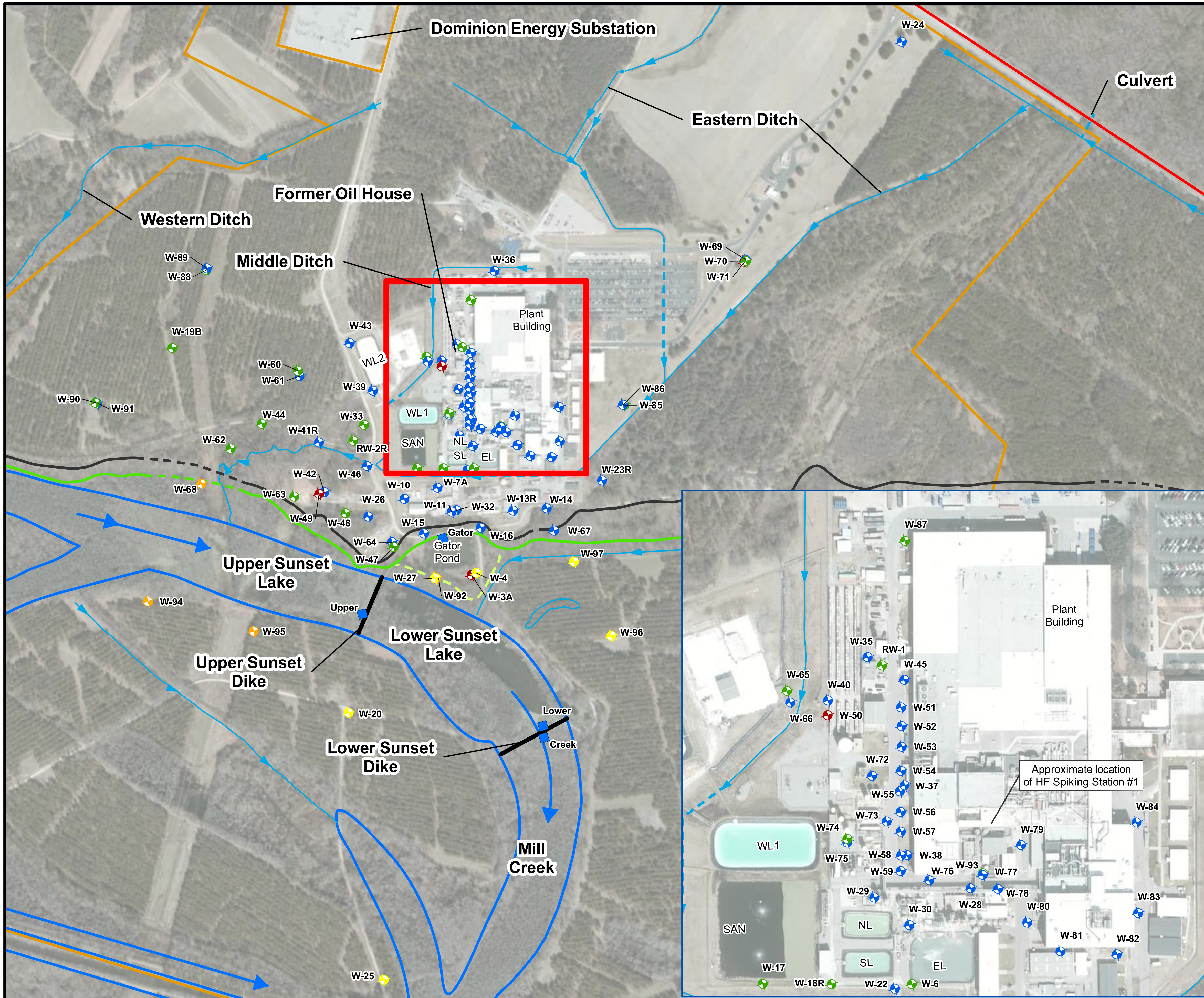
Field investigation activities were performed in May 2020 and included the installation of five hand auger borings to collect samples from beneath the HFSS #1 footprint and two angled hand auger borings to collect soil samples from adjacent to the plant buildings footer near HFSS #1. Composite soil samples were collected from five intervals, except for borings where hand auger refusal was encountered at shallower depths. Soil samples were analyzed for percent moisture, fluoride, nitrate, isotopic U, Tc-99, and pH.

Soil from four borings contained U above the site-specific remediation action level, as documented in the facility's *Procedure RA-433 Environmental Remediation Revision 1* (Westinghouse, 2020b), with the greatest impact encountered in soil samples from two boreholes at depths ranging from 2 feet below slab surface (bss) to 8 feet bss. Soil impact within two boreholes increased from the surface to the greatest impact in the 4-6 foot sampling interval and decreased thereafter. The floor (slab surface) of the manufacturing plant is elevated 4 feet above ground surface.

The report concluded:

- Some of the soil below the concrete floor within the HF Spiking Station #1 area is impacted with fluoride, nitrate, and U, and has areas of low pH (<5 standard units).
- In general, surficial soils (0-2 feet bss) has minimal impact from the operations of HFSS #1.
- Soil from four borings exceeds the site-specific remedial action levels.

The report recommended performing evaluations for dose/risk under an industrial worker scenario, potential for off-site impacts if the soil is left in place, and an assessment of site conditions as part of the decision making process. The results of the investigation are presented in the *HF Spiking Station #1 Assessment Report* (AECOM, 2020). Pertinent excerpts from this report are included below.



Legend

- Ditch
- Culvert
- Mill Creek Flow Direction
- EL East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon I
- WL2 West Lagoon II

Groundwater Monitoring Wells

- Upper Surficial Aquifer
- Lower Surficial Aquifer
- Black Mingo Aquifer
- Upper Floodplain Well
- Lower Floodplain Well
- Mill Creek
- Property Line
- SCRDI Bluff Road (Superfund Site)
- Dike Location
- Staff Gauge Location
- Top of Bluff
- Inferred Top of Bluff
- Bottom of Bluff
- Inferred Bottom of Bluff
- Secondary Bluff Area

0 300 600 Feet

1:7,200

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Source: 2020 AECOM HF Spiking Station #1 Assessment Report

AECOM

101 Research Drive
Columbia, SC 29203
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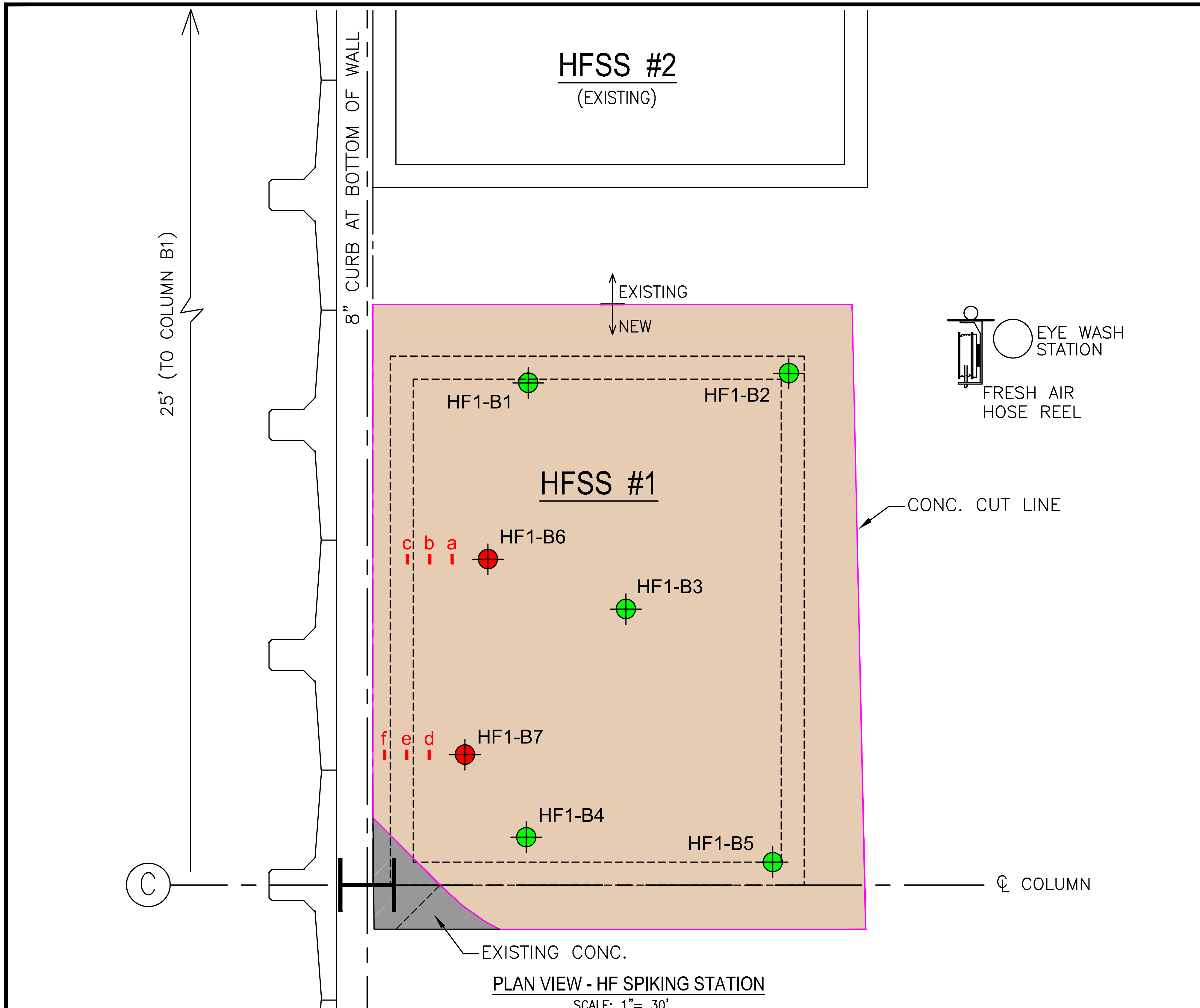
Site Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

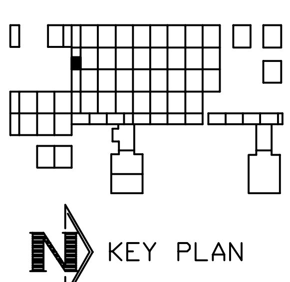
PROJECT NO.	PREPARED BY:	DATE:	
60633543	CCS	July 2020	FIGURE 2

Path: M:\EnvDataViz\Westinghouse\mxd\2020_Interim_RI_Data_Summary_Rpt\fig_2_SiteMap.mxd



PLAN VIEW - HF SPIKING STATION

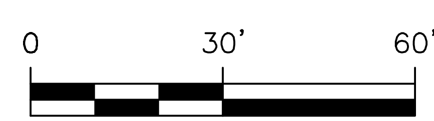
SCALE: 1"= 30'



KEY PLAN

LEGEND - SOIL SAMPLING	
SYMBOL	DESCRIPTION
	REMOVED DIKE OUTLINE, HF SPIKING STATION 1
	CONCRETE REMOVAL FOR REPLACEMENT SPIKING STATION
	SOIL SAMPLING LOCATIONS FOR SCDHEC WORK PLAN
	SOIL SAMPLING LOCATIONS FOR STRUCTURAL ENGINEERING, (SAMPLES COLLECTED @ AN ANGLE)

Source: 2020 AECOM HF Spiking Station #1 Assessment Report



GRAPHIC SCALE

Sample Data Collection Results

HF1 - B1 Sample Data 05-04-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
1–2	4.81	28.3	180	0.447 U	13.2	0.828	3.22
2–4	4.02	706	707	0.88 U	8,310	465	1,620
4–6	3.88	1,500	1,240	0.0772 U	10,100	436	1,680
6–8	4.03	936	971	0.871 U	4,500	252	802
8–10	4.26	96.4	303	0.656 U	1,440	79.4	263

HF1 - B2 Sample Data 05-05-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
1–2	6.38	1.28	76.5	0	4.65	0.455	1.39
2–4	5.16	0.623 J	90.8	0	0.847	0.107 U	0.785
4–6	6.05	1.09	94	0	1.5	0.0943 U	0.955
6–8	5.98	1.1	45.9	0.00658 U	0.926	0.0131 U	0.218
8–10	6.17	0.8 J	23.4	0	1.52	0.0407 U	0.421

HF1 - B3 Sample Data 05-05-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
1–2	4.82	6.24	285	0	3.52	0.0795 U	1.13
2–4	4.08	683	589	0	3,510	159	582
4–6	3.96	1,020	1,290	0	5,600	264	948
6–8	4.11	546	700	0	2,790	171	632
8–10	4.25	343	398	0	2,600	139	636

HF1 - B4 Sample Data 05-06-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
1–2	5.46	65.8	69.3	0	563	29	110
2–4	3.97	335	70.4	0.171 U	511	22.1	105
4–5.33	3.29	359	82.5	2.6 U	700	31.9	139

HF1 - B5 Sample Data 05-06-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
1–2	5.07	1.55	232	0	9.36	0.396	2.56
2–4	4.39	135	288	0	1,520	82.8	246
4–6	4.28	21.7	440	0	1,250	50.9	224
6–8	5.67	1.11	150	0	9.67	0.587	1.61
8–10	4.35	0.879 J	54.3	0	2.65	0.294	1.02

HF1 - B7 Sample Data (Sample collected @ angle - a,b,c) 05-06-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
"a" 0–1.90	8.09	N/S	N/S	N/S	N/S	N/S	N/S
"b" 1.90–3.79	6.35	5.67	14.5	0	403	19.3	78.5
"c" 3.79–5.37	6.22	43.8	38.0	0	226	9.66	41.6

HF1 - B7 Sample Data (Sample collected @ angle - d,e,f) 05-06-2020

Depth BSS ft.	Corrosivity SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
"d" 0–1.88	4.72	40.4	127	0	2,140	93.5	313
"e" 1.88–3.75	4.41	158	178	3.15 U	2,020	92	355
"f" 3.75–5.08	5.21	121	83	0.627 U	799	46.5	158
5.08–REFUSAL	4.58	N/S	N/S	N/S	N/S	N/S	N/S

	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
REMEDIAL ACTION SCREENING LEVEL	3,100	130,000	88,400	3,310	39	179

NOTES:

BSS - BELOW SOIL SURFACE
FT. - FEET
SU - STANDARD UNITS
mg/kg - MILLIGRAM PER KILOGRAM
pCi/g - PICOCURIES PER GRAM
U - NOT DETECTED ABOVE THE METHOD DETECTION CONCENTRATION
N/S - NOT SAMPLED
- SHADED CELLS EXCEED THE REMEDIAL ACTION SCREENING LEVEL
- GEL LABORATORY WORK ORDERS : 510581, 510757, 510807

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Figure 3

HF Spiking Station #1
Soil CoC Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY: CAV	CHECKED BY: JG	APPROVED BY: JG
60533543	DATE: JULY 15, 2020	DATE: JULY 15, 2020	SHEET: 1 OF 1

Table 1
Westinghouse Columbia Fuel Fabrication Facility
HF Spiking Station #1
Soil Analytical Results

			Analyte Unit	pH SU	Fluoride mg/kg	Nitrate mg/kg	Technetium-99 pCi/g	Uranium-233/234 pCi/g	Uranium-235/236 pCi/g	Uranium-238 pCi/g
Sample ID	Sample Depth	Depth BSS	Sample Date							
HF1-B1-(1-2)	1 - 2 ft	1 - 2 ft	5/4/2020	**4.81**	**28.3**	**180**	0.447 U	**13.2**	**0.828**	**3.22**
HF1-B1-(2-4)	2 - 4 ft	2 - 4 ft	5/4/2020	**4.02**	**706**	**707**	0.88 U	**8,310**	**465**	**1,620**
HF1-B1-(4-6)	4 - 6 ft	4 - 6 ft	5/4/2020	**3.88**	**1500**	**1240**	0.0772 U	**10,100**	**436**	**1,680**
HF1-B1-(6-8)	6 - 8 ft	6 - 8 ft	5/4/2020	**4.03**	**936**	**971**	0.871 U	**4,500**	**252**	**802**
HF1-B1-(8-10)	8 - 10 ft	8 - 10 ft	5/4/2020	**4.26**	**96.4**	**303**	0.656 U	**1,440**	**79.4**	**263**
HF1-B2-(1-2)	1 - 2 ft	1 - 2 ft	5/5/2020	**6.38**	**1.28**	**76.5**	0	**4.65**	**0.455**	**1.39**
HF1-B2-(2-4)	2 - 4 ft	2 - 4 ft	5/5/2020	**5.16**	**0.623 J**	**90.8**	0	**0.847**	0.107 U	**0.785**
HF1-B2-(4-6)	4 - 6 ft	4 - 6 ft	5/5/2020	**6.05**	1.09	**94**	0	**1.5**	0.0943 U	**0.955**
HF1-B2-(6-8)	6 - 8 ft	6 - 8 ft	5/5/2020	**5.98**	1.1	**45.9**	0.00658 U	**0.926**	0.0131 U	**0.218**
HF1-B2-(8-10)	8 - 10 ft	8 - 10 ft	5/5/2020	**6.17**	**0.8 J**	**23.4**	0	**1.52**	0.0407 U	**0.421**
HF1-B3-(1-2)	1 - 2 ft	1 - 2 ft	5/5/2020	**4.82**	**6.24**	**285**	0	**3.52**	0.0795 U	**1.13**
HF1-B3-(2-4)	2 - 4 ft	2 - 4 ft	5/5/2020	**4.08**	**683**	**589**	0	**3,510**	**159**	**582**
HF1-B3-(4-6)	4 - 6 ft	4 - 6 ft	5/5/2020	**3.96**	**1020**	**1290**	0	**5,600**	**264**	**948**
HF1-B3-(6-8)	6 - 8 ft	6 - 8 ft	5/5/2020	**4.11**	**546**	**700**	0	**2,790**	**171**	**632**
HF1-B3-(8-10)	8 - 10 ft	8 - 10 ft	5/5/2020	**4.25**	**343**	**398**	0	**2,600**	**139**	**636**
HF1-B4-(1-2)	1 - 2 ft	1 - 2 ft	5/6/2020	**5.46**	**65.8**	**69.3**	0	**563**	**29**	**110**
HF1-B4-(2-4)	2 - 4 ft	2 - 4 ft	5/6/2020	**3.97**	**335**	**70.4**	0.171 U	**511**	**22.1**	**105**
HF1-B4-(4-5.33)	4 - 5.33 ft	4 - 5.33 ft	5/6/2020	**3.29**	**359**	**82.5**	2.6 U	**700**	**31.9**	**139**
HF1-B5-(1-2)	1 - 2 ft	1 - 2 ft	5/6/2020	**5.07**	**1.55**	**232**	0	**9.36**	**0.396**	**2.56**
HF1-B5-(2-4)	2 - 4 ft	2 - 4 ft	5/6/2020	**4.39**	**135**	**288**	0	**1,520**	**82.8**	**246**
HF1-B5-(4-6)	4 - 6 ft	4 - 6 ft	5/6/2020	**4.28**	**21.7**	**440**	0	**1,250**	**50.9**	**224**
HF1-B5-(6-8)	6 - 8 ft	6 - 8 ft	5/6/2020	**5.67**	1.11	**150**	0	**9.67**	**0.587**	**1.61**
HF1-B5-(8-10)	8 - 10 ft	8 - 10 ft	5/6/2020	**4.35**	**0.879 J**	**54.3**	0	**2.65**	**0.294**	**1.02**
HF1-B6-(0-2)	0 - 2 ft	0-1.90 ft	5/6/2020	**8.09**	NA	NA	NA	NA	NA	NA
HF1-B6-(2-4)	2 - 4 ft	1.90-3.79 ft	5/6/2020	**6.35**	**5.67**	**14.5**	0	**403**	**19.3**	**78.5**
HF1-B6-(4-5.67)	4 - 5.67 ft	3.79-5.37 ft	5/6/2020	**6.22**	**43.8**	**38**	0	**226**	**9.66**	**41.6**
HF1-B7-(0-2)	0 - 2 ft	0-1.88 ft	5/6/2020	**4.72**	**40.4**	**127**	0	**2,140**	**93.5**	**313**
HF1-B7-(2-4)	2 - 4 ft	1.88-3.75 ft	5/6/2020	**4.41**	**158**	**178**	3.15 U	**2,020**	**92**	**355**
HF1-B7-(4-5.42)	4 - 5.42 ft	3.75-5.08 ft	5/6/2020	**5.21**	**121**	**83**	0.627 U	**799**	**46.5**	**158**
HF1-B7-REFUSAL	5.42 - 5.42 ft	5.08 ft	5/6/2020	**4.58**	NA	NA	NA	NA	NA	NA
Industrial Use Remedial Action Level					3,100	130,000	89,400	3,310	39	179

Notes:
SU - standard units
mg/kg - milligram per kilogram
pCi/g - picocuries per gram
BSS - below soil surface
ft - feet
U - not detected above the minimum detectible concentration
Shaded cells exceed the remedial action screening level

Source: 2020 AECOM HF Spiking Station #1 Assessment Report

2021 Westinghouse Sanitary Lagoon Sludge Characterization Report

Site sanitary sewage is treated in an extended aeration package plant prior to discharge to the Sanitary Lagoon. The Sanitary Lagoon was installed in 1968 and is not lined. The Sanitary Lagoon is approximately 240 feet (ft) by 240 ft and approximately 6-7 ft deep. Sludge in the Sanitary Lagoon was characterized in 2021 in support of the planned closure of the Sanitary Lagoon.

To characterize the lagoon sludge for removal, the *Sanitary Lagoon Sludge Characterization Work Plan* (Westinghouse, 2021a) was submitted to DHEC in January 2021 and following approval, implemented in June 2021. The intent was for the characterization data to be used to prepare a Closure Plan. The analytical data was also used to identify COPCs that potentially could have impacted soil and groundwater underlying the lagoon.

The Sanitary Lagoon was gridded into five rows and five columns creating 25 grid squares. A total of 26 sludge samples were collected with 25 samples from the middle of each grid square and one sample at the lagoon influent. The samples were collected by pushing a PVC tube into the sludge, sealing the open end, and retrieving the sample. The samples were analyzed for isotopic U, Tc-99, fluoride, nitrate, and ammonia. Five samples were analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) and the EPA's Target Compound List/Target Analyte List.

The laboratory radiological data was compared to the Residential Use Screening Levels and the Industrial Use Screening Levels using the sum of fractions (SOFs) approach. Values less than or equal to 1.0 for SOFs indicated that the screening level was not exceeded and results greater than 1.0 indicated that the SOFs was exceeded. The radiological results were reported in two ways, dried sample activity and moisture included. Based on dried sample activity, the results for all 26 samples exceeded the residential SOFs and 14 samples exceeded the industrial SOFs. However, the report indicated that the dried results did not represent risk to the work force since the lagoon is not dry. Therefore, the report recommended that moisture-included activity results should be considered with respect to the risk evaluation. These results indicated that the residential SOFs was exceeded in the 26 sludge samples, but the industrial SOFs was exceeded in only one sample.

The chemical analytical data was compared to EPA residential and industrial screening levels for fluoride, nitrate, and ammonia. The results indicated that none of the residential and industrial screening levels were exceeded. TCLP results indicated that four of the TCLP constituents were detected at concentrations less than TCLP hazardous waste limits for barium, methyl ethyl ketone, PCE, and TCE. These results were documented in the *Sanitary Lagoon Sludge Characterization Report* (Westinghouse, 2021b).

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Appendix D
Historical Remediation Report Summaries and Excerpts

Historical Remediation Activities

Previous environmental remediation activities were performed beginning in 1998. Brief summaries of these remediation activities are below.

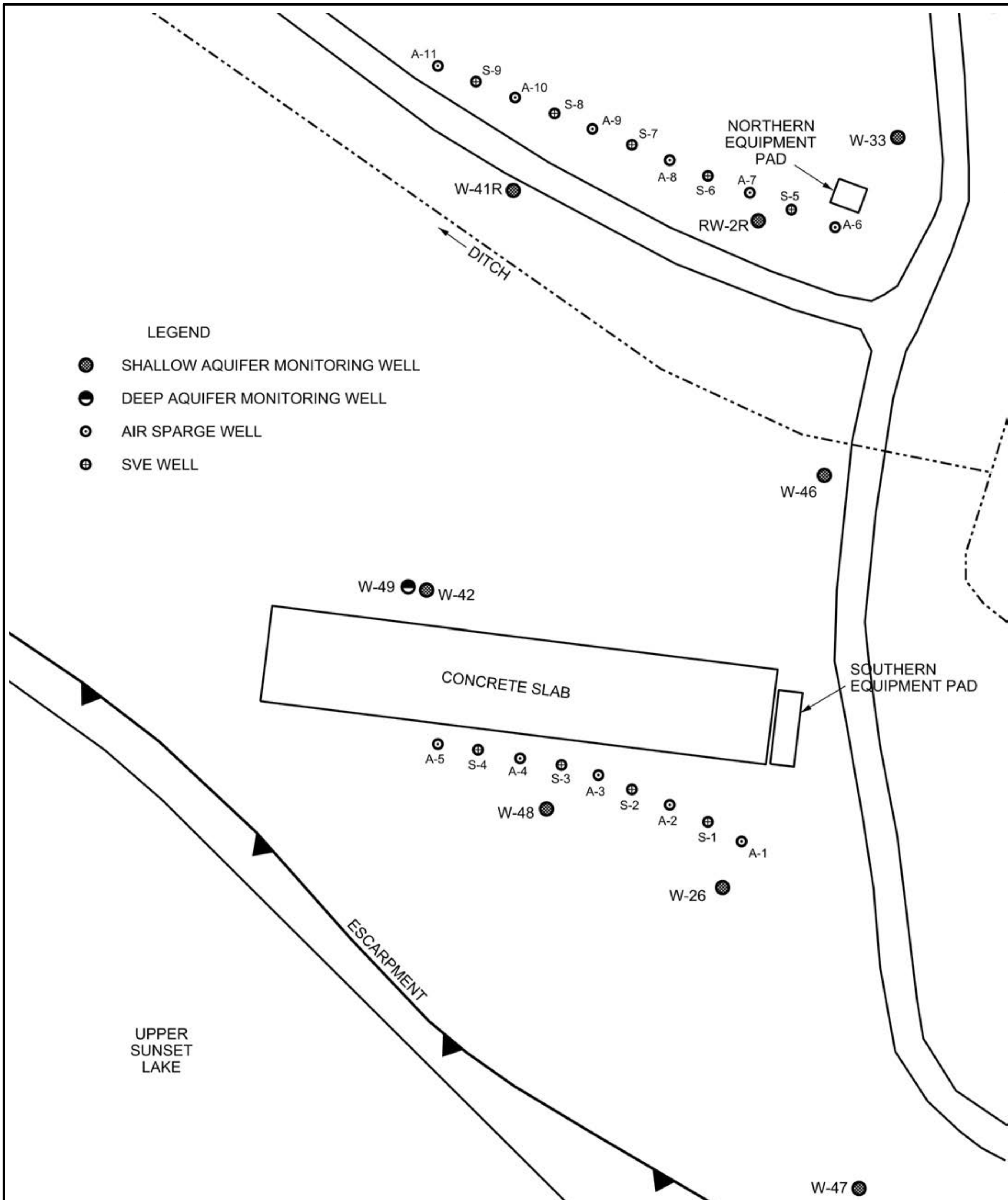
Air Sparge/Soil Vapor Extraction System

An air sparge/soil vapor extraction (AS/SVE) pilot study was conducted in 1996 that indicated AS/SVE technology was effective for removing chlorinated volatile organic compounds (CVOCs) from the shallow aquifer and unsaturated zone. A full-scale AS/SVE system was constructed in 1997 in downgradient areas of the CVOC plume. The system consisted of a southern area of five AS wells and four SVE wells and a northern area of six AS wells and five SVE wells. The locations of these wells are shown below. Monitoring wells W-26, W-42, W-48, and W-49 are located in the southern AS/SVE area, and monitoring wells W-33, RW-2, and W-41 are located in the northern AS/SVE area.

The AS/SVE system blew air into the surficial aquifer at the top of the confining clay. This air migrated upward through groundwater impacted with volatile organic compounds (VOCs). A vacuum was applied to the vadose zone that removed the VOC impacted air from the subsurface which was exhausted through a stack that did not require additional treatment to meet air quality standards.

A system performance evaluation in 2009 (AECOM, 2009) indicated that the AS/SVE system appeared to have reached a plateau phase with reduced efficiency and decreased ability to further reduce VOC concentrations. According to the evaluation, the operation of the system resulted in decreasing CVOC concentrations in groundwater and reduced the estimated total mass in the AS/SVE areas by approximately 76 percent. Estimated mass reduction in the areas influenced by the AS/SVE system was 97 percent in the southern AS/SVE area and 44 percent in the northern AS/SVE area. The mass removal in these areas were likely attributable to air sparging, biodegradation of the CVOCs, and other natural attenuation mechanisms.

The South Carolina Department of Health and Environmental Control (DHEC) agreed to the shutdown of the system in 2011, and it was turned off.



0 50 100 200

SCALE IN FEET

Source: 2009 AECOM, Remediation Performance Evaluation and Application for Groundwater Mixing Zone

AECOM

810 Dutch Square Blvd., Suite 202
Columbia, SC 29210
T: (803) 798-1073 F: (803) 216-0708

AIR SPARGE/SVE SYSTEM LAYOUT

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	DRAWN BY:	DATE:	
60302740	RJS	December 2013	FIGURE 1-4

2019 HF Spiking Station #2 Soil Removal

The data provided in the *HF Spiking Station #2 Assessment Report* (AECOM, 2018) and the *Technical Basis Document – Site-Specific Clean-up for Uranium in Soil at HF Spiking Station #2 at the Westinghouse Columbia Fuel Fabrication Facility (WCFFF)* (Leidos, 2018) concluded that some of the soil below the concrete floor within the Hydrofluoric Acid (HF) Spiking Station #2 (HFSS#2) area was impacted with fluoride, nitrate, uranium (U) and had localized areas of low pH (<5 standard units). Except for soil from borehole HF-B1, the analytes did not indicate impact below 7-9 feet below concrete surface (bcs) within the HFSS#2 footprint. In borehole HF-B1, impacted soil was detected to a depth of 11-12 feet bcs.

Based on the data, WCFFF completed the following:

- Removed impacted soil below the HFSS#2 to a practical excavation depth of approximately 9-12 feet to eliminate risk to WCFFF employees and risk of potential future migration to the groundwater. Soil samples were collected from the bottom of the excavation to confirm completion of the remedial activities.
- Filled the area underneath HFSS#2, where impacted soil was removed with a suitable fill material.
- Disposed of the impacted soil in an approved facility and submitted copies of the waste disposal manifests to DHEC.
- Developed and implemented a conceptual site model to assist the Columbia Fuel Fabrication Facility (CFFF) in developing and implementing monitoring and remediation strategies needed for constituents of potential concern (COPC).

2021 East Lagoon Closure

CFFF uses lined lagoons as part of the wastewater treatment process. The liner in the East Lagoon had reached the end of its useful life, and CFFF decided to close the East Lagoon and conduct the primary wastewater treatment function that the lagoon accomplished in an above ground storage tank. Therefore, the *East Lagoon Closure Plan* (GEL, 2020) was developed to specify the process to accomplish closure. East Lagoon closure was submitted as Addendum 2 of the overall Remedial Investigation being performed under Consent Agreement (CA) CA-19-02-HW.

To characterize the sludge in the East Lagoon, sampling for U, technetium-99 (Tc-99), fluoride, nitrate, and ammonia was conducted in October 2019. The sludge sample analyses were used to develop remediation plans and to inform decisions regarding sludge disposal. East Lagoon Characterization results are summarized in the *Wastewater Treatment Area Operable Unit East Lagoon Characterization Summary Report* dated December 6, 2019 (Westinghouse, 2019e) and in the *East Lagoon Closure Certification* dated September 29, 2021 (GEL, 2021). Remediation plans were developed using the Westinghouse risk-based *Procedure RA-433, Environmental Remediation* (Westinghouse, 2020a).

The remediation strategy began first in 2020 with lagoon dewatering and sludge stabilization, using calcium fluoride and Portland cement. The removed materials (sludge, liners, soil, and debris) were packaged onsite and shipped offsite for disposal at the properly permitted U.S. Ecology landfill in Grandview, Idaho.

To evaluate soil quality below the liner, sub-liner soil sampling was performed at 16 gridded sludge sampling locations and at 10 additional biased locations. Radiological and chemical concentrations of the 26 soil samples were compared to the RUSLs provided in the facility's *Procedure RA-433, Environmental Remediation* (Westinghouse, 2020a). U and Tc-99 concentrations in sub-liner soil exceeded RUSLs but were lower than those identified in the sludge and were below Industrial Use Screening Levels. Chemical constituent concentrations in sub-liner soil were also lower than those identified in the sludge and all but one of the sample concentrations were below the RUSL.

Plans were developed to excavate radiologically impacted soils exceeding the Residential Use Screening Levels (RUSL) to the maximum extent practical considering existing structures or presence of groundwater. The excavation was performed from June 8 through June 30, 2021. The excavation included removal of the Hypalon® and asphalt liners, and excavation of soils exceeding the RUSL around the lagoon perimeter and in the lagoon bottom to the extent practical. Areas where radiological concentrations in the soil did not exceed the RUSL were not excavated.

Upon completion of soil excavation, additional soil sampling and radiological analyses were performed on soils left in-place in areas where excavation depths were below the initial characterization sample depths. The sum of fractions (SOFs) for U and Tc-99 activity exceeded the RUSL in 7 of the 23 soil samples at SOFs ranging from 1.0 to 4.2. These results are stored in the site's decommissioning records and will be used to guide future remediation planning at the time of facility decommissioning. Restoration activities, including placement of clean backfill, grading and site stabilization, were completed in August 2021 and DHEC approval of the closure was received on November 1, 2021 (DHEC, 2021).

The *East Lagoon Closure Certification* (GEL, 2021) is included below.

Westinghouse Electric Company
Nuclear Fuel
Columbia Fuel Fabrication Facility
5801 Bluff Road
Hopkins, South Carolina 29061
USA

Mr. Samuel Jones
Midlands EA Office
State Park Health Center
SC Department of Health and Environmental Control
8500 Farrow Road, Building 12
Columbia, South Carolina 29203

Direct tel: 803.647.3171
Direct fax: 803.695.3964
e-mail: teaguecj@westinghouse.com
Your ref: NPDES Permit #SC0001848
Our ref: LTR-RAC-21-67

cc:
SCDHEC
Kim Kuhn, Bureau of Land & Waste Management
Crystal Rippy, Bureau of Water
Byron Amick, Bureau of Water
2600 Bull Street
Columbia, SC 29201

cc:
Tom Hutto, GEL
Clark Evers, LEIDOS

cc:
Nancy Parr, Diana Joyner, Brian Pasco

Subject: East Lagoon Closure Certification

September 29, 2021

Please accept the enclosed "East Lagoon Closure Certification," consolidated on Westinghouse's behalf by GEL Engineering.

Once the Department has reviewed the report, Westinghouse would be pleased to schedule the final inspection to achieve final closure of the East Lagoon.

Respectfully,

Cynthia J. Teague

Cynthia J. Teague
Principal Environmental Engineer
Westinghouse Electric Company, CFFF
803.312.4171 (m)

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September 29, 2021

Mr. Samuel Jones
Midlands EA Office
State Park Health Center
SC Department of Health and Environmental Control
8500 Farrow Road, Building 12
Columbia, South Carolina 29203

Re: **East Lagoon Closure Certification**
Westinghouse Electric Company, LLC
Columbia Fuel Fabrication Facility
NPDES Permit #SC0001848
Richland County, South Carolina

Dear Mr. Jones:

In Byron Amick's letter dated October 14, 2020, Westinghouse received *East Lagoon Closure Plan* Approval # LOA-005497. Approval of the closure plan included seven conditions. Westinghouse implemented the closure activities, as discussed below, except for the final inspection by personnel from the regional office of the Department of Health and Environmental Control (approval condition No. 7). Therefore, Westinghouse requests the final inspection in order to achieve final closure.

Approval of the *East Lagoon Closure Plan* included seven conditions which are shown below in *italics* followed by information pertaining to conformance with these conditions.

1. *Closure shall be completed in accordance with the closure plan submitted to this office on September 11, 2020.*

   East Lagoon Closure activities were conducted in conformance with *East Lagoon Closure Plan* (LTR-RAC-20-57) as described in Attachment 1.

2. *Wastewater will be disposed via the on-site wastewater treatment system and discharge through the permitted NPDES outfall (SC0001848).*

   All wastewater was disposed via the NPDES outfall as described in Attachment 1.

3. *Sludge and the liner will be disposed at US Ecology's landfill in Grand View, Idaho. If the material needs to be taken to a different facility for final disposal, the Department will have to grant approval prior to disposal.*

   The sludge and liner were disposed at US Ecology's Grand View facility as described in Attachment 1.

4. *As indicated in the closure plan, once the lagoon is removed Westinghouse will coordinate with this Office and Department's Site Assessment, Remediation & Revitalization Division to assess the soil beneath the lagoon to determine if additional soil removal or remediation is required. The Department must agree that the constituents in the soil beneath the lagoon are acceptable before the final steps of closure can be taken.*

This required coordination and assessment occurred as described in Attachment 1.

5. *Areas around the waste treatment facility shall remain secured until closeout has been approved by DHEC.*

   The areas around the waste treatment facility remain secured pending DHEC approval of the closeout.

6. *Once closeout construction has begun, it shall be continuous until closeout is completed. Failure to properly proceed with the closeout or properly complete the closeout of this lagoon may result in enforcement action by this Agency. Closeout shall be completed by December 31, 2021. Any request for an extension shall be made in writing and approved by this office in writing. Justification of the need for an extension shall be included with the request.*

   Closeout was conducted in an ongoing manner, and an extension was not requested.

7. *Upon completion of closeout, the facility shall request a final inspection by the regional DHEC office. The request will include a letter from a SC Registered Professional Engineer or a SC Registered Professional Geologist, stating that the closeout has been completed in accordance with the approved closure plan. You may contact Samuel Jones of the Midlands EA office at State Park Health Center, 8500 Farrow Road, Bldg. 12 Columbia SC 29203, 803-896-0620 to set up this inspection. Final closeout will be considered only after written approval from the regional DHEC office.*

   This letter constitutes the required certification and request for final inspection.

Thank you for your assistance in completing this project. We look forward to meeting you onsite.

Yours very truly,

Tom Hutto

Thomas D.W. Hutto, P.G.
Principal

Attachments

cc: Mr. Byron M. Amick, DHEC Bureau of Water
Ms. Kim Kuhn, DHEC Bureau of Land and Waste Management
Ms. Nancy Parr, Westinghouse
Ms. Cynthia Teague, Westinghouse
Ms. Diana Joyner, Westinghouse
Mr. Brian Pasco, Westinghouse

ATTACHMENT 1

Westinghouse Columbia Fuel Fabrication Facility
East Lagoon Closure

Summary

Closure of the East Lagoon at the Westinghouse Columbia Fuel Fabrication Facility (Westinghouse) was performed in accordance with the *East Lagoon Closure Plan* (*Closure Plan*) dated June 30, 2020 (LTR-RAC-20-57). Minor adjustments were made based on field conditions as allowed by the plan. Clean-up of impacted soils was completed in accordance with the Westinghouse risk-based procedure RA-433, *Environmental Remediation*. The removed materials (sludge, liners, soil, and debris) were packaged onsite and shipped offsite for disposal at the properly permitted U.S. Ecology landfill in Grandview, Idaho. Backfill and restoration activities were completed using clean soil, and grass is now growing in the former lagoon footprint.

Site History and Background

Westinghouse manufactures commercial nuclear fuel near Columbia, South Carolina under Nuclear Regulatory Commission (NRC) Special Nuclear Material (SNM) license SNM-1107. The facility treats wastewater generated by its production process in accordance with its National Pollutant Discharge Elimination System (NPDES) permit SC0001848 issued by the South Carolina Department of Health and Environmental Control (DHEC).

The liner in the East Lagoon had reached the end of its useful life, and Westinghouse determined that it would close the East Lagoon and conduct the primary wastewater treatment function that the East Lagoon accomplished in an above ground tank. Therefore, the *East Lagoon Closure Plan* was developed to specify the process to accomplish closure. The *East Lagoon Closure Plan* was approved by DHEC in a letter dated October 14, 2020 (# LOA-005497).

Characterization Sampling

To characterize the sludge in the East Lagoon, sampling was conducted in October 2019. A grid of 16 sample locations was superimposed over the East Lagoon surface. Sludge samples were collected and analyzed for various radiological and chemical parameters at each of the sample locations. Thickness of water and sludge was also measured at each location. The results of these analyses were used to develop remediation plans, as well as to inform decisions regarding the disposal of the sludge. The results of the East Lagoon Characterization are summarized in the *Wastewater Treatment Area Operable Unit East Lagoon [Sludge] Characterization Summary Report* dated December 6, 2019 (LTR-RAC-19-97). The grid and 16 sample points are shown in **Figure 1**.

Figure 1 – East Lagoon Sludge Characterization Sampling Grid

Remediation Planning

Remediation plans were developed using the Westinghouse risk-based procedure RA-433, *Environmental Remediation* and the findings contained in the *Wastewater Treatment Area Operable Unit East Lagoon [Sludge] Characterization Summary Report*. The remediation strategy began first with dewatering the lagoon, and then focused on stabilizing sludge "in place". Sludge stabilization was performed by dividing the East Lagoon into small pockets, or "operating cells" and adding a mixture of calcium fluoride (CaF_2) and portland cement to solidify the sludge, absorb any residual free liquid and prepare the waste for packaging and transportation.

Westinghouse submitted an Alternate Disposal Request (ADR) to the NRC as outlined in 10 CFR 20.2002 to request approval for low activity waste disposal at the US Ecology Disposal Facility in Grandview, Idaho (USE-I). The 10 CFR 20.2002 regulation specifies the process to request permission from the NRC to dispose of low level radioactive waste (LLRW) at this facility. The request was approved by NRC in December of 2020 (ADAMS Accession No. ML20302A341). Subsequent to that, Westinghouse requested a second ADR in February of 2021. The amendment was necessary because the segregated CaF_2 pile approved to be disposed in the initial request was not adequate to meet the volume required in the initial ADR. Test results of a second segregated CaF_2 pile were provided to show that the contents of a second pile were bounded by the data provided in the original request. The second ADR request was approved by the NRC in March of 2021 (ADAMS Accession No. ML21064A225).

Sludge Stabilization and Removal

Dewatering and sludge stabilization began in January 2021 and continued through June 2021. The process of removing water and stabilizing sludge was iterative. After each rainfall event, more water would be pumped out of the East Lagoon for onsite wastewater treatment. As each operating cell of sludge was stabilized and removed, a new cell was created, until all the sludge was stabilized and removed. A photograph of the stabilized sludge being prepared for packaging and transport is shown in **Figure 2**.

Figure 2 – East Lagoon Sludge Stabilization

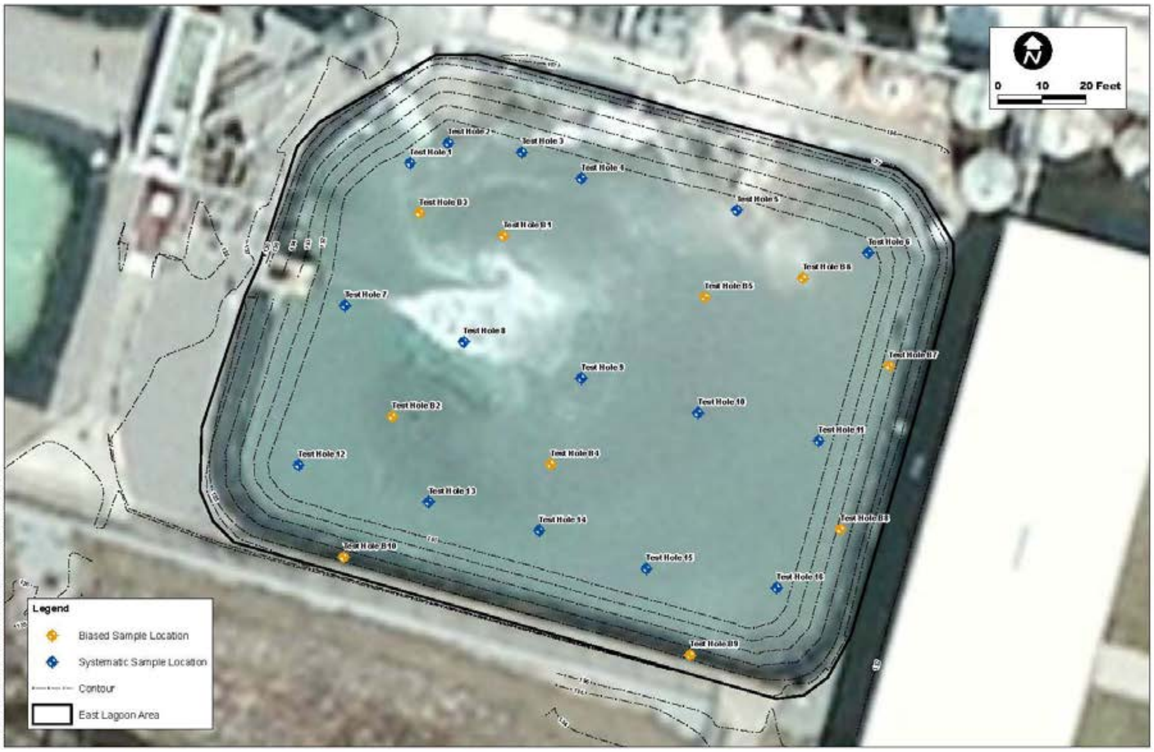
Once removed from the lagoon, the solidified sludge was packaged into 9 cubic yard "super sacks," sampled, and radiologically surveyed in accordance with the *Closure Plan.* Next, the packages were loaded onto flatbed trucks and driven approximately 10 miles to a rail transfer facility in Columbia, SC. At the facility, the super sacks were transferred to rail cars. Full rail cars were transported from Columbia to Grandview, Idaho. The rail cars were received at the USE-I facility where the low activity material was transferred to a landfill that is specifically designed to contain these types of wastes.

In total, 332 super sacks of stabilized East Lagoon sludge were generated and resulted in 17 rail car shipments.

Soil Sampling and Liner Removal

As the sludge stabilization and removal process proceeded, portions of the Hypalon liner became exposed. As the liner was exposed, it was inspected for degradation that could be a potential preferential pathway for constituent migration into the subsurface. To evaluate soil quality below the liner, sub-liner soil systematic sampling was performed at the original 16 sludge sampling locations, and at 10 additional biased locations based on observations of the liner or the professional judgement of the sampling crew. Small openings were cut in the liner, and a hand auger was used to collect soil samples from multiple depths at each location. Sample depths ranged from immediately beneath the liner to a depth of 4.5 feet below soil surface. Groundwater was encountered in some locations, mainly along the northern portion of the lagoon floor. The locations of each systematic and biased sub-liner soil sampling location are shown in **Figure 3**.

Figure 3 – Sub-Liner Soil Sampling Locations



A photograph of the sampling crew collecting sub-liner soil samples is shown in **Figure 4**.

Figure 4 – Sub-Liner Soil Sampling Crew

When sub-liner soil sampling began, an asphalt liner approximately 1 inch thick was identified immediately beneath the rubber Hypalon liner. This liner was likely from the original construction of the East Lagoon. Samples were collected from the asphalt to determine if it contained asbestos, and laboratory analysis showed that the asphalt underlayment was free of asbestos. Low levels of radioactivity were detected within the asphalt liner (possibly from its original use prior to placement of the Hypalon liner). It was removed and disposed of with the impacted soil and liner materials.

<u>Soil Remediation</u>

Radiological and chemical concentrations of the 26 soil sampling locations were compared to the Residential Use Screening Levels (RUSLs) provided in Westinghouse procedure RA-433, *Environmental Remediation*. These screening levels are provided in **Table 1.** Since the CFFF is an active facility, using the

RUSLs as a comparison is a conservative measure. For example, the RUSLs for radiological constituents were determined using highly conservative assumptions to develop an exposure scenario where it is assumed that a person would construct a house on the property, live on the property, drink the groundwater, and eat produce farmed on the property as well as fish caught on the property.

Table 1 – RA-433 Residential Use Screening Levels

Contaminant	Residential Use Screening Level (RUSL)	Basis of Screening Level
Uranium – 234	13 pCi/g (0.002 mg/Kg)	NUREG 1757, Vol. 2, Rev. 1, Appendix H[1]
Uranium – 235	8 pCi/g (3.704 mg/Kg)	NUREG 1757, Vol. 2, Rev. 1, Appendix H[1]
Uranium – 238	14 pCi/g (41.667 mg/Kg)	NUREG 1757, Vol. 2, Rev. 1, Appendix H[1]
Technetium – 99	19 pCi/g (1.110 E -03 mg/Kg)	NUREG 1757, Vol. 2, Rev. 1, Appendix H[1]
Tetrachloroethylene (PCE)	0.0023 mg/Kg	EPA Regional Screening Levels[2]
Fluoride	600 mg/Kg	EPA Regional Screening Levels[2]
Nitrate	130,000 mg/Kg	EPA Regional Screening Levels[3]

[1]NUREG-1757 Vol. 2, Rev.1 Consolidated Decommissioning Guidance, Appendix H: Criteria for Conduction Screening Dose Modeling Evaluations, Table H-2, September 2006. Screening levels are equivalent to 25 mrem/y TEDE to the critical group. These levels are considered suitable for unrestricted use per 10CFR20.1402

[2]USEPA MCL-based Soil Screening Level (TR=1E-06, HQ=1), November 2018.

[3]USEPA Regional Screening Level, Summary Table, Residential Soil Screening (TR=1E-06, HQ=1), November 2018

The radiological screening levels in **Table 1** are based on single contaminant concentrations for each isotope. When multiple radionuclides are present a “sum of fractions” (SOF) approach is used for comparison to the screening levels. The SOF for each unique sample is calculated using the following equation:

$$SOF = \frac{Conc_{U-234}}{SSL_{,U-234}} + \frac{Conc_{U-235}}{SSL_{,U-235}} + \frac{Conc_{U-238}}{SSL_{,U-238}} + \frac{Conc_{Tc-99}}{SSL_{,Tc-99}}$$

Chemical screening levels are compared individually to each chemical parameter, and do not require a sum of fractions.

Concentrations in some samples exceeded the RUSLs. As per procedure, the next step is to compare results above the RUSL to the Industrial Use Screening Levels (IUSLs). These screening levels are provided in **Table 2**. IUSLs are also based on conservative assumptions, but these assumptions better represent the current and future use of the CFFF, as it is assumed that the industrial worker will not live on the property or engage in the consumption of any food or water produced on the property.

For the radiological constituents, the concentrations contained within the sub-liner soil were lower than those identified in the sludge, and all radiological concentrations were below IUSLs. For example, the maximum identified isotopicUranium (U) concentration in the sub-liner soil was 69.4 pCi/g U-234, 2.91 pCi/g U-235, and 16.6 pCi/g U-238, and the maximum Tc-99 concentration in the sub-liner soil was 77.7 pCi/g. While these concentrations exceed the RUSL, they are significantly below IUSLs provided in **Table 2**.

Table 2 – RA-433 Industrial Use Screening Levels

Contaminant	Industrial Use Screening Level (IUSL)	Basis of Screening Level
Uranium – 234	3,310 pCi/g	NUREG 1757, Appendix H[1]
Uranium – 235	39 pCi/g	NUREG 1757, Appendix H[1]
Uranium – 238	179 pCi/g	NUREG 1757, Appendix H[1]
Technetium – 99	89,400 pCi/g	NUREG 1757, Appendix H[1]
Tetrachloroethylene (PCE)	100 mg/kg	EPA Regional Screening Levels[2]
Fluoride	3,100 mg/kg	EPA Regional Screening Levels[3]
Nitrate	130,000 mg/kg	EPA Regional Screening Levels[3]

[1] NUREG-1757 Vol. 1, Rev.2 Consolidated Decommissioning Guidance, Appendix H: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, Final Report September 2006. The individual isotope limits are based on carcinogenic risk.

[2] USEPA Regional Screening Level, Summary Table, Industrial Soil Standard (TR=1E-06, HQ=1), November 2018.

[3] USEPA Regional Screening Level, Summary Table, Residential Soil Standard (TR=1E-06, HQ=1), November 2018

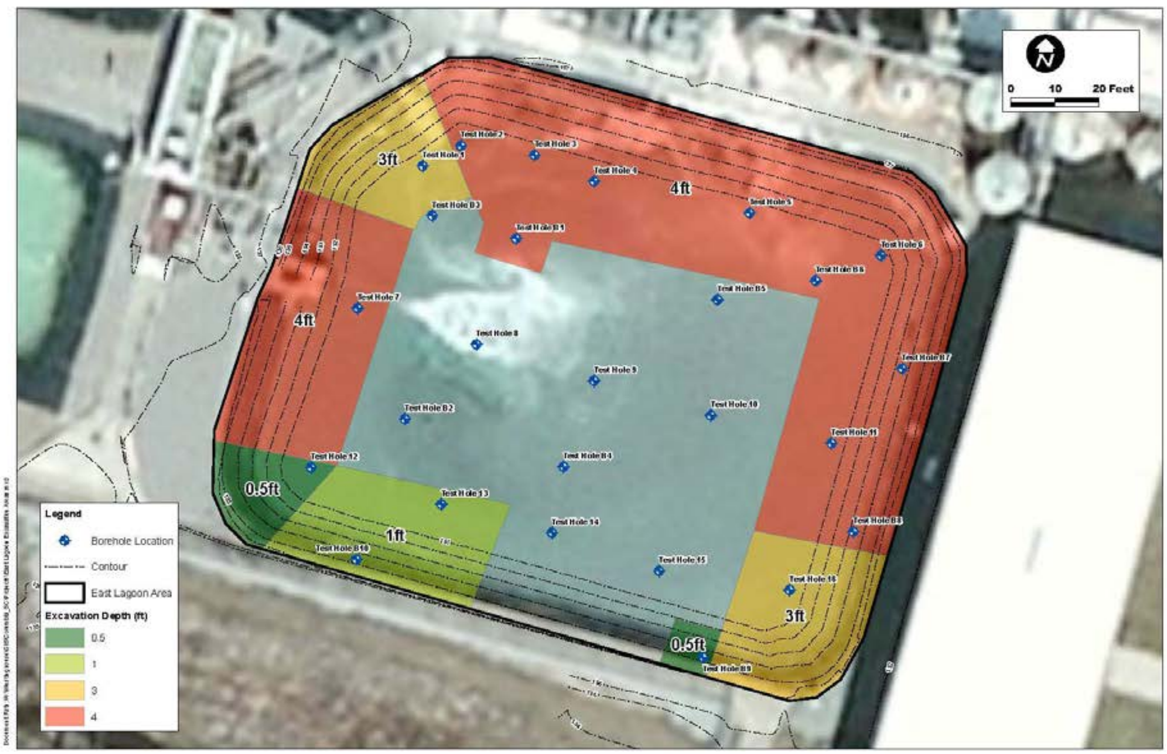
For the chemical constituents, the concentrations contained within the sub-liner soil also were lower than those identified in the sludge, and all but one of the chemical sample concentrations (PCE with a result of 0.0044 mg/Kg compared to the RUSL of 0.0023 mg/Kg) were below the RUSL specified in RA-433. Based on this small exceedance, and the sample location approximately 10 ft below the ground surface, it presents very little risk to the workers or the environment; therefore, no remediation was necessary for the soil based on chemical constituent concentrations. The full table of all chemical sampling results are provided for reference in **Appendix 1**.

Soil Removal

A large area in the center of the lagoon exhibited radiological concentrations below the RUSL. Portions of the banks of the lagoon were above the radiological RUSL, but below the IUSL.

Excavation plans were developed to remediate radiologically impacted areas based on the soil concentrations identified in each area and the depths to which they extended. Areas that were identified as below the RUSL in Table 1 did not require any remedial action. Areas that exceeded the RUSL were excavated to the maximum extent practical as described in the steps below (i.e., excavations were proceeded as far as possible without undermining existing structures or encountering groundwater). These results are shown on **Figure 5**.

Figure 5 – East Lagoon Soil Excavation Areas



The goal of East Lagoon soil remediation efforts was to remove soil containing impacts above the RUSLs wherever it was safely accessible. These remediation plans were discussed with DHEC prior to the start of excavation through site visits, weekly phone calls regarding the Remedial Investigation (RI) status, and monthly progress reports required by Consent Agreement 19-02-HW. In summary the removal included the following:

1) The former East Lagoon Hypalon and asphalt liners were completely removed except where small portions of the asphalt liner extended beneath the concrete sidewalk to the South of the East Lagoon. Soil samples collected from underneath the sidewalk were below the RUSLs. Because the sidewalk was not removed, this area has been noted in decommissioning records and will be investigated and remediated as required at the time of facility decommissioning.

2) Excavation was limited around the perimeter of the East Lagoon because it was surrounded by structures. Excavation of too much soil would undermine the existing structures such as the LLRW storage building, the ammonia distillation columns, and the walkways that support water management for the remaining lagoons. Excavations around the East Lagoon perimeter were limited to a Type C slope as defined by the OSHA Technical Manual (OTM) Section V, Chapter 2 to be a 1.5:1 height to depth ratio. Areas where radiological impacts remain above RUSLs have been noted in decommissioning records and will be investigated and remediated as required at the time of facility decommissioning.

3) During excavation, it was noted that groundwater intrusion occurred at depths greater than approximately 4 ft below the East Lagoon bottom (or approximately 10ft below natural ground surface). Therefore, future excavations within the footprint were limited to 3 feet below the East Lagoon bottom (or approximately 9 ft below the natural ground surface) to avoid encountering additional groundwater.

4) Areas where radiological concentrations in the soil did not exceed the RUSL were not excavated, and the soil was left in place.

Soil remediation concluded in June 2021. A photograph of the East Lagoon following excavation is included as **Figure 6**.

Figure 6 – Sub-Liner Soil Excavation

Soil and liner materials that were removed from the East Lagoon were packaged in the same manner as the East Lagoon sludge and shipped by rail to the USE-I facility.

In total, 165 super sacks were generated of East Lagoon soil, liner material, and small amounts of miscellaneous debris that resulted in 8 rail car shipments.

Three features associated with the East Lagoon were exposed during removal of sludge and underlying soil. These include the following:

- Concrete Sump - During sludge removal, a 3-foot diameter concrete structure was uncovered and removed. The structure resembled a sump and had a closed, concrete bottom protruding through the lagoon liner, and therefore did not create a pathway into the environment. The structure was located in the northwest corner of the lagoon at a low point. Sludge samples collected from the inside of the structure and the surrounding area were consistent with the remainder of the East Lagoon sludge. Soil sample ID EL-SUMP-4.5' was collected from the underlying soil after removal of the concrete sump, and the results are presented in **Table 3**. The results show that the area radiological concentrations are slightly elevated when compared to the RUSLs, which is consistent with the conditions of the surrounding soil.

- Small Diameter Clay Pipe - Discovered during soil excavation, the pipe circled the bottom perimeter of the East Lagoon footprint and was a French drain installed during the original lagoon construction as a means for leak detection. The French drain discharged into the adjacent stormwater ditch and was removed and disposed of with the surrounding soil. Soil sample ID EL-TR-French Drain was collected within the ditch at the French drain outfall, and the results are presented in **Table 3**. The results show that the area radiological concentrations are slightly elevated when compared to the RUSLs, which is consistent with the conditions of the surrounding soil.

- Stainless Steel Pipe - During soil excavation a stainless steel pipe was identified in the southwest corner of the lagoon. The pipe appeared to extend approximately 60 feet towards the stormwater ditch to the south of the lagoon. No elevated radiological readings were identified on the accessible portions of the pipe. The pipe appears to have been previously abandoned in place. At the time of East Lagoon closure, the pipe was capped at the accessible end within the lagoon footprint and information was added to the decommissioning records. Soil sample ID EL-SS-Discharge was collected in the adjacent stormwater ditch where the pipe may have discharged, and the results are presented in **Table 3.** The results show that the area radiological concentrations are slightly elevated when compared to the RUSLs, which is consistent with the conditions of the surrounding soil.

Upon completion of soil excavation, a civil engineering survey was performed using Global Positioning Systems (GPS) to document the various depths of excavation. Additionally, a radiological gamma walkover survey was performed of the excavated areas using a sodium-iodide (NaI) probe. Soil sampling was performed in areas where excavation depths reached the 4 ft interval where the initial characterization sampling terminated. Using the surveyed depth of excavation, **Table 3** shows the "as left" radiological conditions. Sample locations that were completely remediated are not included in **Table 3**. This table, along with this report will be stored in the site's decommissioning records and used to guide future remediation planning at the time of facility decommissioning.

Table 3 – “As Left” Radiological Condition

Sample ID	Gross Analyte Activity (pCi/g)				Sum of Fractions
	U-234	U-235	U-238	Tc-99	RUSL
EL-1-4'	9.4	0.2	3.1	0.3	1.0
EL-2-4.5'	1.6	0.1	0.7	0.0	0.2
EL-3-4.5'	10.3	0.4	2.5	0.1	**1.0**
EL-4-4.5'	18.1	0.9	3.7	0.2	**1.8**
EL-5-4.5'	7.9	0.4	1.8	1.1	0.8
EL-6-4.5'	15.5	0.9	4.0	1.8	**1.7**
EL-7-4.5'	5.9	0.4	1.8	0.5	0.7
EL-8-6"	4.5	0.1	1.5	1.8	0.6
EL-9-6"	1.9	0.0	1.1	1.5	0.3
EL-10-6"	1.0	0.0	0.6	0.0	0.1
EL-11-4.5'	42.4	2.3	9.0	0.4	**4.2**
EL-12-2'	7.0	0.3	4.5	0.8	0.9
EL-13-2'	3.4	0.1	0.9	0.6	0.4
EL-14-6"	5.1	0.3	1.6	3.0	0.7
EL-15-6"	1.0	0.0	0.9	0.0	0.1
EL-16-4'	2.7	0.2	1.3	0.6	0.4
EL-SUMP-4.5'	19.8	1.0	4.5	0.2	**2.0**
EL-B1-4.5'	7.7	0.4	2.1	1.2	0.9
EL-B2-6"	1.4	0.0	0.7	0.2	0.2
EL-B3-6"	5.5	0.2	1.4	3.2	0.7
EL-B5-6"	3.3	0.1	1.4	1.1	0.4
EL-SS-Discharge	12.1	3.0	0.6	0.0	**1.3**
EL-TR-French Drain	21.5	1.0	4.6	10.5	**2.7**

Note: **Bold** indicates sample results $\geq$ the RUSL ‘Sum of Fractions’ of 1.0

While localized areas of soil remain above the RUSL, the RUSLs assume soil concentrations are present at land surface, and in the case of the former East Lagoon area, most of the localized areas of soil above the RUSL are approximately 10 feet below ground surface. Furthermore, the former East Lagoon area is surrounded by industrial uses and should be considered an Industrial Use area until site decommissioning.

Following excavation, backfill and restoration activities were completed in July and August 2021. All remediation equipment was removed from the area and decontaminated. A free release survey was performed of the as-left work area to ensure that no residual radioactivity remained at land surface above site limits, and radiological postings were removed. Clean fill soil was placed into the excavated areas, and then spread and compacted per the final design specifications developed by Stewart Engineering to support proper drainage. Routine compaction testing was performed to ensure that a compaction percentage of 98% (recommended by the American Society for Testing Materials, ASTM D698) of the soil's maximum dry density (as determined by a standard Proctor) was reached. A photograph of the backfill and compaction process is shown in **Figure 7**.

Figure 7 – Backfill and Compaction Process

Compaction testing field reports were generated by Stewart Engineering after each field test and are saved on file by the Westinghouse Engineering staff. A photograph of the final backfilled surface following hydroseeding is shown in **Figure 8**.

Figure 8 – Final Backfilled Surface

Conclusions and Long-Term Monitoring

Closure of the East Lagoon was performed in accordance with the *Closure Plan*. Minor adjustments were made based on field conditions as allowed by the plan. The removed materials (sludge, soil, liners, and debris) were packaged and disposed offsite at the USE-I facility.

All residual concentrations for radiological and chemical constituents that were left in place were below the IUSL. Limited areas of soil containing concentrations above RUSL were left in place either because removing them would undermine existing structures or they are located below the water table. All but one area of soil contained chemical concentrations below the RUSL. This one exception exceeded the RUSL for PCE, with a result of 0.0044 mg/Kg compared to the RUSL of 0.0023 mg/Kg. In all cases these areas of soil are in the subsurface, and there is no potential route of exposure to site personnel unless the areas are excavated. The locations of these areas have been recorded in the site's decommissioning records.

None of the data acquired during closure suggests a need to modify the existing groundwater monitoring program for the wastewater treatment area. Prior to East Lagoon closure, existing groundwater data suggested the East Lagoon may be a potential source for the Tc-99 that is observed slightly downgradient in two existing monitoring wells. However, based on the Tc-99 concentrations detected during closure sampling, no clear connection can be drawn between the East Lagoon sludge or soil and the Tc-99 impact.

Therefore, groundwater monitoring will continue in accordance with the facility's NPDES permit and the ongoing work being performed as part of the Consent Agreement (19-02-HW) between Westinghouse and DHEC.

Lastly, the land areas disturbed during East Lagoon closure are inspected periodically for stabilization. Once stabilized, a request to terminate the Sediment and Erosion Control Permit will be submitted to Richland County.

Appendix 1 – East Lagoon Chemical Sampling Results

		Sample ID	EL-1-6"	EL-1-6" DUP	EL-3-6"	EL-5-6"	EL-5-6" DUP	EL-9-6"	EL-11-6"	EL-11-6" DUP	EL-15-6"	EL-B1-1-6"	EL-B1-1-6" DUP	EL-B3-6"	EL-B5-6"	EL-B5-6" DUP	EL-B8-6"	EL-B10-6"	EL-B10-6" DUP
		Date	5/13/2021	5/13/2021	5/13/2021	5/18/2021	5/18/2021	5/18/2021	5/27/2021	5/27/2021	5/27/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/27/2021	5/27/2021	5/27/2021
		Type	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD
Group	Analyte	Units																	
Chemical	Fluoride	mg/kg	**66.3**	**71.8**	**30.7**	**149**	**166**	**207**	**98.2**	**65.4**	**17.1**	**152**	**138**	**94.4**	**111**	**112**	**16.2**	**24.5**	**26.9**
Chemical	Nitrate ion	mg/kg	**5.63**	**5.57**	**43.3**	**87.4**	**97.2**	**0.931 J**	**47.8**	**39.8**	**0.760 J**	< 1.10	< 1.10	**48.8**	< 1.09	< 1.10	**0.840 J**	**1.04 J**	**1.19**
Metals	Aluminum	mg/kg	**4860**	**5000**	**6130**	**5700**	**6060**	**4960**	**6920**	**6360**	**7330**	**5340**	**5780**	**4530**	**4850**	**5360**	**12800**	**6350**	**7100**
Metals	Antimony	mg/kg	< 2.15	< 2.1	< 2.18	< 2.15	< 2.1	< 2.05	< 2.1	**0.409 J**	**0.647 J**	< 2.17	< 2.09	< 2.08	< 2.11	< 1.98	< 2.16	**0.542 J**	**0.48 J**
Metals	Arsenic	mg/kg	**0.695 J**	**0.55 J**	**1.07 J**	< 3.22	< 3.14	**0.64 J**	**0.65 J**	**0.788 J**	**1.85 J**	< 3.26	< 3.14	**0.734 J**	**0.747 J**	**0.732 J**	**1.31 J**	**0.896 J**	**0.92 J**
Metals	Barium	mg/kg	**18.1**	**16.2**	**25.1**	**12.5**	**14.6**	**22**	**13.9**	**11.2**	**55.2**	**25.3**	**21.5**	**29**	**26.8**	**27.5**	**45.4**	**29.3**	**25.5**
Metals	Beryllium	mg/kg	**0.133 J**	**0.119 J**	**0.224 J**	< 0.536	< 0.524	< 0.513	< 0.526	< 0.504	**0.415 J**	< 0.544	< 0.523	**0.107 J**	**0.111 J**	**0.119 J**	**0.176 J**	**0.123 J**	**0.122 J**
Metals	Cadmium	mg/kg	< 0.537	< 0.526	< 0.544	< 0.536	< 0.524	< 0.513	< 0.526	< 0.504	< 0.492	< 0.544	< 0.523	< 0.519	< 0.527	< 0.495	< 0.539	< 0.545	< 0.521
Metals	Calcium	mg/kg	**351**	**328**	**707**	**216**	**250**	**300**	**267**	**278**	**592**	**233**	**223**	**259**	**321**	**440**	**2490**	**382**	**355**
Metals	Chromium	mg/kg	**4.13**	**4.25**	**5.09**	**4.23**	**5.63**	**4.64**	**6.68**	**5.21**	**20.8**	**6.41**	**5.92**	**5.64**	**4.73**	**4.98**	**12.2**	**9.7**	**9.56**
Metals	Cobalt	mg/kg	**0.611**	**0.503 J**	**1.51**	**0.232 J**	**0.316 J**	**0.747**	**0.413 J**	**0.323 J**	**3.7**	**0.56**	**0.514 J**	**1.2**	**0.792**	**0.813**	**2.11**	**1.47**	**1.51**
Metals	Copper	mg/kg	**1.47 J**	**1.12 J**	**1.53 J**	**0.78 J**	**1.17 J**	**1.31 J**	**0.898 J**	**0.905 J**	**3.04**	**1.1 J**	**1.13 J**	**1.56 J**	**1.33 J**	**1.42 J**	**3.55**	**2.7**	**2.96**
Metals	Iron	mg/kg	**3080**	**2240**	**4130**	**1530**	**1740**	**3840**	**3890**	**4460**	**9210**	**2540**	**2320**	**3640**	**3520**	**3860**	**9690**	**7220**	**7980**
Metals	Lead	mg/kg	**4.11**	**3.9**	**6.02**	**4.4**	**4.8**	**4.91**	**4.86**	**4.12**	**11**	**5.95**	**5.15**	**6.44**	**5.85**	**5.86**	**8.74**	**6.43**	**6.31**
Metals	Magnesium	mg/kg	**218**	**190**	**126**	**91.2**	**101**	**92.5**	**90.9**	**79.9**	**282**	**104**	**129**	**116**	**136**	**157**	**345**	**168**	**165**
Metals	Manganese	mg/kg	**20.3**	**22.9**	**68.3**	**7.64**	**8.97**	**42.3**	**8.1**	**7.52**	**227**	**28.9**	**26.6**	**47.1**	**52.7**	**54.5**	**180**	**57.2**	**62.8**
Metals	Mercury	mg/kg	**0.0270**	**0.0260**	**0.0259**	**0.0167 J**	**0.0190 J**	**0.0111 J**	**0.0410**	**0.0266**	**0.0183 J**	**0.0177 J**	**0.0186 J**	< 0.0218	**0.0173 J**	**0.0196 J**	< 0.0235	**0.0190 J**	**0.0127 J**
Metals	Nickel	mg/kg	**12.9**	**6.56**	**2.2**	**3.35**	**3.92**	**0.914**	**1.78**	**1.67**	**2.31**	**0.914**	**0.969**	**1.15**	**0.997**	**1.38**	**5.26**	**2.27**	**2.3**
Metals	Potassium	mg/kg	**108**	**106**	**137**	**73.9**	**79.5**	**109**	**75.6**	**70.3**	**241**	**120**	**144**	**103**	**133**	**143**	**302**	**183**	**184**
Metals	Selenium	mg/kg	< 3.22	< 3.15	< 3.27	< 3.22	< 3.14	< 3.08	< 3.16	< 3.02	< 2.95	< 3.26	< 3.14	< 3.11	< 3.16	< 2.97	< 3.24	< 3.27	< 3.13
Metals	Silver	mg/kg	< 0.537	< 0.526	< 0.544	< 0.536	< 0.524	< 0.513	< 0.526	< 0.504	< 2.46	< 0.544	< 0.523	< 0.519	< 0.527	< 0.495	< 0.539	< 0.545	< 0.521
Metals	Sodium	mg/kg	**167**	**159**	**85.7**	**36.8**	**43.5**	**51.5**	**56.5**	**54.4**	**35.5**	**65.5**	**74.4**	**91.5**	**20.6 J**	**27.4**	**52.3**	**166**	**173**
Metals	Thallium	mg/kg	< 2.15	< 2.1	< 2.18	< 2.15	< 2.1	< 2.05	< 2.1	< 2.01	< 1.97	< 2.17	< 2.09	< 2.08	< 2.11	< 1.98	< 2.16	< 2.18	< 2.08
Metals	Vanadium	mg/kg	**10.5**	**8.94**	**13**	**7.24**	**9.44**	**12.7**	**14.2**	**13.3**	**21.2**	**12.8**	**11.3**	**13.9**	**14**	**14.6**	**25.6**	**19**	**20.3**
Metals	Zinc	mg/kg	**3.54**	**2.46**	**3.95**	**2.63**	**2.9**	**2.48**	**2.36**	**2.37**	**7.48**	**2.09 J**	**2.59**	**3.46**	**3.16**	**3.75**	**13**	**6.56**	**7.03**
SVOCs	1,1'-Biphenyl	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	1,2,4,5-Tetrachlorobenzene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,3,4,6-Tetrachlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,4,5-Trichlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,4,6-Trichlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,4-Dichlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,4-Dimethylphenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,4-Dinitrophenol	mg/kg	< 0.724	< 0.754	< 0.72	< 14.5	< 14.6	< 14.3	< 0.731	< 3.66	< 0.731	< 0.72	< 0.726	< 0.719	< 0.73	< 0.716	< 0.736	< 0.745	< 0.741
SVOCs	2,4-Dinitrotoluene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2,6-Dinitrotoluene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2-Chloronaphthalene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	2-Chlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2-Methylnaphthalene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	2-Methylphenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2-Nitroaniline	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	2-Nitrophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	3&4-Methylphenol(m&p Cresol)	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	3,3'-Dichlorobenzidine	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	3-Nitroaniline	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4,6-Dinitro-2-methylphenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4-Bromophenyl phenyl ether	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4-Chloro-3-methylphenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371

Appendix 1 – East Lagoon Chemical Sampling Results

		Sample ID	EL-1-6"	EL-1-6" DUP	EL-3-6"	EL-5-6"	EL-5-6" DUP	EL-9-6"	EL-11-6"	EL-11-6" DUP	EL-15-6"	EL-B1-1-6"	EL-B1-1-6" DUP	EL-B3-6"	EL-B5-6"	EL-B5-6" DUP	EL-B8-6"	EL-B10-6"	EL-B10-6" DUP
		Date	5/13/2021	5/13/2021	5/13/2021	5/18/2021	5/18/2021	5/18/2021	5/27/2021	5/27/2021	5/27/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/27/2021	5/27/2021	5/27/2021
		Type	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD
Group	Analyte	Units																	
SVOCs	4-Chloroaniline	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4-Chlorophenyl phenyl ether	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4-Nitroaniline	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	4-Nitrophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Acenaphthene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Acenaphthylene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Acetophenone	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Anthracene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Atrazine	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Benz(a)anthracene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Benzaldehyde	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Benzo(a)pyrene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Benzo(b)fluoranthene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	**0.0115 J**	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Benzo(g,h,i)perylene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Benzo(k)fluoranthene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Bis(2-chloroethoxy)methane	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Bis(2-chloroethyl)ether	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Bis(2-chloroisopropyl)ether	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Bis(2-ethylhexyl)phthalate	mg/kg	< 0.0362	**0.0245 J**	**0.0270 J**	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	**0.0151 J**	< 0.0363	< 0.0359	< 0.0365	**0.0107 J**	< 0.0368	< 0.0373	< 0.0371
SVOCs	Butyl benzyl phthalate	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	**0.0115 J**	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Caprolactam	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Carbazole	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Chrysene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Dibenz(a,h)anthracene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Dibenzofuran	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Diethyl phthalate	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Dimethyl phthalate	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Di-n-butyl phthalate	mg/kg	< 0.0362	< 0.0377	**0.0137 J**	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	**0.0115 J**	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Di-n-octyl phthalate	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Diphenylamine	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Fluoranthene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Fluorene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Hexachlorobenzene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Hexachlorobutadiene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Hexachlorocyclopentadiene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Hexachloroethane	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Indeno(1,2,3-cd)pyrene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Isophorone	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Naphthalene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Nitrobenzene	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	N-Nitrosodi-n-propylamine	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Pentachlorophenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Phenanthrene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
SVOCs	Phenol	mg/kg	< 0.362	< 0.377	< 0.36	< 7.27	< 7.28	< 7.14	< 0.366	< 1.83	< 0.365	< 0.36	< 0.363	< 0.359	< 0.365	< 0.358	< 0.368	< 0.373	< 0.371
SVOCs	Pyrene	mg/kg	< 0.0362	< 0.0377	< 0.0360	< 0.727	< 0.728	< 0.714	< 0.0366	< 0.183	< 0.0365	< 0.0360	< 0.0363	< 0.0359	< 0.0365	< 0.0358	< 0.0368	< 0.0373	< 0.0371
VOCs	(1-Methylethyl)-Benzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	**0.000339 J**	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,1,1-Trichloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150

Appendix 1 – East Lagoon Chemical Sampling Results

		Sample ID	EL-1-6"	EL-1-6" DUP	EL-3-6"	EL-5-6"	EL-5-6" DUP	EL-9-6"	EL-11-6"	EL-11-6" DUP	EL-15-6"	EL-B1-1-6"	EL-B1-1-6" DUP	EL-B3-6"	EL-B5-6"	EL-B5-6" DUP	EL-B8-6"	EL-B10-6"	EL-B10-6" DUP
		Date	5/13/2021	5/13/2021	5/13/2021	5/18/2021	5/18/2021	5/18/2021	5/27/2021	5/27/2021	5/27/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/27/2021	5/27/2021	5/27/2021
		Type	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD
Group	Analyte	Units																	
VOCs	1,1,2,2-Tetrachloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,1,2-Trichlor-1,2,2-trifluoroethane	mg/kg	< 0.00371	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	< 0.00396	< 0.00457	< 0.00390	< 0.00435	< 0.00384	< 0.00368	< 0.00464	< 0.00752
VOCs	1,1,2-Trichloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,1-Dichloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,1-Dichloroethene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2,3-Trichlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2,4-Trichlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2-Dibromo-3-chloropropane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2-Dibromoethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2-Dichlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2-Dichloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,2-Dichloropropane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,3-Dichlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,4-Dichlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	1,4-Dioxane	mg/kg	< 0.0371	< 0.0444	< 0.0428	< 0.0402	< 0.0458	< 0.0375	< 0.0536	< 0.0485	< 0.0454	< 0.0396	< 0.0457	< 0.0390	< 0.0435	< 0.0384	< 0.0368	< 0.0464	< 0.0752
VOCs	2-Butanone	mg/kg	< 0.00371	< 0.00444	**0.00256 J**	< 0.00402	< 0.00458	**0.00603**	< 0.00536	< 0.00485	< 0.00454	**0.00747**	**0.0121**	< 0.00390	**0.0118**	**0.0101**	< 0.00368	< 0.00464	< 0.00752
VOCs	2-Hexanone	mg/kg	< 0.00371	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	< 0.00396	< 0.00457	< 0.00390	< 0.00435	< 0.00384	< 0.00368	< 0.00464	< 0.00752
VOCs	4-Methyl-2-pentanone	mg/kg	< 0.00371	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	< 0.00396	< 0.00457	< 0.00390	< 0.00435	< 0.00384	< 0.00368	< 0.00464	< 0.00752
VOCs	Acetone	mg/kg	**0.00394**	< 0.00444	**0.00336 J**	**0.00323 J**	**0.00289 J**	**0.0234**	**0.00665**	**0.0147**	**0.0105**	**0.0242**	**0.0406**	**0.00442**	**0.0267**	**0.0386**	**0.00890**	**0.00875**	**0.0117**
VOCs	Benzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Bromochloromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Bromodichloromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Bromoform	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Bromomethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Carbon disulfide	mg/kg	< 0.00371	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	< 0.00396	< 0.00457	< 0.00390	< 0.00435	**0.00145 J**	< 0.00368	< 0.00464	< 0.00752
VOCs	Carbon tetrachloride	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Chlorobenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Chloroethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Chloroform	mg/kg	< 0.000741	**0.000665 J**	**0.00135**	< 0.000805	**0.000385 J**	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Chloromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	cis-1,2-Dichloroethene	mg/kg	< 0.000741	< 0.000887	**0.000488 J**	< 0.000805	**0.000485 J**	**0.00303**	< 0.00107	< 0.000971	**0.000345 J**	**0.00124**	**0.00162**	**0.0255**	**0.0158**	**0.00303**	< 0.000736	< 0.000927	< 0.00150
VOCs	cis-1,3-Dichloropropene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Cyclohexane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Dibromochloromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Dichlorodifluoromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Ethylbenzene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	**0.00101**	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Methyl acetate	mg/kg	< 0.00371	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	**0.00311 J**	< 0.00457	< 0.00390	**0.00958**	< 0.00384	< 0.00368	< 0.00464	< 0.00752
VOCs	Methyl tert-butyl ether	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Methylcyclohexane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	**0.00101**	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Methylene chloride	mg/kg	**0.00163 J**	< 0.00444	< 0.00428	< 0.00402	< 0.00458	< 0.00375	< 0.00536	< 0.00485	< 0.00454	< 0.00396	< 0.00457	< 0.00390	< 0.00435	< 0.00384	**0.00200 J**	< 0.00464	< 0.00752
VOCs	Styrene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Tetrachloroethylene	mg/kg	< 0.000741	< 0.000887	**0.00132**	< 0.000805	**0.000421 J**	**0.000450 J**	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	**0.000491 J**	**0.00436**	**0.000284 J**	< 0.000736	< 0.000927	< 0.00150
VOCs	Toluene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	**0.00170**	< 0.00107	< 0.000971	< 0.000908	< 0.000792	**0.000329 J**	**0.00204**	**0.00594**	**0.000522 J**	< 0.000736	< 0.000927	< 0.00150
VOCs	trans-1,2-Dichloroethene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	**0.000593 J**	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	trans-1,3-Dichloropropene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Trichloroethylene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	**0.000850**	**0.000696 J**	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Trichlorofluoromethane	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150

Appendix 1 – East Lagoon Chemical Sampling Results

		Sample ID	EL-1-6"	EL-1-6" DUP	EL-3-6"	EL-5-6"	EL-5-6" DUP	EL-9-6"	EL-11-6"	EL-11-6" DUP	EL-15-6"	EL-B1-1-6"	EL-B1-1-6" DUP	EL-B3-6"	EL-B5-6"	EL-B5-6" DUP	EL-B8-6"	EL-B10-6"	EL-B10-6" DUP
		Date	5/13/2021	5/13/2021	5/13/2021	5/18/2021	5/18/2021	5/18/2021	5/27/2021	5/27/2021	5/27/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/27/2021	5/27/2021	5/27/2021
		Type	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD	N	N	FD
Group	Analyte	Units																	
VOCs	Vinyl chloride	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	< 0.000751	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	**0.00431**	< 0.000870	< 0.000768	< 0.000736	< 0.000927	< 0.00150
VOCs	Xylenes, m- & p-	mg/kg	< 0.00148	< 0.00177	< 0.00171	< 0.00161	< 0.00183	**0.000758 J**	< 0.00215	< 0.00194	< 0.00182	< 0.00158	< 0.00183	< 0.00156	**0.00397**	< 0.00154	< 0.00147	< 0.00185	< 0.00301
VOCs	o-Xylene	mg/kg	< 0.000741	< 0.000887	< 0.000856	< 0.000805	< 0.000916	**0.000330 J**	< 0.00107	< 0.000971	< 0.000908	< 0.000792	< 0.000915	< 0.000780	**0.00152**	< 0.000768	< 0.000736	< 0.000927	< 0.00150

Notes: **Bold concentrations indicate detections**

J - Result below reporting limit

mg/kg - milligrams per kilogram

SVOCs - semi volatile organic compounds

VOCs - volatile organic compounds

FD - field duplicate sample

N - regular sample

2019-2021 Southern Storage Area Operable Unit Investigation Reports

On June 18, 2019, CFFF submitted a work plan (Westinghouse, 2019a) to DHEC to investigate the Southern Storage Area Operable Unit (SSAOU). The SSAOU investigation was submitted as Addendum 1 of the overall Remedial Investigation being performed under Consent Agreement CA-19-02-HW. Historically, the SSAOU was partially used for intermodal storage of materials awaiting U reclamation.

On May 30, 2019, a scheduled inspection of intermodal containers (sealands) within the SSAOU was completed and identified impaired roofing and degraded drums due to rainwater intrusion in one sealand, C-40. The drums within this sealand included solid combustible materials, such as mop heads and filters, awaiting U reclamation by onsite incineration and dissolution. C-40 was safely emptied of its contents by June 5, 2019; the drums were transferred to the main building for processing; and C-40 was wrapped with tarps to minimize further water intrusion.

Three soil samples were collected at 1 foot below land surface (BLS) in the area of the degraded drums beneath C-40, with U concentrations ranging from 2-4 picocuries per gram. In addition, groundwater wells associated with the SSAOU (W-7A, W-10, W-11, 13R, W-15, W-16, and W-32) were sampled on June 4-5, 2019. The results were received on June 21, 2019, and submitted to DHEC on August 1, 2019 as part of the July 2019 CA Progress Report (Westinghouse, 2019b). These results indicated that the intermodal storage did not impact groundwater. Further review and comparison of groundwater well data from 2004 by CFFF personnel indicated that gross beta, Tc-99, and VOC concentrations had not changed during the time of sealand occupancy. On August 8, 2019, CFFF submitted the "*Southern Storage Area Operable Unit Remedial Investigation Work Plan Addendum 1 Assessment Report*" (Westinghouse, 2019c), and the report was approved by DHEC on September 4, 2019.

A risk-based action plan was developed by CFFF to empty the remaining intermodal containers containing U-bearing material in the SSAOU and remove the emptied intermodal containers from the site. On October 30, 2019, CFFF submitted the "*Southern Storage Area Operable Unit Intermodal Container Work Plan*" (Westinghouse, 2019d), which detailed how Westinghouse would sample the soil underneath sealand containers once they were removed from the site. The work plan was approved by DHEC on November 5, 2019.

According to the plan following container removal, Health Physics (HP) personnel completed direct radiological surveys of the soil using an Eberline E-600 with an alpha/beta probe instrument. If survey results indicated alpha contamination above background levels, the top layer of soil ("surficial soil") was removed until the survey results were at or below background levels. In these instances where surficial soil was removed, CFFF notified DHEC per the communication protocol and discussed the next steps.

Additionally, systematic soil sampling was completed in the footprint of the area formerly occupied by the container. As needed, biased sampling was performed in areas of potential impact based on the as-found condition of the sealand container and the direct-read radiological surveys of the soil underneath. Soil sampling and analysis was performed as described in the approved work plans. Soil sampling procedures and analytical methods in the *Final Remedial Investigation Work Plan* (AECOM, 2019) and the facility's *Procedure RA-433 Environmental Remediation Revision 1* (Westinghouse, 2020a) were followed during this scope of work. Soil samples were initially collected from 0-1 foot BLS and were analyzed by a state certified laboratory with a chain of custody maintained throughout the process to ensure sample integrity. Analyses were performed on the samples according to the COPC(s) that could be present in the soil based on materials stored in the intermodal containers. The COPCs in the SSAOU included isotopic U, Tc-99, fluoride and CVOCs.

If the soil sample results were above the RUSL, impacted soil was excavated to 1 foot BLS and additional soil sampling was conducted. The additional sampling included vertical delineation of soil impact by hand augering borings deeper into the subsurface in the assessment area until results below the RUSL were achieved. Excavated soils from the SSAOU were transported to two different facilities for disposal. Soil containing U only was transported to Waste Control Solutions in Texas for proper disposal. Soil containing tetrachloroethylene (PCE) only was transported to Clean Harbors, Chattanooga facility for proper disposal. No excavated soil contained both U and PCE. Therefore, no excavated soil was characterized as a mixed waste. More information regarding the soil under intermodal container C-21, which contained PCE, can be found in the February 2021 CA progress report (Westinghouse, 2021b).

As of February 2023, 79 intermodal containers (62 of which previously contained accountable U or equipment contaminated with U) were removed from the SSAOU. The results of the soil sampling conducted below the intermodal containers were reported to DHEC in CA monthly progress reports spanning from 2019-2021. Soil in the SSAOU where intermodal containers were once located is no longer impacted above applicable standards and does not have restrictions on its use. Below is a visual showing the progression of this work through November 2021.

Sealand Removal

11/7/19

9/24/20

11/8/21

Westinghouse

A detailed description of the historical use of sealand containers at the CFFF as well as soil data tables from the removal of sealands in the Southern Storage Area Operable Unit (SSAOU) and other areas of the site follows.

Sealand Removal Background Information

At the CFFF, sealand containers were categorized into two types:
- “C” which can potentially contain U, and
- “S” which are not allowed to contain U (also known as sheds).

A risk-based approach was used to empty and remove sealand containers in the SSAOU.

When CFFF started the sealand elimination project in June of 2019, there were 62 “C” sealands. These were:
- 49 sealands containing accountable quantities of U,
- 11 sealands with equipment contaminated with low levels of residual U, and
- 2 empty (at the start of the project).

CFFF also had a total of 47 “S” sealands containing items such as maintenance and project spare parts, janitorial supplies, and miscellaneous tools, equipment and consumables used at the plant.

CFFF prioritized emptying the sealands according to the type of material it contained and the potential risk for environmental impact. A three-phased plan was implemented to empty and remove the “C” and “S” sealands.

Phase I: Accountable Quantities of Uranium
CFFF established a goal to remove the 49 “C” sealands containing accountable quantities of U by November 16, 2020 and exceeded the goal by completing this phase of work on September 24, 2020. The “C” sealands with accountable quantities of U included:

- 29 sealands containing Wet Combustible Material (WCM)
- 10 sealands containing Dry Combustible Material (DCM),
- 6 sealands containing contaminated zirconium (zirc) tubing,
- 2 sealands containing drums of oil, contaminated with low levels of U and stored in overpacks, and
- 2 sealands containing shipping packages with ash material for U recovery.

Phase II: Contaminated Equipment
The second phase of the risk reduction project was to remove the 11 “C” sealands containing contaminated equipment by the end of the 2020. CFFF met this goal when the last “C” sealand was removed on November, 13, 2020.

The “C” sealands containing contaminated equipment were:
- 4 sealands containing excess manufacturing equipment contaminated with low levels of residual U,
- 1 sealand containing empty plastic containers, also known as polypaks (PP), that had previously been used for storing U dioxide powder, and
- 6 sealands containing shipping containers referred to as “2901s.”

The “C” sealand identification numbers from both phase I and II of the project are listed in the table below by the type of material it contained.

"C" Sealands											
Accountable Quantities of Uranium							Contaminated Equipment			Empty at start	TOTAL
WCM			DCM	Zirc Tubes	Contaminated Oil	Ash	Excess Manufacturing Equipment	Empty PPs	2901		
29			10	6	2	2	4	1	6	2	62
C-4	C-34	C-54	C-18	WEC-400	C-13	C-17	C-15	C-16	C-7	C-26	
C-19	C-35	C-57	C-20	WEC-500	C-36	C-38	C-47		C-8	C-46	
C-23	C-37	C-58	C-21	WEC-700			C-48		C-9		
C-28	C-39	C-61	C-25	WEC-800			C-49		C-10		
C-29	C-41	C-62	C-52	WEC-1000					C-11		
C-30	C-42	C-63	C-53	WEC-1001					C-24		
C-31	C-43	C-64	C-56								
C-32	C-45	C-65	C-59								
C-33	C-51	C-66	C-60								
C-44	C-40		C-67								

Phase III: Sheds

The third phase of the risk reduction project was to reduce or eliminate sheds, "S" sealands. At project initiation, there were 47 "S" sealands on site. To support Phase I and Phase II activities at the start of the SSAOU project, four new sealands with metal floors were purchased as contingency planning. Two have since been removed, and two (S-52, S-53) were kept for storage of consumable items used in waste packaging operations, bringing the total number of S sealands to 49.

Since the start of the project, 17 "S" sealands have been emptied and removed from the site, and 32 remain onsite in various areas of the site. It should be noted that in 2020, the CFFF procedure for control of sealand containers was revised to explicitly prohibit storage of radioactive/contaminated materials or hazardous materials in new sealands.

The "S" sealand identification numbers are listed below.

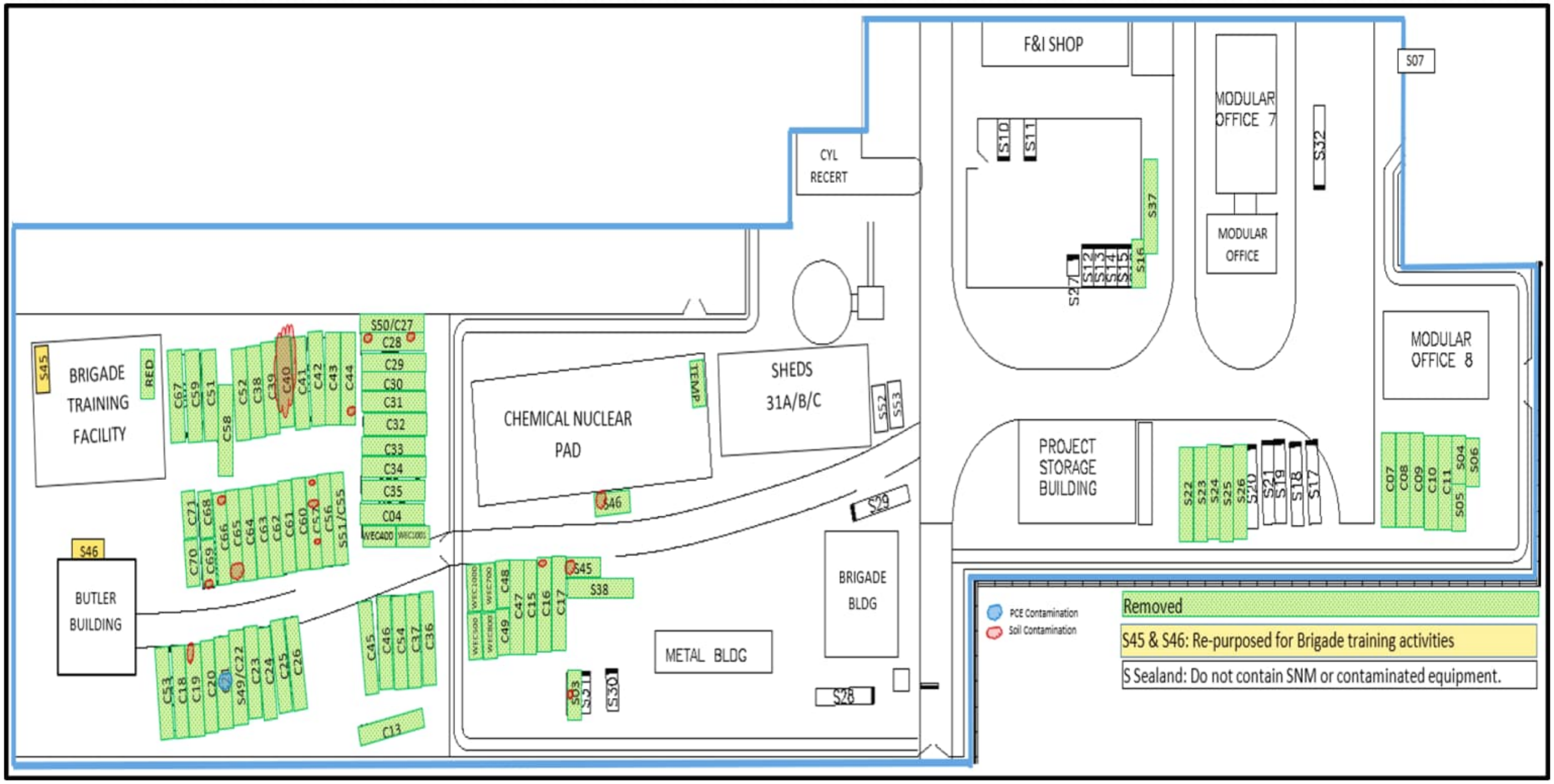
"S" Sealands				
Currently in Use			Removed/Relocated	
32			17	
S-02	S-19	S-34	S-03	S-38
S-07	S-20	S-35	S-04	S-45
S-08	S-21	S-36	S-05	S-46
S-09	S-27	S-39	S-06	S-49
S-10	S-28	S-45	S-16	S-50
S-11	S-29	S-46	S-22	S-51
S-12	S-30	S-47	S-23	ERT (RED)
S-13	S-31	S-48	S-24	
S-14	S-32	S-52	S-25	
S-15	S-33	S-53	S-26	
S-17				
S-18				

Note: S-45 and S-46 were previously used to store non-uranium bearing development materials and tool room equipment and parts. During the shed and sealand removal campaign, these units were removed, surveyed, and the soil underneath them sampled. Because S-45 and S-46 containers were in good condition and not contaminated, they were repurposed and relocated by the site for emergency preparedness supplies. Therefore, S-45 & S-46 show up in both the "Currently in Use" and "Removed/Relocated" columns.

Soil Sampling Results

The information that follows summarizes the soil sampling data collected when sealand containers were removed from the SSAOU at CFFF.

Removal of “C” designated sealands in the SSAOU was the first priority for the project. “S” sealands in the SSAOU as well as in other areas of the plant were also removed. In total, soil underneath the footprint of thirteen sealands in the SSAOU was remediated, twelve for U impact and one for PCE impact. No soil impact was identified in areas where sealands were removed outside of the SSAOU. The diagram below represents a focused view of the SSAOU where the “C” sealands were located. The red and blue circles indicate the small areas of impact for U and PCE, respectively.



The following table summarizes the results from impacted soil underneath the footprint of the thirteen sealands in the SSAOU.

Sealands Requiring Remediation							
Sea land	Sealand Removed	HP Direct Radiological Survey Results	Soil Sample Results	Westinghouse Letter #	DHEC Website Posted Date	DHEC Website Title	GEL Analytical Results
C-40	6/28/19	Most of back half of sealand: 15k to 100k dpm Beta, excavated 6-9" for HP. Additional 2' excavated based on GEL results.	GEL data required additional soil removal-final results below residential limit.	LTR-RAC-19-65	August 9, 2019	Remedial Investigation (RI) Work Plan Addendum 1 Assessment Report on the Southern Storage Area Operable Unit	Attachment C
C-44	11/6/19	1.5' DIA: 200,000 dpm beta, excavated 8-12" for HP. Additional 2' excavated based on GEL results.	GEL data required additional soil removal-final results below residential limit.	LTR-RAC-20-15	February 5, 2020	January 2020 Consent Agreement Progress Report	Attachment B
C-28	11/13/19	3' x 5' NW corner: 2k to 500k dpm beta 1,500 dpm Alpha (Max)	GEL data-results below residential limit-No further action required.	LTR-RAC-20-15	February 5, 2020	January 2020 Consent Agreement Progress Report	Attachment B
	11/13/19	1.5' DIA, ~10' back on North side: 150k dpm Beta 1,000 dpm Alpha	GEL data-results below residential limit-No further action required.	LTR-RAC-20-15	February 5, 2020	January 2020 Consent Agreement Progress Report	Attachment B
C-65	11/14/19	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-15	February 5, 2020	January 2020 Consent Agreement Progress Report	Attachment B
S-3	1/15/20	Acceptable HP soil sample results. Excavated ~2' initially based on GEL results & resampled. Excavated again for confirmatory testing.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-34	April 8, 2020	March 2020 Consent Agreement Progress Report	Attachment B
C-16	1/16/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-34	April 8, 2020	March 2020 Consent Agreement Progress Report	Attachment B
C-57	3/25/20	1.5' DIA, 80k dpm Beta, excavated 8-12" for HP.	GEL data-results below residential limit-No further action required.	LTR-RAC-20-47	May 12, 2020	April 2020 Consent Agreement Progress Report	Attachment B
	3/25/20	1' DIA, 25k dpm Beta, excavated 8-12" for HP.	GEL data-results below residential limit-No further action required.	LTR-RAC-20-47	May 12, 2020	April 2020 Consent Agreement Progress Report	Attachment B
	3/25/20	1' x 3': 25k dpm Beta, excavated 8-12" for HP.	GEL data-results below residential limit-No further action required.	LTR-RAC-20-47	May 12, 2020	April 2020 Consent Agreement Progress Report	Attachment B
C-66	3/25/20	2' x 2': 120k dpm Beta, excavated 2' for HP.	GEL data-results below residential limit-No further action required.	LTR-RAC-20-47	May 12, 2020	April 2020 Consent Agreement Progress Report	Attachment B
C-69	9/2/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-90	December 9, 2020	November Consent Agreement Progress Report	Attachment B
C-19	9/9/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-90	December 9, 2020	November Consent Agreement Progress Report	Attachment B
C-21	9/9/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled. Excavated an additional ~2'.	GEL data required soil removal for PCE only-final data below residential limit.	LTR-RAC-20-90 (Radiological)	December 9, 2020	November Consent Agreement Progress Report	Attachment B
				LTR-RAC-21-24 (PCE)	March 11, 2021	February 2021 Consent Agreement Progress Report	Attachment B
S-45	9/16/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-90	December 9, 2020	November Consent Agreement Progress Report	Attachment B
S-46	9/16/20	Acceptable HP soil sample results. Excavated ~2' based on GEL results & resampled.	GEL data required soil removal-final results below residential limit.	LTR-RAC-20-90	December 9, 2020	November Consent Agreement Progress Report	Attachment B

Note: Throughout the report, sheds with single digit numbers may be referred to as “S-X” or “S-0X” (e.g., “S-3” and “S-03” refer to the same physical shed).

The table below summarizes the sealands which did not require remediation due to U or PCE impact.

Sealands Not Requiring Remediation						
Sealand	Sealand Removed	Figure #	Westinghouse Letter #	DHEC Website Posted Date	DHEC Website Title	GEL Analytical Results
C-18	11/5/19	13	LTR-RAC-20-15	February 5, 2020	January 2020 Consent Agreement Progress Report	Attachment B
C-20	11/6/19	13				
C-25	11/6/19	13				
C-26	11/5/19	13				
C-46	11/5/19	13				
C-35	11/5/19	13				
C-32	11/14/19	13				
C-31	11/6/19	13				
C-30	11/5/19	13				
C-29	11/5/19	13				
C-43	1/17/20	14	LTR-RAC-20-34	April 8, 2020	March 2020 Consent Agreement Progress Report	Attachment B
C-58	1/16/20	14				
S-50	1/15/20	14				
C-33	1/15/20	14				
C-51	1/16/20	14				
C-59	1/15/20	14				
C-39	1/16/20	14				
C-52	1/15/20	14				
C-67	1/15/20	14				
WEC-1000	3/26/20	15	LTR-RAC-20-47	May 12, 2020	April 2020 Consent Agreement Progress Report	Attachment B
WEC-500	3/27/20	15				
WEC-700	3/26/20	15				
WEC-800	3/27/20	15				
WEC-400	3/26/20	15				
WEC-1001	3/27/20	15				
C-45	3/27/20	15				
C-42	3/27/20	15				
C-53	3/26/20	15				
C-63	3/26/20	15				
S-16	3/27/20	15				
C-60	6/23/20	16	LTR-RAC-20-68	August 12, 2020	July 2020 Consent Agreement Progress Report	Attachment B
C-56	6/23/20	16				
C-41	6/23/20	16				
C-48	9/2/20	17	LTR-RAC-20-90	December 9, 2020	November Consent Agreement Progress Report	Attachment B
C-49	9/2/20	17				
C-68	9/2/20	17				
C-70	9/2/20	17				
C-71	9/2/20	17				
C-24	9/21/20	17				
C-62	9/23/20	17				
C-13	9/22/20	17				
C-36	9/22/20	17				
C-37	9/23/20	17				
C-54	9/23/20	17				
ERT (RED)	9/22/20	17				
C-09	9/21/20	17				
S-5	9/22/20	17				
C-23	9/22/20	17				
C-22	9/24/20	17				
C-61	9/22/20	17				
C-64	9/22/20	17				
C-04	9/21/20	17				
C-55	9/22/20	17				
C-15	9/23/20	17				
C-17	9/21/20	17				
C-34	9/21/20	17				
C-38	9/23/20	17				
S-38	9/23/20	17				
C-47	9/23/20	17				
C-8	9/24/20	17				
C-7	11/13/20	17				
C-10	11/13/20	17				
C-11	11/13/20	17				
S-22	6/28/21	18	LTR-RAC-21-62	September 2, 2021	August 2021 Consent Agreement Progress Report	Attachment A
S-23	6/28/21	18				
S-24	6/28/21	18				
S-25	6/28/21	18				
S-26	6/28/21	18				
S-04	9/13/22	19	LTR-RAC-22-22	April 5, 2022	March 2022 Consent Agreement Progress Report	Attachment A
S-06	9/13/22	19				

Areas of Impact

Sealand Container C-40

In preparation for removal of the first sealand, C-40, and adjacent sealands, gravel was laid to make the work area safe for forklift travel. Prior to gravel placement, soil samples were taken in the work area and identified to have no impact by CFFF COPCs as displayed in the table below. These sample locations are identified by numbers 1-11 in the image below. Refer to correspondence previously submitted to the Department for more information entitled *Southern Storage Area Operable Unit Remedial Investigation Work Plan Addendum 1 Assessment Report* (LTR-RAC-19-65, Westinghouse, 2019c).

C-40 Gravel Area Sampling														
Systematic (S) or Bias (B) Sample	Sample Location	pH		U_{234} (ug/g)	U_{235} (ug/g)	U_{238} (ug/g)		Total Isotopic Uranium (µg/g)		Tc-99 (pCi/g)	Ammonia (mg/kg)	Nitrate (mg/kg)		Fluoride (mg/kg)
S	1	5.55	<	0.00207	0.055	2.58	<	2.64	<	3.62	86.4	2.15		1.32
S	2	5.23	<	0.00231	0.00958	0.903	<	0.915	<	5.16	134	0.799		0.724
S	3	4.48	<	0.00211	0.0609	2.74	<	2.80	<	0.785	84.8	1.19	<	0.382
S	4	4.63	<	0.00221	0.00829	0.804	<	0.815	<	4.81	55.4	1.30	<	0.363
S	5	5.23	<	0.00207	0.00661	0.802	<	0.811	<	4.22	53.5	1.08	<	0.362
S	6	4.75	<	0.00216	0.0162	1.35	<	1.37	<	-4.81	58.8	0.722		0.405
S	7	5.49	<	0.00211	0.0345	1.79	<	1.83	<	3.60	149	1.6		1.36
S	8	4.95	<	0.00219	0.00752	0.671	<	0.681	<	2.21	46.1	0.873	<	0.372
B	9	4.92	<	0.00215	0.0362	1.82	<	1.86	<	2.07	53.0	2.17		0.778
B	10	5.00	<	0.0021	0.0519	3.37	<	3.42	<	-2.3	76.1	1.88		0.832
B	11	4.72	<	0.00223	0.279	8.07	<	8.35	<	4.46	51.0	2.84		0.702

COPC	Industrial Use Screening Level	Basis of Screening Level
Uranium - 234	3,310 pCi/g	NUREG 1757 Vol.1, Rev.2, Appendix H[1]
Uranium - 235	39 pCi/g	NUREG 1757 Vol.1, Rev.2, Appendix H[1]
Uranium - 238	179 pCi/g	NUREG 1757 Vol.1, Rev.2, Appendix H[1]
Technetium - 99	89,400 pCi/g	NUREG 1757 Vol.1, Rev.2, Appendix H[1]
Tetrachloroethylene (PCE)	100 mg/kg	EPA Regional Screening Levels[2]
Fluoride	47,000 mg/kg	EPA Regional Screening Levels[2]
Nitrate	1,900,000 mg/kg	EPA Regional Screening Levels[2]

[1] NUREG-1757 Vol. 1, Rev.2 Consolidated Decommissioning Guidance, Appendix H: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, Final Report September 2006. The individual isotope limits are based on carcinogenic risk.
[2] USEPA Regional Screening Level, Summary Table, Industrial Soil Standard (TR=1E-06, HQ=1), May 2022.
[3] USEPA Regional Screening Level Table is updated semiannually.

Afterwards, Sealand C-40 was emptied and removed. Based on the HP radiological survey, a small area of impacted surficial soil was identified underneath the sealand footprint and immediately removed. Subsequent soil sample analysis also identified a result above residential screening levels; the impact in this small area was remediated by removing the soil. Please refer to the aforementioned LTR-RAC-19-65 (Westinghouse, 2019c) for more information. C-40 (R1-R3) samples were taken following soil removal to confirm remediation to residential screening levels. The table below summarizes the results.

Phase 2 Southern Storage Area Operable Unit - Soil Sampling - Beneath Sea-land C-40

July 1, 2019 Sampling

	1 mg/kg = 1 ppm			SU	pCi/g	1 ug/g = 1 ppm			
	Fluoride	Ammonia	Nitrate	pH (H)	Tc-99	U238	U234	U235	**Total U**
C-40-1	1.52	28.8	2.05	4.76	*14.0*	0.763	*0.00212*	0.00727	0.772
C-40-2	0.593	37.6	1.77	4.75	*14.0*	2.77	*0.00218*	0.0925	2.86
C-40-3	1.00	50.2	2.60	4.95	*11.9*	0.706	*0.00207*	0.00618	0.714
C-40-4	1.36	33.3	1.75	5.52	*12.1*	0.768	*0.00206*	0.0059	0.776
C-40-5	0.851	35.9	2.14	4.73	*16.3*	0.630	*0.00218*	0.00532	0.638
C-40-6	*0.396*	76.9	2.23	4.84	*16.5*	2.46	*0.00228*	0.0513	2.51
C-40-7	0.900	49.9	5.00	4.52	*13.4*	0.660	*0.00211*	0.00508	0.667
C-40-8	*0.375*	50.0	1.95	4.66	*22.9*	1.15	*0.00207*	0.0193	1.17
C-40-9	*0.391*	81.3	2.18	4.53	*22.5*	20.4	0.00881	0.905	21.31
C-40-10	0.658	38.2	3.23	4.63	*16.8*	6.46	0.00238	0.240	6.70
C-40-11	1.98	36.3	15.4	4.15	*19.3*	2.20	*0.00213*	0.0641	2.27
C-40-12	*0.366*	42.3	1.26	4.79	*20.9*	1.27	*0.00216*	0.0215	1.29
C-40-13	*0.374*	44.9	2.27	4.66	*15.1*	1.46	*0.00221*	0.019	1.48
C-40-14	1.06	91.0	2.43	4.74	*15.2*	6.63	*0.00218*	0.179	6.81
C-40-15	0.495	87.8	2.69	4.60	*22.2*	4.47	*0.0021*	0.118	4.59
C-40-16	0.957	56.5	2.22	4.65	*21.9*	2.87	*0.00217*	0.0439	2.92
C-40-17	*0.391*	88.6	2.58	4.75	*13.7*	3.83	*0.00225*	0.0838	3.92
C-40-18	1.1	46.1	2.69	4.85	*20.0*	7.14	0.00258	0.248	7.39

July 30, 2019 Sampling

Re-sampling following soil excavation of Sample #9 Area

	ug/kg				1000 ug/kg = 1 ppm			
	U238	U234	U235	**Total U**	U238	U234	U235	**Total U**
C-40-R1	667	*2.11*	4.61	673.720	0.667	*0.00211*	0.00461	**0.674**
C-40-R2	659	*2.18*	4.93	666.110	0.659	*0.00218*	0.00493	**0.666**
C-40-R3	562	*2.16*	4.02	568.180	0.562	*0.00216*	0.00402	**0.568**

NOTE: *italicized = non-detectable, reported at detection limit*

(H): out of holding

		C-40 REAR		
6.81	4.59	2.92	3.92	7.39
#14	#15	#16	#17	#18
		#13		
		1.48		
#11				#12
2.27				1.29
			R3	
		#10	**0.568**	
3.85		6.70		
#7		#8	R2	#9
0.667		1.17	**0.666**	21.31
		2.93		
			R1	
			0.674	
0.638				2.51
#5				#6
		#4		
2.91		0.776		
#1		#2		#3
0.772		2.86		0.714
		C-40 FRONT		

SAMPLE RESULTS ARE IN PPM U

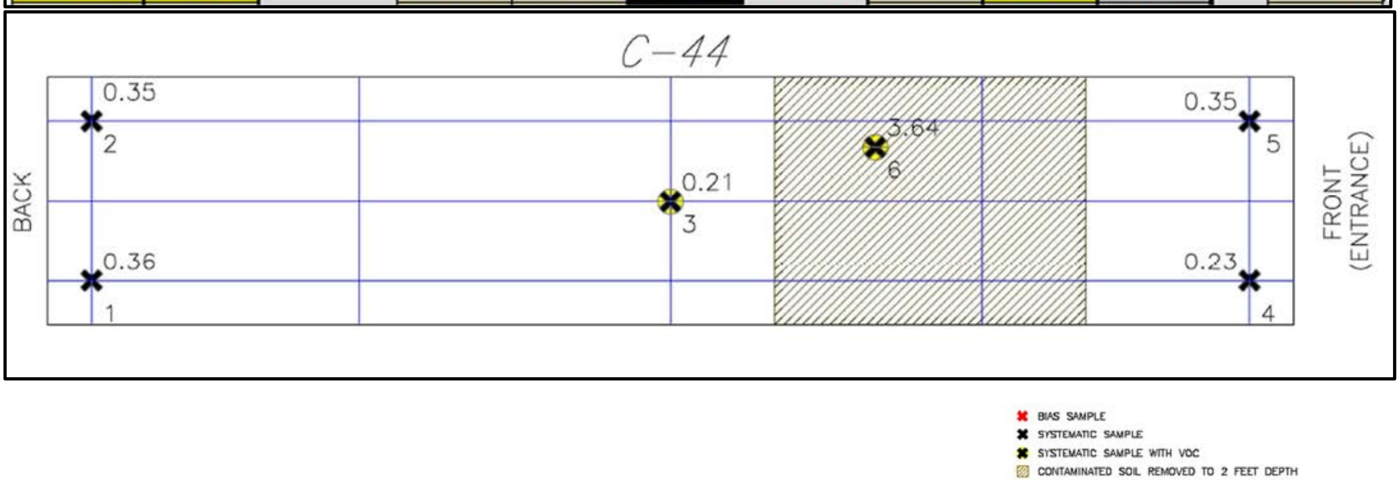
- initial Chem Lab samples
- systematic samples
- bias samples
- excavated area following first round of sampling

<u>**Areas of Impact**</u>

Sealand Container C-44

Based on the HP radiological survey, a small area of surficial soil impact was found underneath C-44 and immediately removed. Subsequent soil sample analysis also identified one result (highlighted in yellow in the table below) above RUSL, and the impact in this area was remediated by removing the soil. Refer to correspondence previously submitted to the Department for more information entitled *January 2020 Consent Agreement Progress Report* (LTR-RAC-20-15, Westinghouse, 2020b). Samples were taken following soil removal to confirm remediation to below RUSL. The table below summarizes the results.

Sample ID	Analyte (pCi/g)							SOF	SOF		mg/kg
	U-234		U-235	U-238	Sum U		Tc-99	Resid.	Ind.		Fluoride
C-44-1	3.36		0.245	0.982	4.587	< 3.60	0	0.36	0.01		0.58
C-44-2	3.02		0.227	1.32	4.567	< 3.84	0	0.35	0.01	<	0.39
C-44-3	1.55	< 0.1030	0.0594	1.22	2.8294	< 3.92	0	0.21	0.01		0.71
C-44-4	1.84		0.142	0.942	2.924	< 3.86	0	0.23	0.01		0.73
C-44-5	3.21		0.112	1.27	4.592	< 4.11	0	0.35	0.01		0.73
C-44-6	38.5		1.92	6.07	46.49	< 4.12	0	3.64	0.09		1.92



Resampling in January 2020 for isotopic U following soil excavation in the C-44-6 area produced the following tabulated results below RUSL and industrial use screening levels (IUSL). The sketch depicting the exact location of confirmatory sampling locations C-#44-1 and C#44-2 is unavailable but would have been taken in close proximity to original sample location C-44-6.

Confirmatory Soil Sampling Results After Soil Excavation											
Sample ID	Analyte (pCi/g)									SOF	SOF
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
WO 500519											
C-#44-1	0.237	<	0.117	0.0391	0.864	1.14		NS	NS	0.08	0.01
C-#44-2	1.20	<	0.402	0.0537	1.14	2.39		NS	NS	0.18	0.01

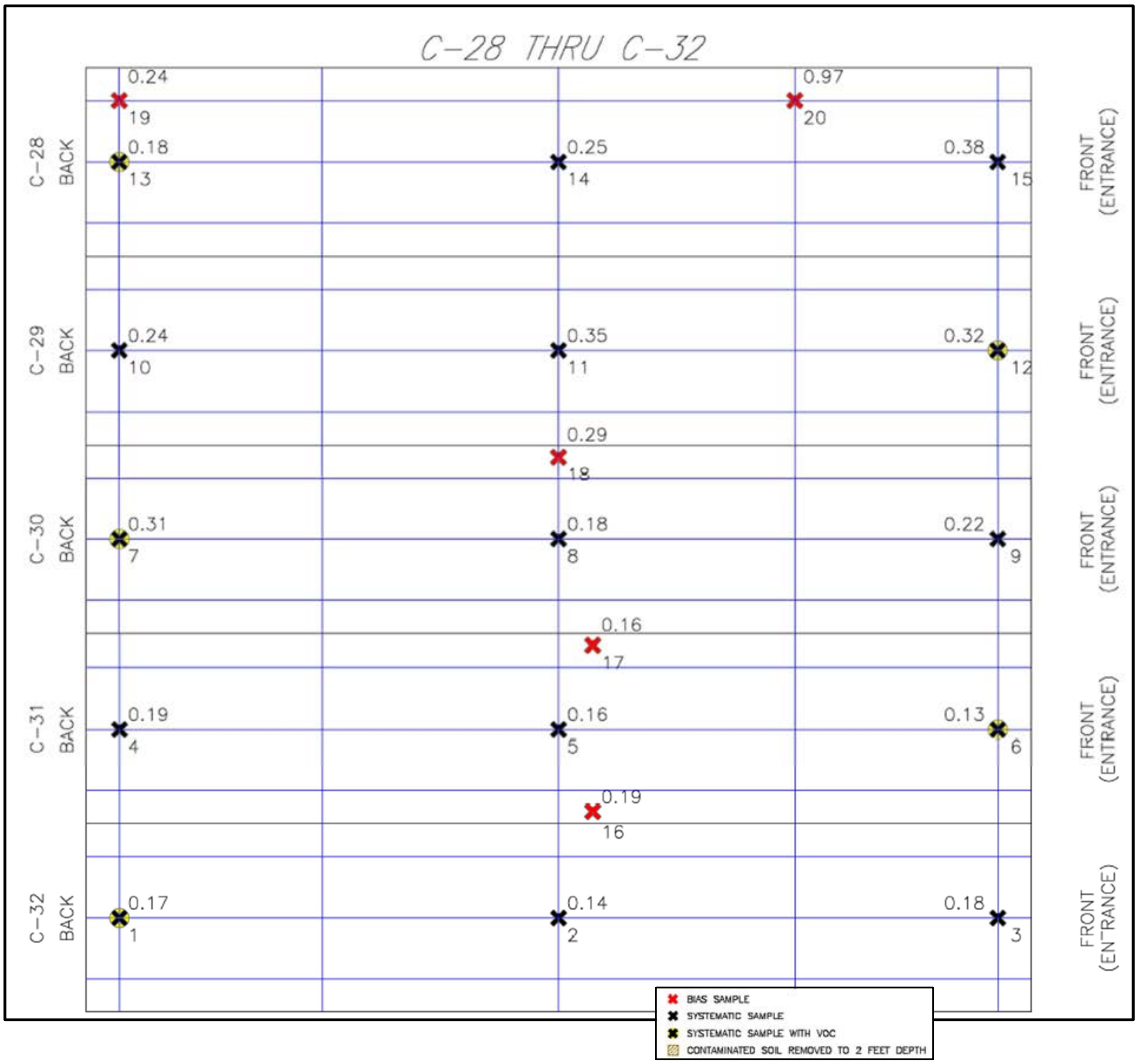
NS Not Sampled

__Areas of Impact__

Sealand Container C-28

Based on the HP radiological survey, a small area of surficial soil impact was found underneath C-28 and immediately removed. Subsequent soil sample analysis displayed in the table below confirmed that the impact was surficial, and no further action was required. The soil sample results were below RUSL and IUSL. Refer to correspondence previously submitted to the Department for more information entitled *January 2020 Consent Agreement Progress Report* (LTR-RAC-20-15). The table below summarizes the results.

Sample ID	Analyte (pCi/g)							SOF	SOF	mg/kg
	U-234		U-235	U-238	Sum U		Tc-99	Resid.	Ind.	Fluoride
C-28-13	1.49	< 0.0758	0.0436	0.797	2.3306	< 3.36	0	0.18	0.01	2.08
C-28-14	1.96		0.138	1.2	3.298	< 3.50	0	0.25	0.01	2.29
C-28-15	3.31		0.262	1.23	4.802	< 3.28	0	0.38	0.01	2.90
C-28-19	2.18	< 0.0576	0.0384	0.887	3.1054	< 3.27	0	0.24	0.01	1.13
C-28-20	9.14		0.672	2.11	11.922	< 3.30	0.565	0.97	0.03	3.00

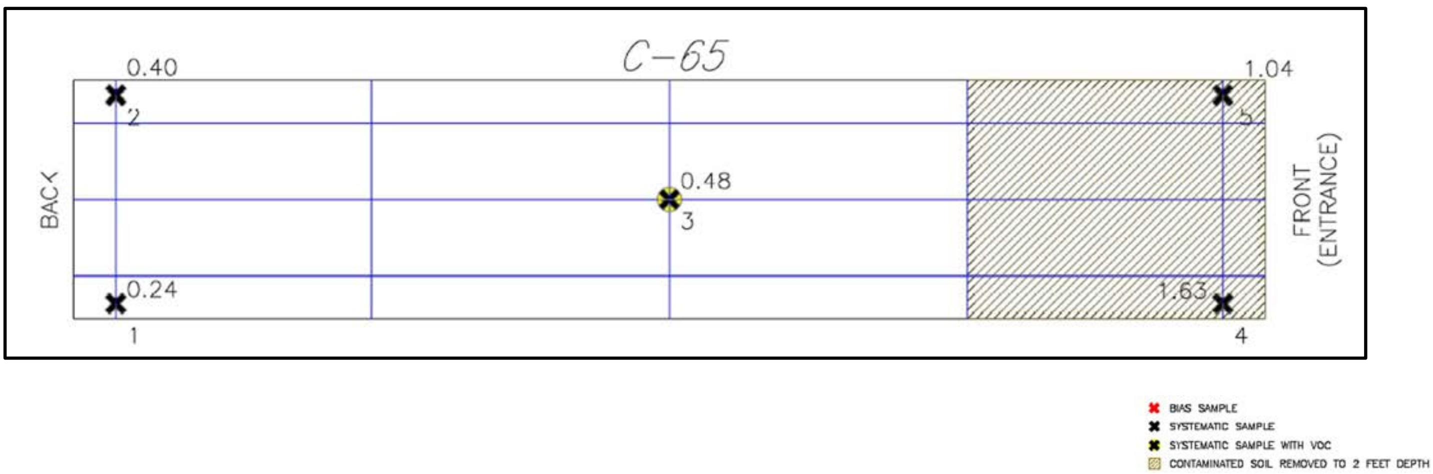


Areas of Impact

Sealand Container C-65

There was no surficial soil impact detected by direct HP radiological surveys underneath C-65. Soil sample analysis indicated two U results above RUSL, and the impact in this area was remediated by removing the soil to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *January 2020 Consent Agreement Progress Report* (LTR-RAC-20-15, Westinghouse, 2020b). Samples were taken following soil removal to confirm remediation to RUSL. The table below summarizes the results.

Sample ID	Analyte (pCi/g)							SOF	SOF		mg/kg
	U-234		U-235	U-238	Sum U		Tc-99	Resid.	Ind.		Fluoride
C-65-1	2.09		0.0938	0.958	3.1418	< 4.32	0	0.24	0.01		0.98
C-65-2	3.35	< 0.1480	0.0801	1.9	5.3301	< 4.07	0	0.40	0.01		1.03
C-65-3	4.32		0.265	1.65	6.235	< 3.79	0	0.48	0.02		0.89
C-65-4	15.5		0.773	4.79	21.063	< 3.68	0	1.63	0.05		2.79
C-65-5	9.85		0.608	2.88	13.338	< 3.37	0	1.04	0.03		1.10



Resampling in January 2020 for isotopic U following soil excavation in the C-65-4 and C-65-5 areas produced the following tabulated results below RUSL and IUSL. The sketch depicting the exact location of confirmatory sampling locations C-#65-1 and C#65-2 is unavailable but would have been taken in close proximity to original sample locations C-65-4 and C-65-5.

Confirmatory Soil Sampling Results After Soil Excavation											
Sample ID	Analyte (pCi/g)									SOF	SOF
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
WO 500519											
C-#65-1	1.10	<	0.260	0.1200	0.609	1.83				0.14	0.01
C-#65-2	1.20	<	0.189	0.109	0.936	2.25				0.17	0.01

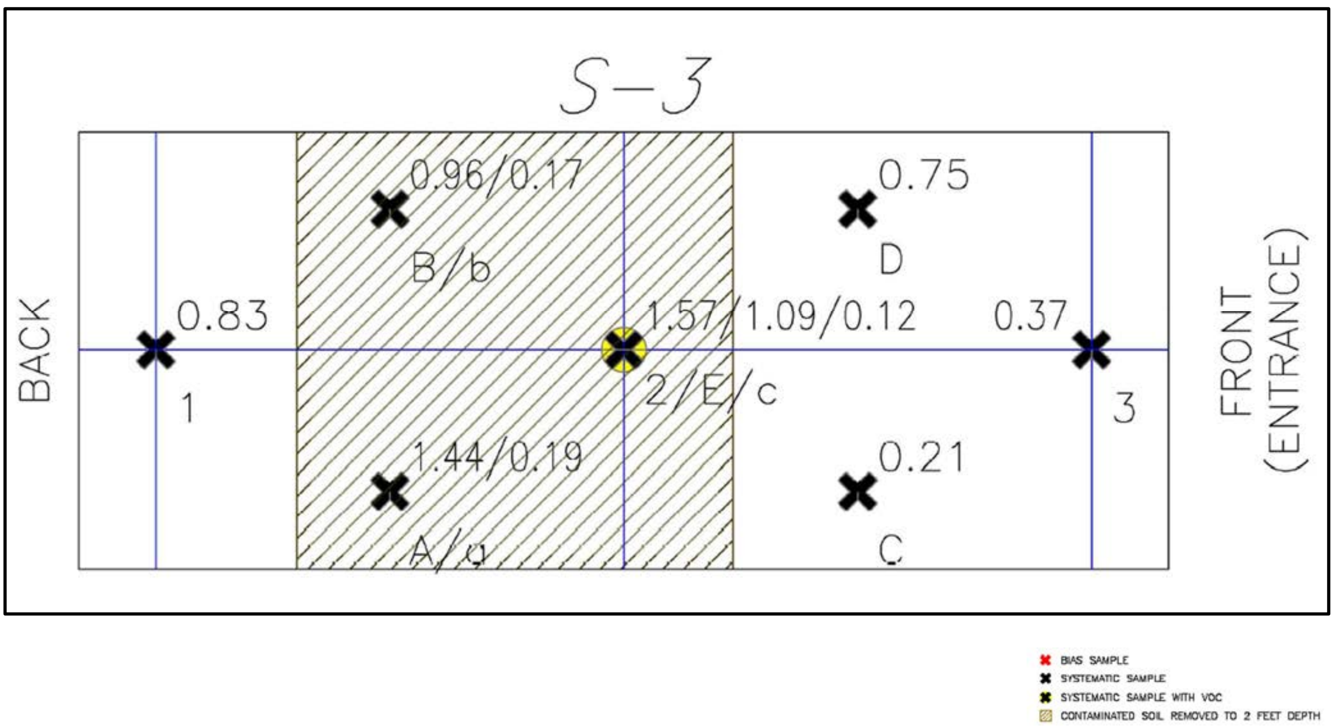
NS Not Sampled

Areas of Impact

Sealand Container S-3

There was no surficial soil impact underneath S-3 detected by the HP radiological surveys. Soil sample analysis found three results above RUSL, and the soil in this area was remediated by removing the soil to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *March 2020 Consent Agreement Progress Report* (LTR-RAC-20-34, Westinghouse, 2020c). The initial soil samples taken are labeled S-3-1 through S-3-3. Following assessment of these results, samples S-3-A through S-3-E were taken to bound the impacted area. Following soil removal, samples S-3-a through S-3-c were taken to confirm remediation to below RUSL. The table below summarizes the results.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
S-3-1	7.14			0.387	3.24	10.767	<	3.76	0	0.83	0.03		1.19
S-3-2	13			0.52	7.08	20.6	<	3.40	0	1.57	0.06		4.16
S-3-3	3.38	<	0.1310	0.113	1.4	4.893	<	3.54	0	0.37	0.01		0.775
S-3-A	12.5			0.513	5.87	18.883				1.44	0.05		
S-3-B	7.81			0.302	4.53	12.642				0.96	0.04		
S-3-C	1.69	<	0.2070	0.0327	1.11	2.8327				0.21	0.01		
S-3-D	7.18	<	0.3120	0.255	2.34	9.775				0.75	0.02		
S-3-E	9.67			0.308	4.32	14.298				1.09	0.03		
S-3-a	1.19			0.0955	1.17	2.4555				0.19	0.01		
S-3-b	1.05	<	0.2870	0.201	0.840	2.091				0.17	0.01		
S-3-c	0.821	<	0.1240	0.0414	0.738	1.6004				0.12	0.01		

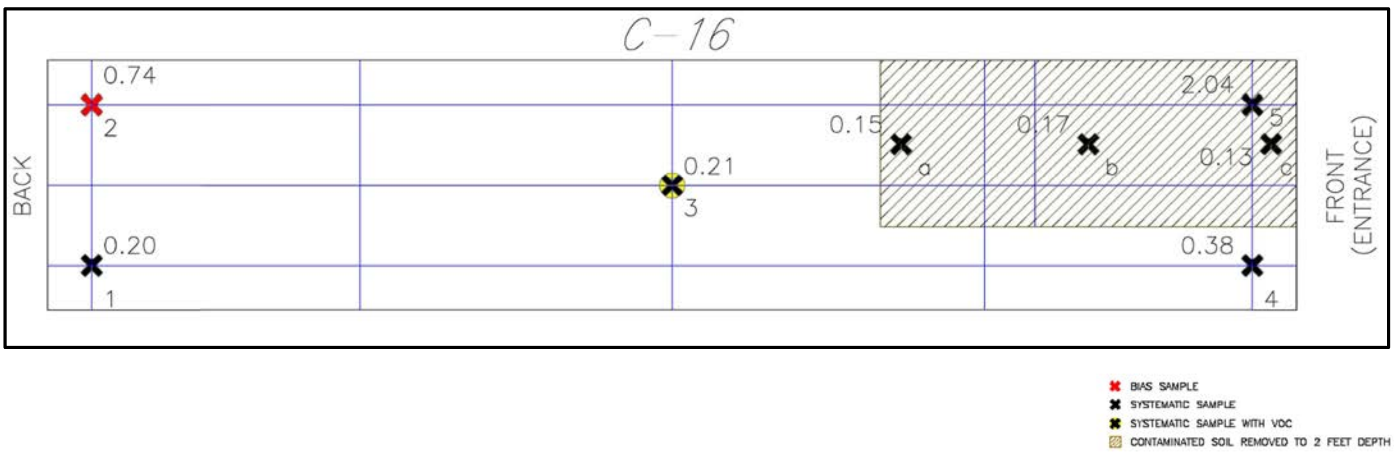


Areas of Impact

Sealand Container C-16

There was no surficial soil impact underneath C-16 detected by the HP radiological surveys. Subsequent soil sample analysis found one result above RUSL, and the impact in this small area was remediated by soil removal to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *March 2020 Consent Agreement Progress Report* (LTR-RAC-20-34, Westinghouse, 2020c). The initial soil samples taken are labeled C-16-1 through C-16-5. Samples C-16-a through C-16-c were taken following soil removal to confirm remediation to below RUSL. The table below summarizes the results.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-16-1	1.7			0.105	0.718	2.523	<	3.53	0.0268	0.20	0.01	<	0.385
C-16-2	6.7			0.371	2.24	9.311	<	4.00	0.267	0.74	0.02		0.925
C-16-3	1.46			0.134	1.2	2.794	<	3.93	0	0.21	0.01		1.11
C-16-4	3			0.121	1.84	4.961	<	3.68	0	0.38	0.01	<	0.375
C-16-5	19.2			0.638	6.74	26.578	<	3.49	0	2.04	0.06		10.4
C-16-a	1.01	<	0.2180	0.0599	0.895	1.9649				0.15	0.01		
C-16-b	1.29	<	0.2670	0.122	0.823	2.235				0.17	0.01		
C-16-c	0.885	<	0.2050	0	0.834	1.719				0.13	0.00		

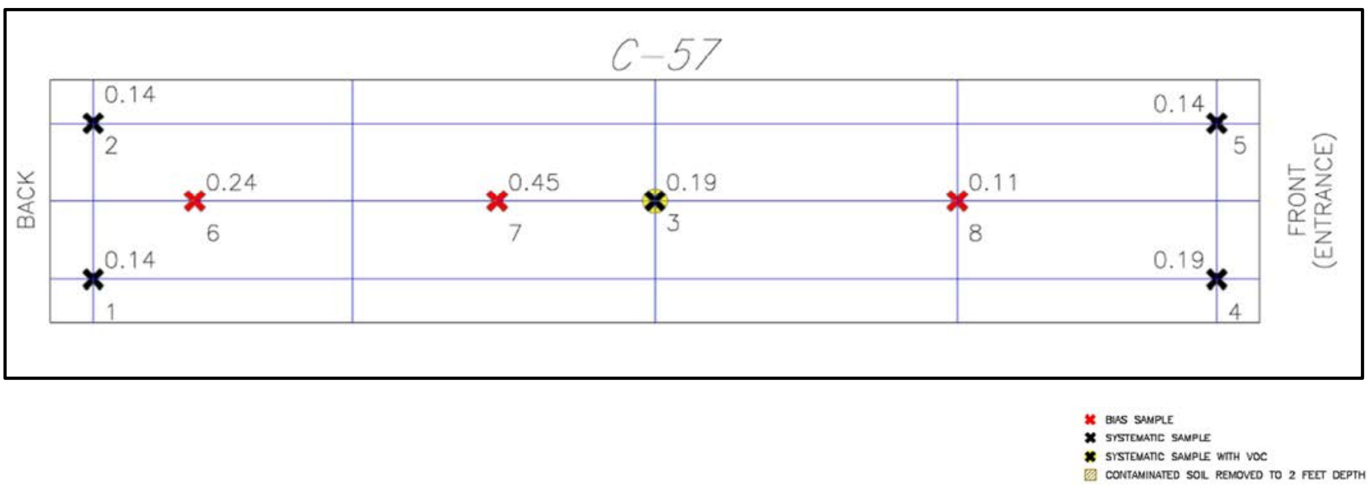


Areas of Impact

Sealand Container C-57

Surficial soil impact was detected by the HP radiological surveys and immediately removed underneath C-57. Subsequent soil sample analysis confirmed that the impact was surficial; therefore, no excavation or further action was required because the soil sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *April 2020 Consent Agreement Progress Report* (LTR-RAC-20-47, Westinghouse, 2020d). The table below summarizes the results.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-57-1	0.842	<	0.183	0.143	0.472	1.46	<	3.93	0.411	0.14	0.01	<	0.371
C-57-2	1.01	<	0.221	0.118	0.622	1.75	<	3.98	0	0.14	0.01	<	0.365
C-57-3	1.73	<	0.281	0.105	0.561	2.40	<	4.08	0	0.19	0.01		0.689
C-57-4	1.53	<	0.131	0.0873	0.857	2.47	<	4.16	0	0.19	0.01		2.33
C-57-5	0.981	<	0.221	0.119	0.647	1.75	<	4.40	0	0.14	0.01		0.490
C-57-6	2.08	<	0.277	0.102	0.948	3.13	<	4.09	0	0.24	0.01		0.850
C-57-7	3.64			0.302	1.11	5.05	<	4.20	0.999	0.45	0.02		0.898
C-57-8	0.624	<	0.169	0.0268	0.570	1.22	<	4.10	0.316	0.11	0.00		1.71

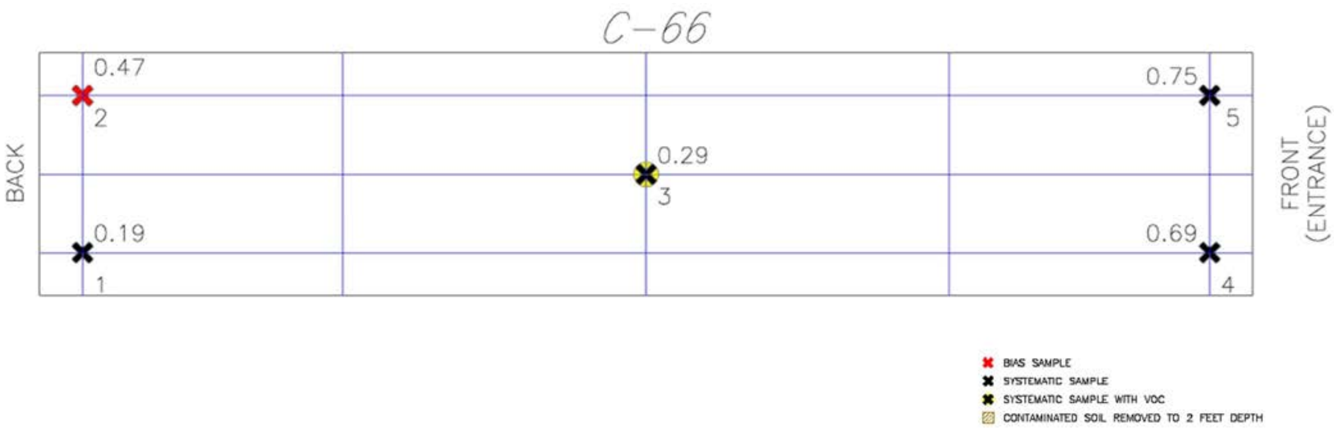


<u>Areas of Impact</u>

Sealand Container C-66

Soil surface impact was detected by the HP radiological surveys and immediately removed underneath C-66. Soil sample analysis confirmed that the impact was surficial, and no further action was required. The soil sample results met RUSL. Refer to correspondence previously submitted to the Department for more information entitled *April 2020 Consent Agreement Progress Report* (LTR-RAC-20-47). The table below summarizes the results.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-66-1	1.67	<	0.189	0.0299	0.822	2.52	<	3.58	0	0.19	0.01		0.724
C-66-2	4.26	<	0.264	0.105	0.951	5.32	<	3.46	1.16	0.47	0.01		0.972
C-66-3	2.14	<	0.298	0	1.49	3.63	<	4.08	0.416	0.29	0.01		0.928
C-66-4	6.08			0.376	2.42	8.88	<	4.04	0	0.69	0.02		8.84
C-66-5	7.08			0.314	2.36	9.75	<	4.00	0	0.75	0.02		2.72



Resampling in January 2020 for isotopic U following soil excavation in the C-66-2 area produced the following tabulated results below RUSL and IUSL. The sketch depicting the exact location of confirmatory sampling location C-#66 is unavailable but would have been taken in close proximity to original bias sample location C-66-2.

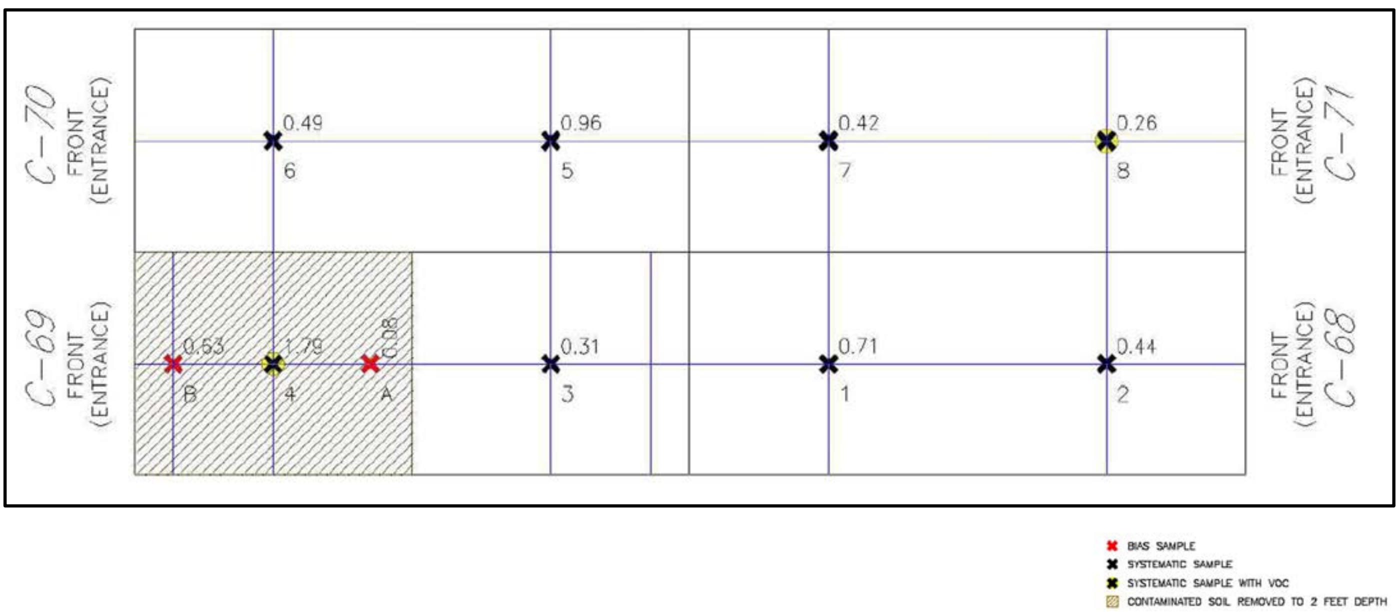
Confirmatory Soil Sampling Results After Soil Excavation											
Sample ID	Analyte (pCi/g)									SOF	SOF
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
WO 500519											
C-#66	4.56	<	0.202	0.348	2.02	6.93				0.54	0.02

Areas of Impact

Sealand Container C-69

Sealands C-68 through C-71 were removed at the same time, and the area was sampled as a single unit. There was no soil surface impact underneath these containers detected by the HP radiological surveys. One soil sample (C-69-4) was above the RUSL and the area was remediated by removing the soil to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *November 2020 Consent Agreement Progress Report* (LTR-RAC-20-90, Westinghouse, 2020f). C-69 (A-B) samples were taken following soil removal to confirm remediation to below RUSL. The table below summarizes the results. Note that there was no impact underneath Sealands, C-68, C-70 and C-71 and these results are included in the “Areas of No Impact” section of this appendix.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-69-3	2.50	<	0.248	0.0681	1.49	4.06	<	0.870	0	0.31	0.01		4.45
C-69-4	17.3			0.996	4.650	22.95	<	0.936	0	1.79	0.06		7.07
C-69-A	0.444	<	0.220	0.0807	0.503	1.03	<	0.906	0	0.08	0.01		
C-69-B	5.99	<	0.291	0.132	1.91	8.03	<	0.795	0.232	0.63	0.02		

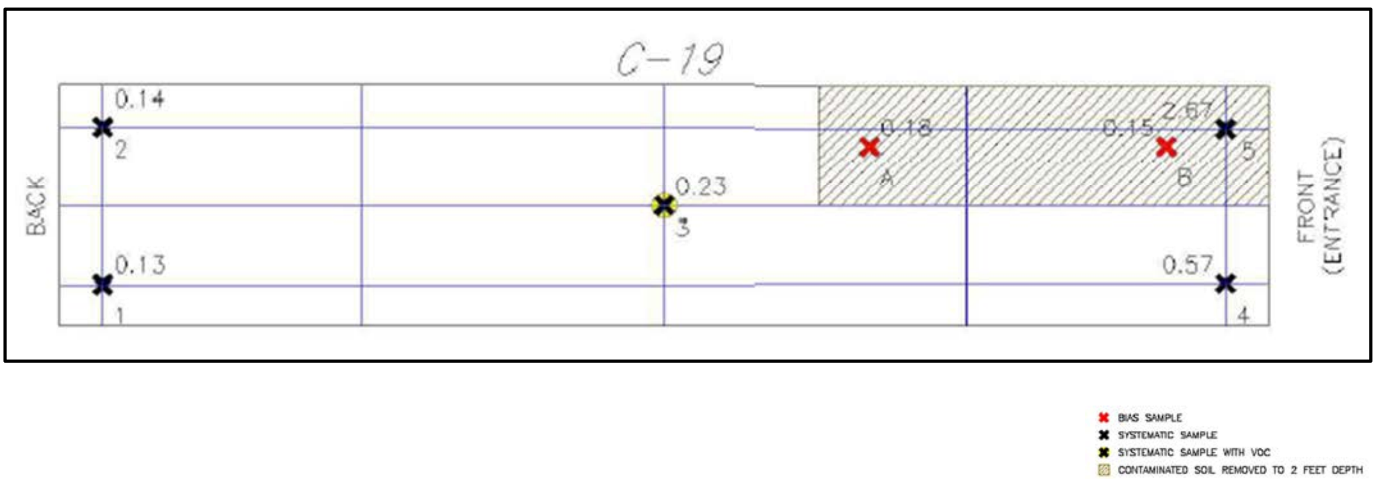


<u>Areas of Impact</u>

Sealand Container C-19

There was no soil surface impact underneath C-19 detected by the HP radiological surveys. Soil sample analysis found one result above RUSL and the impact in this area was remediated by soil removal to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *November 2020 Consent Agreement Progress Report* (LTR-RAC-20-90, Westinghouse, 2020f). Samples C-19 (A-B) were taken following the removal of soil to confirm remediation to below RUSL. The table below summarizes the results.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-19-1	0.552			0.137	0.996	1.69	<	0.678	0	0.13	0.01		0.724
C-19-2	0.964	<	0.157	0.0523	0.871	1.89	<	0.741	0	0.14	0.01	<	0.352
C-19-3	1.86	<	0.139	0.0926	1.07	3.02	<	0.777	0	0.23	0.01	<	0.369
C-19-4	5.04			0.321	2.01	7.37	<	0.699	0	0.57	0.02		3.25
C-19-5	25.7			1.43	7.27	34.40	<	0.749	0	2.67	0.09		1.66
C-19-A	1.25	<	0.252	0.160	0.710	2.12	<	0.845	0.169	0.18	0.01		
C-19-B	1.03	<	0.145	0.000	0.872	1.90	<	0.841	0.233	0.15	0.01		



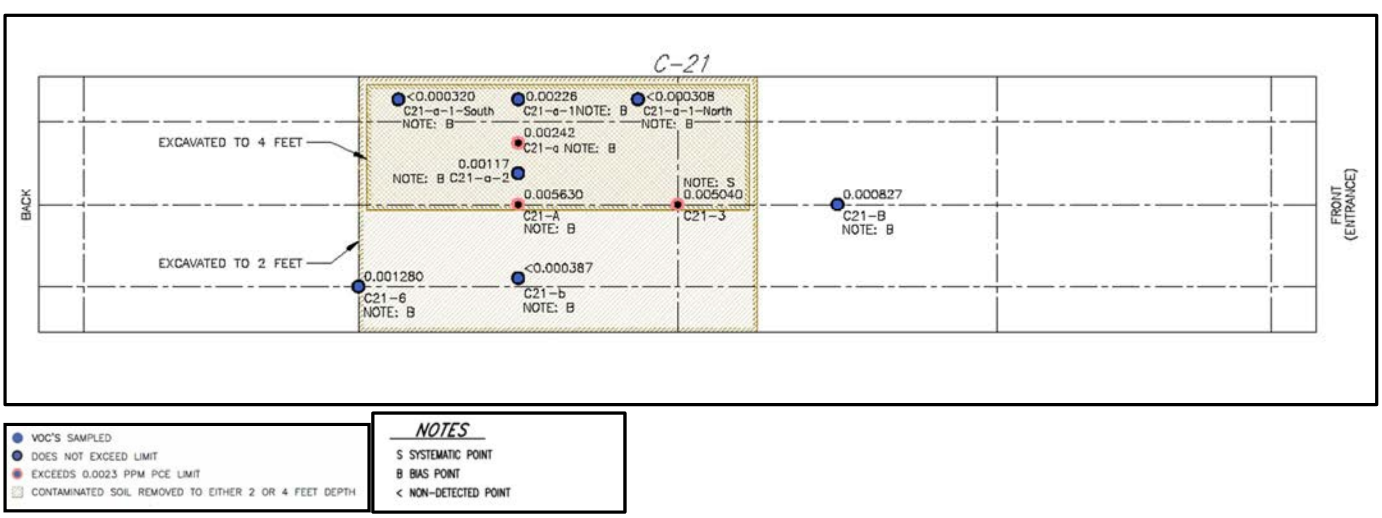
Areas of Impact

Sealand Container C-21

There was no soil surface impact underneath C-21 detected by the HP radiological surveys and there was no U impact in the soil based upon U analytical results. The initial soil samples taken on September 10, 2020 (C-21-3 and C-21-6) identified PCE above the residential screening level (RSL) in a one sample (C-21-3) and the impact was remediated by soil removal. Multiple rounds of soil removal and sampling were completed to remediate this area for the PCE impact as described in the paragraph below. Refer to correspondence previously submitted to the Department for more information entitled *November 2020 Consent Agreement Progress Report* (LTR-RAC-20-90, Westinghouse, 2020f) for radiological content and *February 2021 Consent Agreement Progress Report* (LTR-RAC-21-24, Westinghouse, 2021a) for discussion of PCE.

Following the first iteration of soil removal in the area of sample C-21-3, samples C-21 (A-B) were taken on November 5, 2020. Upon receipt of these results, additional soil was removed and samples C-21 (a-b) were taken on January 26, 2021. Upon receipt of these results, more soil was removed and samples C-21 (a-1, a-2) were taken on February 8, 2021. Upon receipt of these results, because the soil sample result for C-21-a-1 rounded to the residential screening level, out of an abundance of caution, additional soil was removed (a fourth time). Samples C-21 (a-1-North, A-1-South) were taken on February 23, 2021 and confirmed remediation to below RSL.

Sealand Soil Analysis Tetrachloroethylene Results Compilation				
C-21	Date Sampled Lab Report #	< or =	Result (mg/kg)	Notes
C-21-3	9/10/2020 GEL WO 521515	=	0.005040	Systematic excavation required
C-21-6	9/10/2020 GEL WO 521515	=	0.001280	Bias
C-21-A	11/5/2020 GEL WO 526713	=	0.005630	Bias excavation required
C-21-B	11/5/2020 GEL WO 526713	=	0.000827	Bias
C-21-a	1/26/2021 GEL WO 533288	=	0.002420	Bias excavation required
C-21-b	1/26/2021 GEL WO 533288	<	0.000387	Bias
C-21-a-1	2/8/2021 GEL WO 534641	=	0.002260	Bias
C-21-a-2	2/8/2021 GEL WO 534641	=	0.001170	Bias
C-21-a-1-North	2/23/2021 GEL WO 525611	<	0.000308	bias
C-21-a-1-South	2/23/2021 GEL WO 525611	<	0.000320	Bias
Residential Use Screening Level (RUSL): 0.0023 mg/kg				



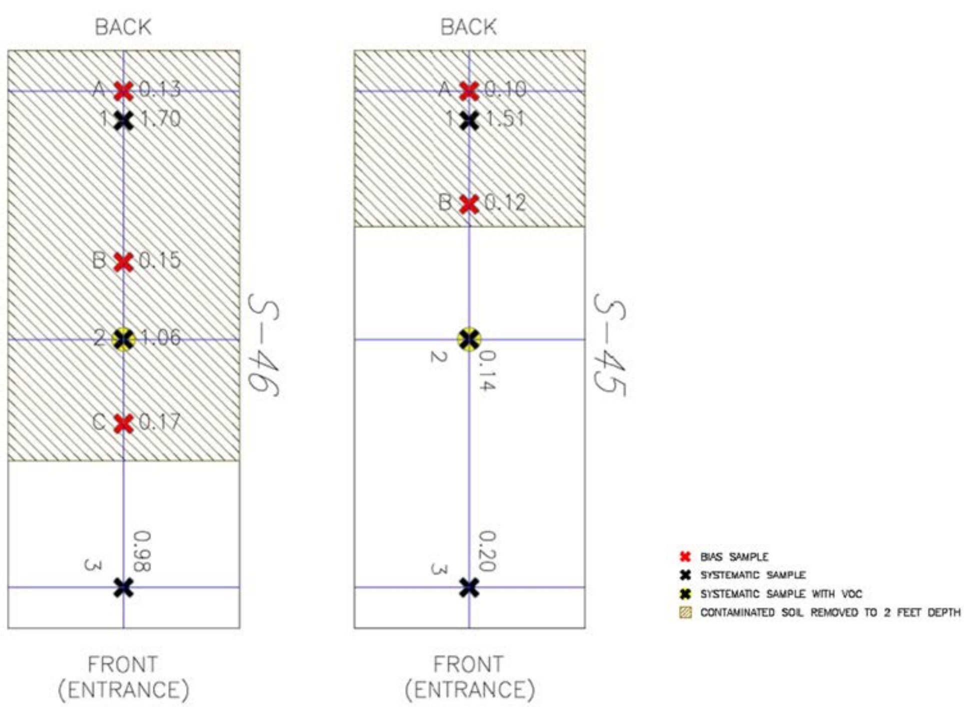
Areas of Impact

Sealand Containers S-45 & S-46

There was no soil surface impact underneath S-45 and S-46 detected by the HP radiological surveys. Soil sample analysis found three results above RUSL under both containers and these areas were remediated by removing the soil to a depth of two feet. Refer to correspondence previously submitted to the Department for more information entitled *November 2020 Consent Agreement Progress Report* (LTR-RAC-20-90, Westinghouse, 2020f). Samples S-45 (A-B) and S-46 (A-C) were taken after soil removal to confirm remediation to below RUSL.

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
S-45-1	14.5			0.791	4.16	19.45	<	0.734	0	1.51	0.05		8.76
S-45-2	0.777	<	0.273	0.100	0.933	1.81	<	0.730	0	0.14	0.01		1.43
S-45-3	1.69	<	0.189	0.0862	0.723	2.50	<	0.643	0.140	0.20	0.01		4.61
S-46-1	16.2			0.932	4.49	21.62	<	0.697	0.293	1.70	0.05		16.8
S-46-2	9.56			0.417	3.75	13.73	<	0.799	0.175	1.06	0.03		24.8
S-46-3	8.89			0.491	3.20	12.58	<	0.620	0.192	0.98	0.03		10.1

Sample ID	Analyte (pCi/g)											SOF	SOF
		U-234 DL	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
S-45-A	<	0.431	0.429	<	0.199	0.000	0.873	1.30	<	0.858	0	0.10	0.01
S-45-B			0.636	<	0.259	0	0.929	1.57	<	0.871	0	0.12	0.01
S-46-A			0.852	<	0.132	0.0441	0.688	1.58	<	0.773	0.245	0.13	0.01
S-46-B			0.997	<	0.181	0.0604	0.879	1.94	<	0.827	0.0127	0.15	0.01
S-46-C			1.34	<	0.197	0.0724	0.593	2.01	<	0.832	0.361	0.17	0.01

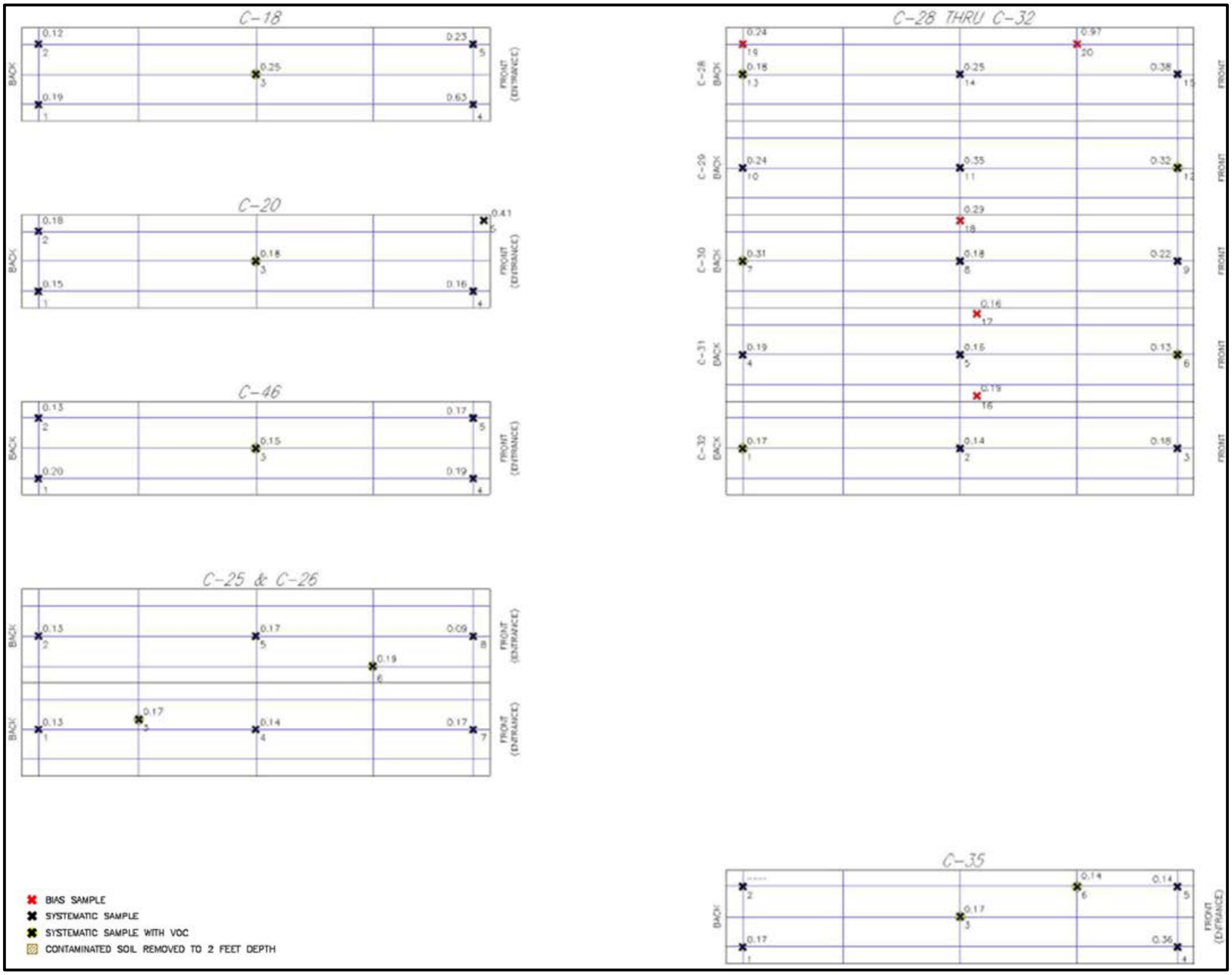


<u>Areas of No Impact</u>

Sealand Containers C-18, C-20, C-25, C-26, C-29, C-30, C-31, C-32, C-35 and C-46

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *January 2020 Consent Agreement Progress Report* (LTR-RAC-20-15, Westinghouse, 2020b).

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-18-1	1.6	<	0.0725	0.0417	0.845	2.4867	<	4.64	0	0.19	0.01	<	0.39
C-18-2	0.862	<	0.0829	0.0477	0.675	1.5847	<	4.25	0	0.12	0.01		1.08
C-18-3	1.56	<	0.0851	0.0313	0.787	2.3783	<	4.29	1.32	0.25	0.01		0.37
C-18-4	6.09			0.132	2.08	8.302	<	4.33	0	0.63	0.02		1.24
C-18-5	1.8			0.0613	1.14	3.0013	<	4.48	0	0.23	0.01		1.90
C-20-1	1.21	<	0.0480	0.032	0.774	2.016	<	4.45	0	0.15	0.01	<	0.37
C-20-2	1.61	<	0.0880	0.069	0.717	2.396	<	4.54	0	0.18	0.01	<	0.35
C-20-3	1.43			0.11	0.773	2.313	<	4.53	0	0.18	0.01	<	0.36
C-20-4	1.18	<	0.1050	0.0289	0.881	2.0899	<	4.32	0	0.16	0.01		0.86
C-20-5	3.37			0.227	1.72	5.317	<	4.37	0.0546	0.41	0.02		3.46
C-25+26-1	0.888	<	0.0951	0.0355	0.734	1.6575	<	4.66	0	0.13	0.01	<	0.39
C-25+26-2	0.777	<	0.0707	0.0259	0.937	1.7399	<	4.14	0	0.13	0.01		0.48
C-25+26-3	1.38	<	0.0988	0.0271	0.845	2.2521	<	4.03	0	0.17	0.01		1.27
C-25+26-4	1.05			0.115	0.601	1.766	<	4.36	0	0.14	0.01	<	0.37
C-25+26-5	1.57	<	0.1490	0.0312	0.701	2.3022	<	4.17	0	0.17	0.01		0.48
C-25+26-6	1.6	<	0.1240	0.0562	0.831	2.4872	<	4.14	0	0.19	0.01		0.80
C-25+26-7	1.15	<	0.1030	0.0281	0.997	2.1751	<	4.20	0.167	0.17	0.01		2.04
C-25+26-8	0.622	<	0.1170	0.0322	0.494	1.1482	<	4.33	0	0.09	0.00		3.80
Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234			U-235	U-238	Sum U			Tc-99	Resid.	Ind.		Fluoride
C-46-1	1.26			0.228	1.1	2.588	<	3.57	0	0.20	0.01		0.79
C-46-2	0.685			0.102	0.942	1.729	<	3.50	0	0.13	0.01	<	0.36
C-46-3	1.23			0.154	0.522	1.906	<	3.89	0	0.15	0.01		0.93
C-46-4	1.4			0.195	0.796	2.391	<	3.79	0	0.19	0.01		1.13
C-46-5	1.07	<	0.1180	0.0826	0.785	1.9376	<	3.74	0.382	0.17	0.01		1.70
C-35-1	1.31	<	0.0908	0.0902	0.851	2.2512	<	3.55	0	0.17	0.01	<	0.41
C-35-2	1.54	<	0.1130	0.0514	0.901	2.4924	<	4.03	0	0.19	0.01	<	0.40
C-35-3	1.49	<	0.0873	0	0.83	2.32	<	3.71	0	0.17	0.01		1.59
C-35-4	2.5			0.241	1.85	4.591	<	3.70	0.172	0.36	0.02		4.73
C-35-5	1.07			0.0655	0.696	1.8315	<	3.78	0	0.14	0.01	<	0.37
C-35-6	1.05	<	0.0963	0.0612	0.686	1.7972	<	3.76	0	0.14	0.01		1.37
Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234			U-235	U-238	Sum U			Tc-99	Resid.	Ind.		Fluoride
C-32-1	1.18			0.146	0.814	2.14	<	3.06	0	0.17	0.01	<	0.38
C-32-2	0.917	<	0.0832	0.0305	0.523	1.4705	<	2.95	0.513	0.14	0.00	<	0.39
C-32-3	1.33			0.118	0.832	2.28	<	3.63	0	0.18	0.01	<	0.38
C-31-4	1.21			0.102	0.858	2.17	<	2.87	0.342	0.19	0.01		1.22
C-31-5	1.1			0.0837	0.855	2.0387	<	3.15	0	0.16	0.01		2.03
C-31-6	0.89			0.0684	0.512	1.4704	<	3.16	0.321	0.13	0.00		1.01
C-30-7	1.24			0.095	0.688	2.023	<	2.94	2.87	0.31	0.01		1.76
C-30-8	1.52	<	0.0863	0.0317	0.761	2.3127	<	3.20	0	0.18	0.01		0.89
C-30-9	1.59			0.13	0.966	2.686	<	3.17	0.287	0.22	0.01		0.76
C-29-10	1.82			0.144	0.831	2.795	<	3.20	0.446	0.24	0.01		1.34
C-29-11	3.39			0.135	0.969	4.494	<	3.20	0	0.35	0.01		3.75
C-29-12	2.84			0.0928	1.26	4.1928	<	3.07	0	0.32	0.01		1.60
Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234			U-235	U-238	Sum U			Tc-99	Resid.	Ind.		Fluoride
C-31-16	1.27	<	0.1050	0.0854	1.08	2.4354	<	3.28	0	0.19	0.01		0.77
C-31-17	1.19	<	0.0458	0.0306	0.835	2.0556	<	3.51	0	0.16	0.01		1.66
C-30-18	2.44			0.125	1.22	3.785	<	3.13	0	0.29	0.01		2.21

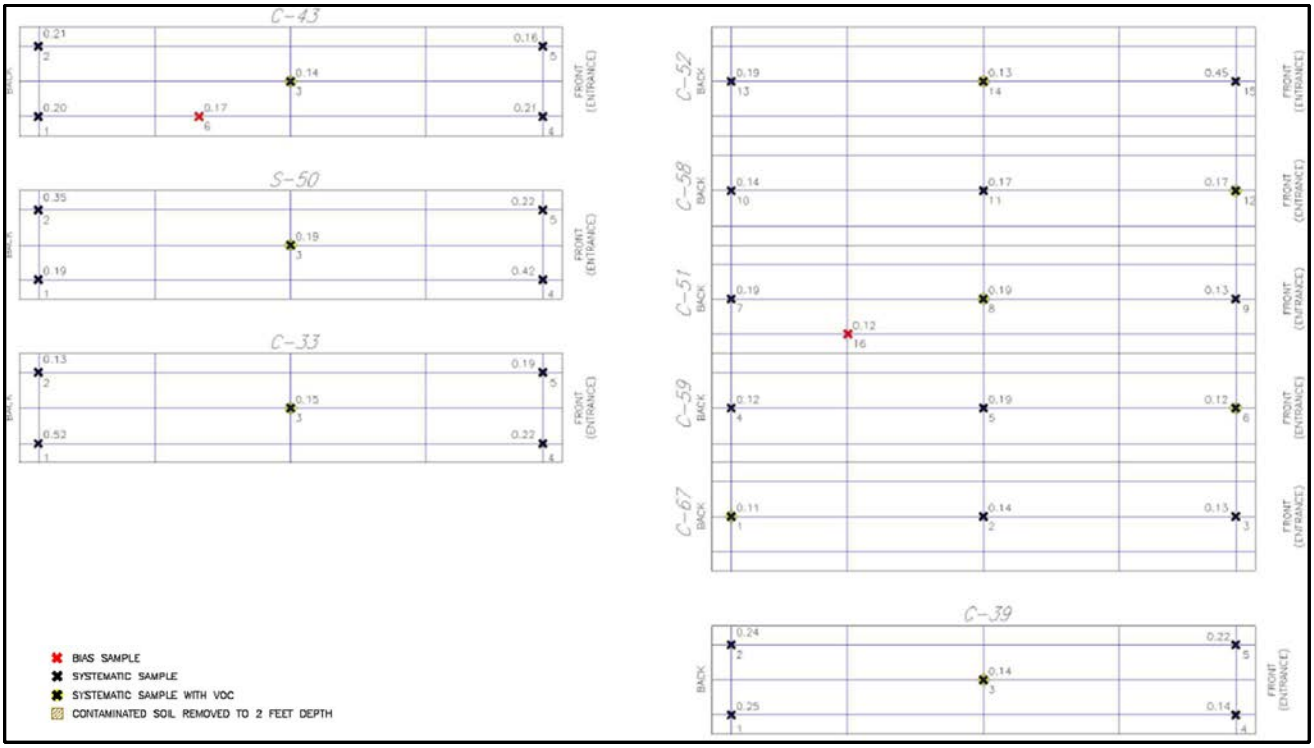

C-18
C-20
C-46
C-25 & C-26
C-28 THRU C-32
C-35
BACK
FRONT (ENTRANCE)
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

Areas of No Impact

Sealand Containers S-50, C-33, C-39, C-43, C-51, C-52, C-58, C-59, and C-67

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL Refer to correspondence previously submitted to the Department for more information entitled *March 2020 Consent Agreement Progress Report* (LTR-RAC-20-34, Westinghouse, 2020c).

Sample ID	Analyte (pCi/g)							SOF	SOF	mg/kg
	U-234		U-235	U-238	Sum U		Tc-99	Resid.	Ind.	Fluoride
C-33-1	4.15		0.212	1.66	6.022	< 3.82	1.08	0.52	0.02	1.86
C-33-2	0.629	< 0.0761	0.00714	0.698	1.33414	< 3.52	0.593	0.13	0.00	3.37
C-33-3	1.06	< 0.0963	0.0554	0.918	2.0334	< 3.77	0	0.15	0.01	1.07
C-33-4	1.38		0.135	1.25	2.765	< 3.71	0.147	0.22	0.01	< 0.394
C-33-5	1.53		0.0652	0.983	2.5782	< 3.89	0	0.20	0.01	< 0.384
S-50-1	1.2		0.0469	0.929	2.1759	< 3.59	0.413	0.19	0.01	< 0.366
S-50-2	3.24		0.119	1.27	4.629	< 3.89	0	0.35	0.01	0.970
S-50-3	1.48	< 0.0939	0.0766	0.978	2.5346	< 2.67	0	0.19	0.01	1.15
S-50-4	3.83		0.253	1.32	5.403	< 2.45	0	0.42	0.02	2.60
S-50-5	1.66	< 0.0906	0.0555	1.19	2.9055	< 2.77	0	0.22	0.01	2.90
C-43-1	1.75	< 0.0858	0.0461	0.849	2.6451	< 2.79	0	0.20	0.01	0.751
C-43-2	1.74	< 0.0724	0.0568	0.983	2.7798	< 2.69	0	0.21	0.01	< 0.380
C-43-3	1.19	< 0.0944	0.0436	0.664	1.8976	< 2.76	0	0.14	0.01	< 0.376
C-43-4	1.76	< 0.1120	0.0604	0.905	2.7254	< 2.57	0	0.21	0.01	1.79
C-43-5	1.23	< 0.0888	0.0882	0.802	2.1202	< 2.65	0	0.16	0.01	0.949
C-43-6	1.32	< 0.1270	0.0974	0.743	2.1604	< 2.68	0	0.17	0.01	< 0.363
C-39-1	1.96	< 0.1060	0.0675	1.3	3.3275	< 2.54	0	0.25	0.01	0.721
C-39-2	1.76		0.221	1.1	3.081	< 2.70	0	0.24	0.01	< 0.369
C-39-3	1.03		0.0921	0.692	1.8141	< 2.83	0	0.14	0.01	0.851
C-39-4	0.873		0.177	0.721	1.771	< 2.81	0.0304	0.14	0.01	< 0.397
C-39-5	1.35		0.16	0.835	2.345	< 2.69	0.619	0.22	0.01	< 0.388
C-67-1	0.763	< 0.0754	0.012	0.707	1.482	< 2.72	0	0.11	0.00	< 0.378
C-67-2	1.1		0.0777	0.68	1.8577	< 3.41	0	0.14	0.01	1.48
C-67-3	0.861	< 0.0972	0.0618	0.746	1.6688	< 3.12	0	0.13	0.01	< 0.389
C-59-4	0.739	< 0.1280	0.00589	0.736	1.48089	< 2.93	0.221	0.12	0.00	< 0.385
C-59-5	1.4	< 0.1150	0.114	0.959	2.473	< 2.95	0	0.19	0.01	2.59
C-59-6	0.952	< 0.1210	0.0113	0.582	1.5453	< 3.20	0	0.12	0.00	1.76
C-51-7	1.53		0.0602	0.871	2.4612	< 2.70	0	0.19	0.01	0.926
C-51-8	1.65	< 0.0570	0.038	0.781	2.469	< 3.19	0	0.19	0.01	4.49
C-51-9	1.04	< 0.0954	0.0151	0.633	1.6881	< 3.13	0	0.13	0.00	3.08
C-58-10	0.714	< 0.9900	0.045	0.764	1.523	< 3.08	0.547	0.14	0.01	1.27
C-58-11	1.09	< 0.1550	0.00708	0.913	2.01008	< 2.94	0.309	0.17	0.01	1.29
C-58-12	1.28	< 0.0673	0.0388	0.983	2.3018	< 3.11	0	0.17	0.01	0.375
C-52-13	1.31	< 0.0988	0.0906	1.04	2.4406	< 3.10	0.0198	0.19	0.01	0.820
C-52-14	0.898	< 0.0863	0.0237	0.732	1.6537	< 3.10	0.0994	0.13	0.00	0.596
C-52-15	4.22		0.159	1.42	5.799	< 3.04	0	0.45	0.01	1.77
C-51-16	0.853		0.044	0.661	1.558	< 3.09	0	0.12	0.01	1.16



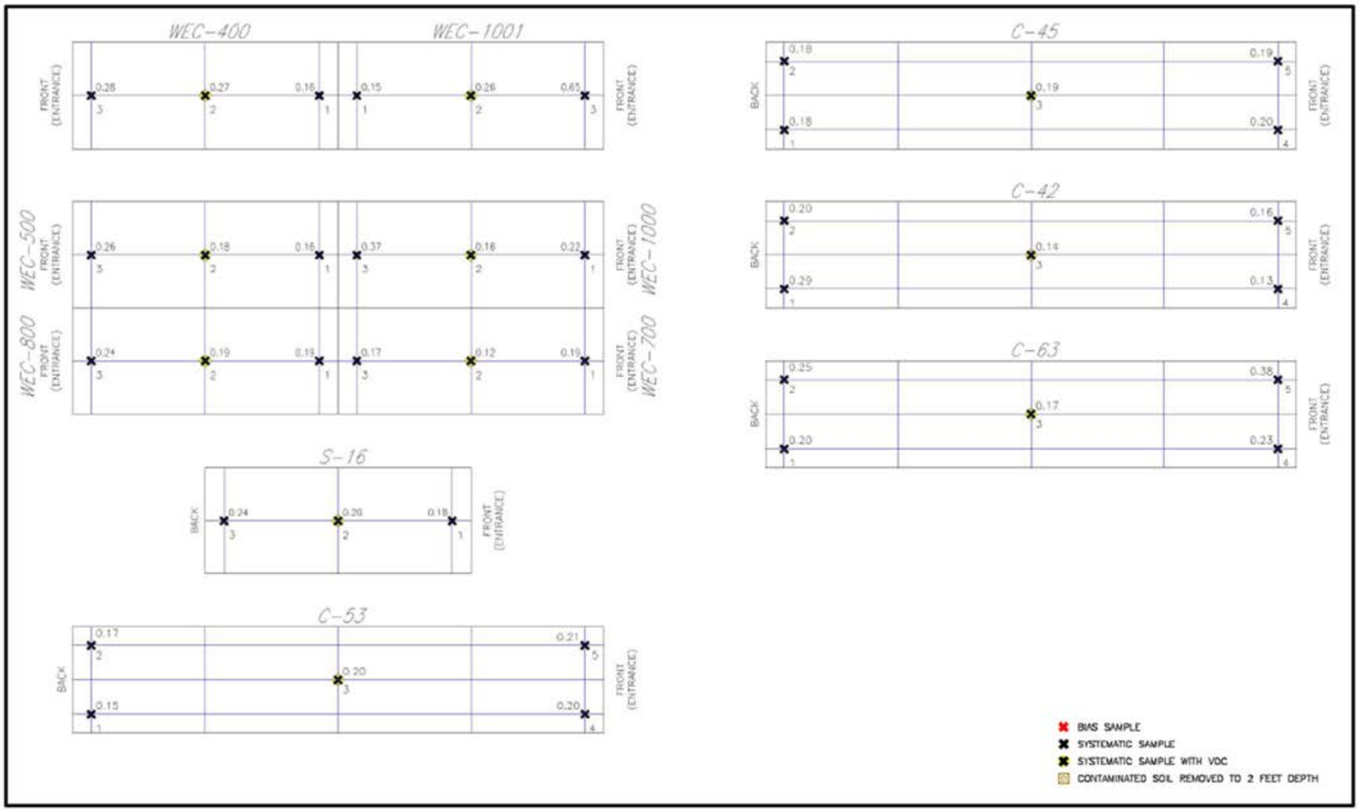
C-43
S-50
C-33
C-52
C-58
C-51
C-59
C-67
C-39
BACK
FRONT (ENTRANCE)
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

Areas of No Impact

Sealand Containers WEC-1000, WEC-500, WEC-700, WEC-800, WEC-400, WEC-1001, C-45, C-42, C-53, C-63 and S-16

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *April 2020 Consent Agreement Progress Report* (LTR-RAC-20-47, Westinghouse, 2020d).

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
WEC1000-1	1.42	<	0.254	0.115	1.33	2.87	<	3.66	0	0.22	0.01		11.7
WEC1000-2	0.991	<	0.381	0	1.11	2.10	<	3.76	0	0.16	0.01		5.54
WEC1000-3	1.86	<	0.177	0.175	1.10	3.14	<	3.91	2.43	0.37	0.01		3.08
WEC500-1	0.946	<	0.563	0	1.12	2.07	<	4.01	0.0546	0.16	0.01		3.13
WEC500-2	1.13	<	0.473	0.0445	1.23	2.40	<	3.69	0	0.18	0.01		1.16
WEC500-3	2.59	<	0.312	0.0857	0.755	3.43	<	3.98	0	0.26	0.01		3.46
WEC700-1	1.27			0.119	0.841	2.23	<	3.99	0.289	0.19	0.01		1.18
WEC700-2	0.715	<	0.357	0.0407	0.794	1.55	<	4.20	0	0.12	0.01		13.0
WEC700-3	0.754	<	0.311	0.142	1.26	2.16	<	3.98	0.125	0.17	0.01		1.06
WEC800-1	0.806	<	0.213	0	1.10	1.91	<	4.23	1.01	0.19	0.01		1.49
WEC800-2	1.31	<	0.198	0.0726	1.08	2.46	<	3.85	0	0.19	0.01		1.80
WEC800-3	1.52	<	0.257	0.0958	1.06	2.68	<	3.66	0.584	0.24	0.01		9.08
WEC400-1	0.894	<	0.247	0.0517	1.18	2.13	<	4.14	0	0.16	0.01		2.72
WEC400-2	1.93	<	0.123	0.204	1.33	3.46	<	4.00	0	0.27	0.01		3.78
WEC400-3	2.05	<	0.226	0.0845	1.56	3.69	<	3.54	0	0.28	0.01		2.89
WEC1001-1	1.06	<	0.178	0.0652	0.788	1.91	<	3.84	0	0.15	0.01		1.73
WEC1001-2	2.13			0.0989	0.941	3.17	<	4.06	0.306	0.26	0.01		3.92
WEC1001-3	5.77			0.243	1.64	7.65	<	3.69	1.08	0.65	0.02		1.56
C-45-1	1.18			0.122	0.961	2.26	<	4.08	0.176	0.18	0.01		1.11
C-45-2	1.39	<	0.256	0.0938	0.864	2.35	<	3.86	0	0.18	0.01	<	0.380
C-45-3	1.04	<	0.189	0.0695	1.14	2.25	<	3.48	0.425	0.19	0.01		0.807
C-45-4	1.29	<	0.293	0	0.720	2.01	<	3.45	0.997	0.20	0.00		0.841
C-45-5	1.51	<	0.231	0.147	0.836	2.49	<	3.59	0	0.19	0.01		0.552
C-42-1	2.48	<	0.230	0.105	1.26	3.85	<	3.62	0	0.29	0.01		0.782
C-42-2	1.43			0.124	0.981	2.54	<	3.38	0.0987	0.20	0.01	<	0.383
C-42-3	1.02	<	0.304	0.0781	0.677	1.78	<	3.62	0	0.14	0.01		0.550
C-42-4	0.839	<	0.246	0.0675	0.819	1.73	<	3.28	0	0.13	0.01		0.565
C-42-5	1.27	<	0.163	0.0597	0.810	2.14	<	3.26	0	0.16	0.01		0.589
C-53-1	1.05	<	0.187	0.108	0.829	1.99	<	3.75	0	0.15	0.01		0.572
C-53-2	1.15	<	0.225	0.158	0.902	2.21	<	3.58	0	0.17	0.01		0.519
C-53-3	1.38	<	0.277	0.0581	0.994	2.43	<	3.46	0.221	0.20	0.01		0.853
C-53-4	1.39	<	0.137	0.0458	1.16	2.60	<	3.49	0.152	0.20	0.01		1.08
C-53-5	0.795	<	0.211	0.183	1.35	2.33	<	3.90	0.639	0.21	0.01		0.903
C-63-1	1.50	<	0.170	0.134	0.957	2.59	<	3.36	0	0.20	0.01		0.513
C-63-2	1.37			0.111	0.814	2.30	<	3.27	1.36	0.25	0.01		0.736
C-63-3	1.21	<	0.183	0.0290	0.958	2.20	<	3.21	0	0.17	0.01		1.14
C-63-4	1.73			0.148	1.05	2.93	<	3.52	0	0.23	0.01		1.03
C-63-5	2.84	<	0.210	0.121	1.24	4.20	<	3.54	1.12	0.38	0.01		0.984
S-16-1	1.12	<	0.107	0.0710	1.13	2.32	<	4.22	0	0.18	0.01		7.10
S-16-2	1.31	<	0.203	0.160	1.10	2.57	<	4.31	0	0.20	0.01		3.07
S-16-3	1.58	<	0.114	0.0378	1.57	3.19	<	4.29	0	0.24	0.01		9.51



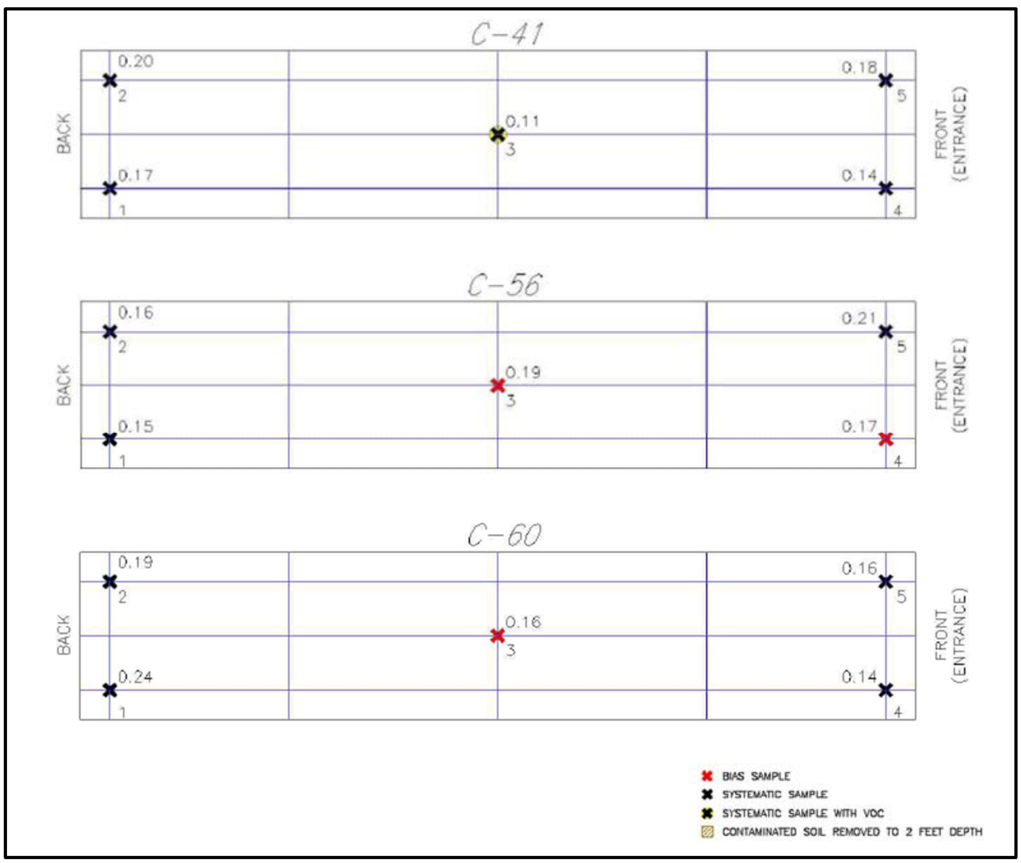
WEC-400
WEC-1001
FRONT (ENTRANCE)
0.28
3
0.27
2
0.16
1
0.15
1
0.26
2
0.65
3
FRONT (ENTRANCE)
WEC-500
FRONT (ENTRANCE)
0.26
3
0.18
2
0.16
1
0.37
3
0.16
2
0.22
1
FRONT (ENTRANCE)
WEC-1000
WEC-800
FRONT (ENTRANCE)
0.24
3
0.19
2
0.19
1
0.17
3
0.12
2
0.19
1
FRONT (ENTRANCE)
WEC-700
S-16
BACK
0.24
3
0.20
2
0.18
1
FRONT (ENTRANCE)
C-53
BACK
0.17
2
0.15
1
0.20
3
0.21
5
0.20
4
FRONT (ENTRANCE)
C-45
BACK
0.18
2
0.18
1
0.19
3
0.19
5
0.20
4
FRONT (ENTRANCE)
C-42
BACK
0.20
2
0.29
1
0.14
3
0.16
5
0.13
4
FRONT (ENTRANCE)
C-63
BACK
0.25
2
0.20
1
0.17
3
0.38
5
0.23
4
FRONT (ENTRANCE)
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

Areas of No Impact

Sealand Containers C-41, C-56 and C-60

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *July 2020 Consent Agreement Progress Report* (LTR-RAC-20-68, Westinghouse, 2020e).

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-41-1	1.33	<	0.173	0.136	0.679	2.15	<	0.751	0	0.17	0.01		1.31
C-41-2	1.73	<	0.116	0.0773	0.868	2.68	<	0.791	0	0.20	0.01		1.17
C-41-3	0.899	<	0.280	0	0.577	1.48	<	0.759	0	0.11	0.00		1.03
C-41-4	0.886	<	0.258	0	1.06	1.95	<	0.762	0	0.14	0.01	<	0.378
C-41-5	1.16	<	0.207	0.0329	1.20	2.39	<	0.708	0	0.18	0.01		1.190
C-56-1	0.994	<	0.261	0.0717	0.870	1.94	<	0.725	0	0.15	0.01	<	0.362
C-56-2	1.07	<	0.259	0.0712	1.01	2.15	<	0.708	0	0.16	0.01		0.443
C-56-3	1.07	<	0.242	0	1.56	2.63	<	0.786	0	0.19	0.01		1.91
C-56-4	1.35	<	0.236	0.0108	0.890	2.25	<	0.759	0	0.17	0.01		1.69
C-56-5	1.51	<	0.263	0.127	1.15	2.79	<	0.759	0	0.21	0.01		3.43
C-60-1	1.34	<	0.249	0.216	1.47	3.03	<	0.751	0	0.24	0.01	<	0.383
C-60-2	1.29	<	0.395	0.0299	1.18	2.50	<	0.768	0	0.19	0.01	<	0.369
C-60-3	0.957	<	0.227	0.0622	1.14	2.16	<	0.749	0	0.16	0.01		0.957
C-60-4	1.12	<	0.246	0.0113	0.685	1.82	<	0.761	0	0.14	0.00		0.753
C-60-5	0.851			0.150	1.02	2.02	<	0.754	0	0.16	0.01		1.68



Areas of No Impact

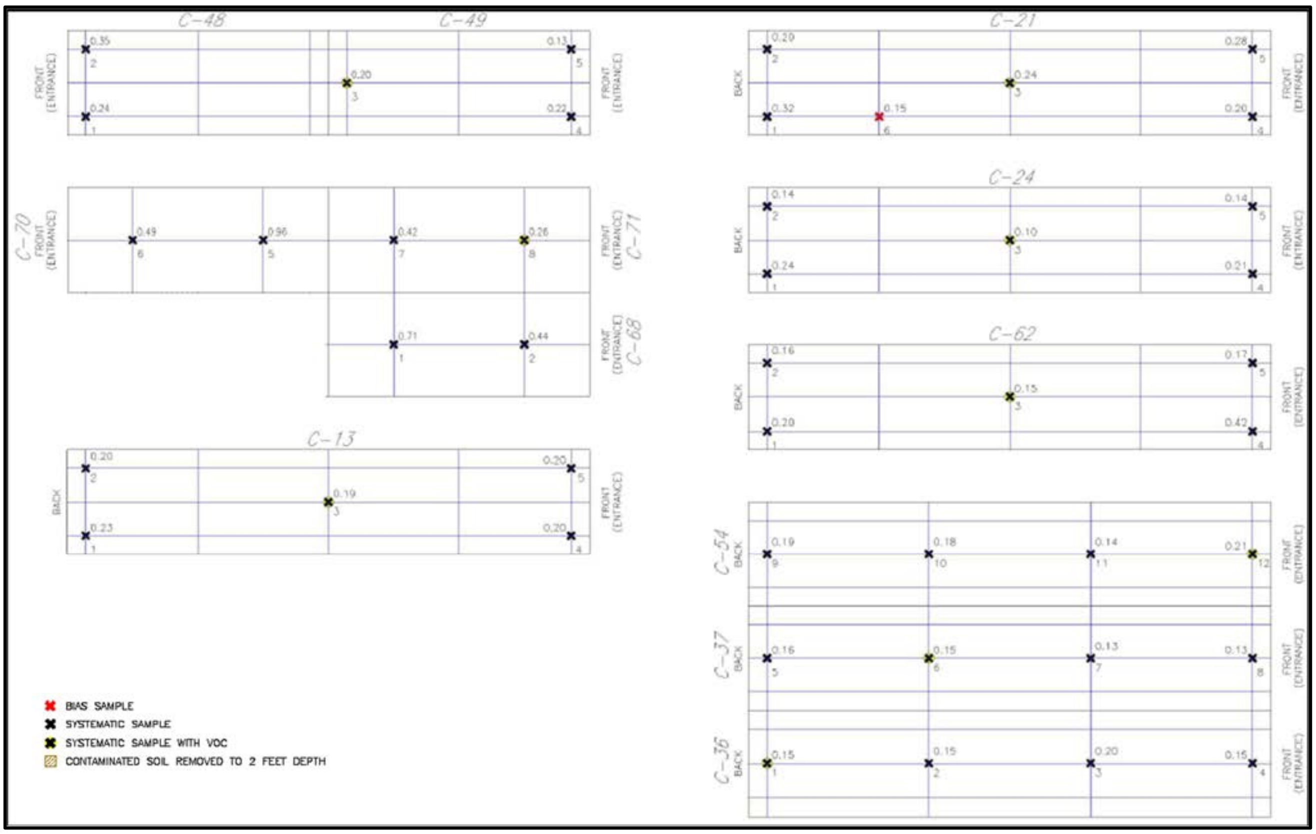
Sealand Containers C-48, C-49, C-68, C-70, C-71, C-24, C-62, C-13, C-36, C-37, C-54, ERT (RED), C-09, S-5, C-23, C-22, C-61, C-64, C-04, C-55, C-15, C-17, C-34, C-38, S-38, C-47, C-8, C-7, C-10 and C-11

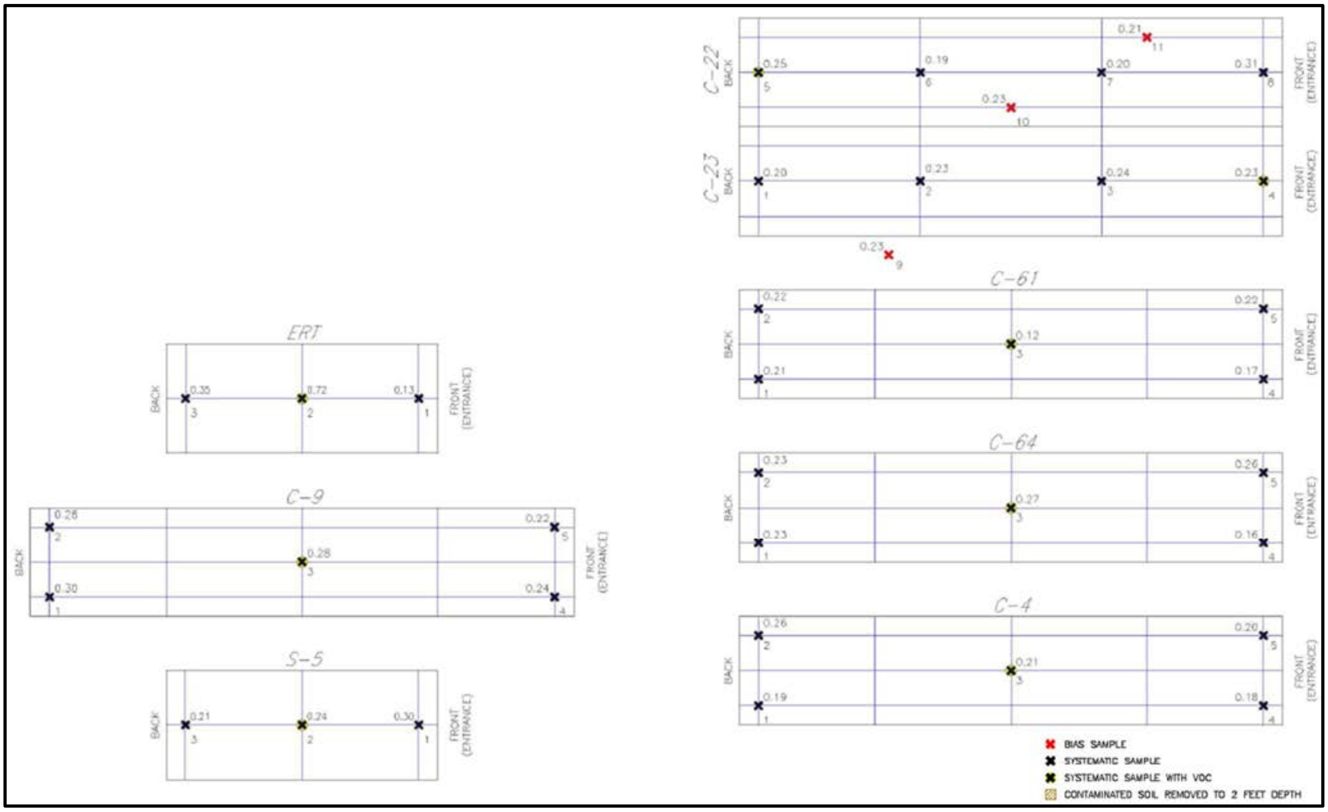
The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results met RUSL. Refer to correspondence previously submitted to the Department for more information entitled *November 2020 Consent Agreement Progress Report* (LTR-RAC-20-90, Westinghouse, 2020f)).

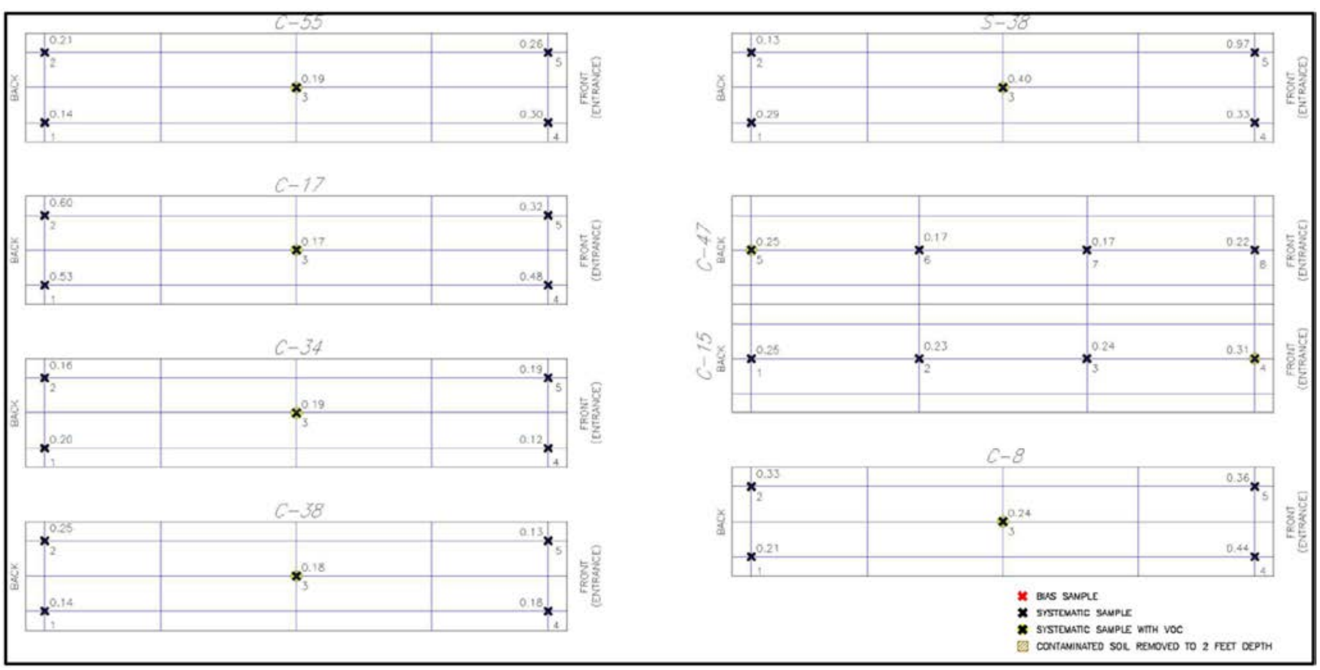
Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-48-1	1.99	<	0.258	0.148	0.985	3.12	<	0.790	0.0128	0.24	0.01		0.866
C-48-2	2.62	<	0.353	0.0403	2.00	4.66	<	0.837	0	0.35	0.01		2.16
C-49-3	1.31	<	0.341	0.261	0.966	2.54	<	0.749	0	0.20	0.01		2.20
C-49-4	1.71	<	0.275	0.00167	1.17	2.88	<	0.787	0.0356	0.22	0.01		13.9
C-49-5	0.946	<	0.233	0.0370	0.751	1.73	<	0.821	0.00368	0.13	0.01		2.97
C-68-1	5.43			0.307	3.430	9.17	<	0.419	0.212	0.71	0.03		5.94
C-68-2	3.74			0.302	1.59	5.63	<	0.917	0	0.44	0.02		4.46
C-70-5	9.06			0.437	2.92	12.42	<	0.487	0	0.96	0.03		6.93
C-70-6	4.43			0.380	1.47	6.28	<	0.932	0	0.49	0.02		6.61
C-71-7	3.35			0.308	1.69	5.35	<	0.894	0	0.42	0.02		5.95
C-71-8	2.29	<	0.104	0.0347	1.17	3.49	<	0.750	0	0.26	0.01		4.40
C-24-1	1.84	<	0.155	0.000	1.34	3.18	<	0.752	0	0.24	0.01	<	0.376
C-24-2	1.04	<	0.161	0.000	0.871	1.91	<	0.752	0	0.14	0.01	<	0.370
C-24-3	0.410			0.128	0.667	1.21	<	0.695	0	0.10	0.01		1.27
C-24-4	1.64	<	0.151	0.101	1.04	2.78	<	0.684	0	0.21	0.01		0.536
C-24-5	0.991	<	0.138	0.0459	0.837	1.87	<	0.658	0	0.14	0.01	<	0.363
C-62-1	1.19	<	0.508	0	1.46	2.65	<	0.745	0	0.20	0.01	<	0.372
C-62-2	1.19	<	0.143	0.000	0.973	2.16	<	0.719	0	0.16	0.01	<	0.377
C-62-3	1.01	<	0.277	0	1.03	2.04	<	0.724	0.0390	0.15	0.01	<	0.349
C-62-4	4.03	<	0.298	0.0923	1.36	5.48	<	0.706	0	0.42	0.01		0.727
C-62-5	1.44	<	0.132	0.0439	0.712	2.20	<	0.695	0.102	0.17	0.01	<	0.370
C-13-1	2.10	<	0.226	0.0904	0.798	2.99	<	0.706	0	0.23	0.01		2.92
C-13-2	1.24			0.237	1.09	2.57	<	0.698	0	0.20	0.01		1.74
C-13-3	1.40	<	0.190	0.109	0.907	2.42	<	0.770	0	0.19	0.01		2.25
C-13-4	1.52	<	0.198	0.0313	1.08	2.63	<	0.867	0	0.20	0.01		1.43
C-13-5	1.27			0.208	1.08	2.56	<	0.749	0	0.20	0.01		1.10
C-36-1	1.03	<	0.284	0.0448	0.958	2.03	<	0.717	0	0.15	0.01	<	0.382
C-36-2	0.942	<	0.261	0.0245	0.982	1.95	<	0.681	0	0.15	0.01		1.50
C-36-3	1.66	<	0.267	0	0.992	2.65	<	0.679	0	0.20	0.01		1.80
C-36-4	1.19	<	0.132	0.0879	0.694	1.97	<	0.820	0	0.15	0.01		2.05
C-37-5	0.862	<	0.152	0.101	1.12	2.08	<	0.748	0	0.16	0.01	<	0.388
C-37-6	1.16	<	0.240	0.0381	0.782	1.98	<	0.686	0	0.15	0.01		3.14
C-37-7	0.790	<	0.150	0.000	0.994	1.78	<	0.657	0	0.13	0.01		5.86
C-37-8	1.05	<	0.135	0.000	0.718	1.77	<	0.686	0	0.13	0.00		3.57
C-54-9	1.21			0.141	1.09	2.44	<	0.711	0.0786	0.19	0.01		1.56
C-54-10	1.41	<	0.311	0	1.02	2.43	<	0.663	0	0.18	0.01		2.03
C-54-11	0.996	<	0.236	0.0866	0.757	1.84	<	0.896	0	0.14	0.01		1.56
C-54-12	1.56	<	0.226	0	1.24	2.80	<	0.678	0	0.21	0.01		1.77
ERT-1	1.11	<	0.266	0.0122	0.552	1.67	<	0.674	0.0316	0.13	0.00		1.44
ERT-2	6.74			0.456	1.96	9.16	<	0.731	0.153	0.72	0.02		7.11
ERT-3	3.17	<	0.283	0.154	1.19	4.51	<	0.721	0.109	0.35	0.01		1.42

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-9-1	2.08	<	0.210	0.0783	1.76	3.92	<	0.832	0	0.30	0.01		10.4
C-9-2	1.74	<	0.224	0.142	1.76	3.64	<	0.796	0	0.28	0.01		11.9
C-9-3	1.87	<	0.360	0	1.89	3.76	<	0.848	0	0.28	0.01		8.55
C-9-4	1.57	<	0.284	0.131	1.43	3.13	<	0.851	0.107	0.24	0.01		11.4
C-9-5	1.59	<	0.164	0.129	1.17	2.89	<	0.789	0	0.22	0.01		5.32
S-5-1	2.11	<	0.295	0.206	1.61	3.93	<	0.847	0	0.30	0.01		6.58
S-5-2	1.51	<	0.265	0	1.43	2.94	<	0.824	0.397	0.24	0.01		2.41
S-5-3	1.60	<	0.215	0.0591	1.14	2.80	<	0.876	0	0.21	0.01		5.43
C-34-1	1.68	<	0.251	0.145	0.716	2.54	<	0.887	0.0190	0.20	0.01		0.491
C-34-2	1.32	<	0.282	0.0322	0.768	2.12	<	0.858	0	0.16	0.01	<	0.399
C-34-3	1.33	<	0.106	0.0709	0.928	2.33	<	0.849	0.241	0.19	0.01		0.828
C-34-4	0.947	<	0.191	0	0.727	1.67	<	0.845	0	0.12	0.00	<	0.390
C-34-5	1.16	<	0.244	0.0973	1.08	2.34	<	0.814	0.182	0.19	0.01	<	0.384
C-38-1	0.965	<	0.252	0.0288	0.904	1.90	<	0.883	0	0.14	0.01	<	0.380
C-38-2	1.68	<	0.251	0.159	1.24	3.08	<	0.960	0.229	0.25	0.01		0.510
C-38-3	1.54	<	0.224	0.102	0.682	2.32	<	0.883	0	0.18	0.01		0.505
C-38-4	1.10	<	0.234	0.0372	1.01	2.15	<	0.830	0.266	0.18	0.01	<	0.387
C-38-5	1.08	<	0.207	0.0327	0.551	1.66	<	0.774	0.121	0.13	0.00		0.439
S-38-1	2.07	<	0.204	0.166	1.50	3.74	<	0.776	0	0.29	0.01		6.56
S-38-2	1.09	<	0.191	0.0701	0.534	1.69	<	0.861	0	0.13	0.01		0.877
S-38-3	3.48	<	0.361	0.201	1.51	5.19	<	0.832	0	0.40	0.01		5.45
S-38-4	3.30	<	0.314	0.109	0.834	4.24	<	0.879	0	0.33	0.01		8.09
S-38-5	9.76	<	0.333	0.151	2.76	12.67	<	0.832	0	0.97	0.02		7.47
C-47-5	1.62	<	0.220	0.219	1.29	3.13	<	0.824	0.0508	0.25	0.01		1.65
C-47-6	0.901			0.192	1.08	2.17	<	0.896	0.0778	0.17	0.01		0.733
C-47-7	1.31	<	0.268	0	0.932	2.24	<	0.852	0	0.17	0.01		0.766
C-47-8	1.68			0.147	1.06	2.89	<	0.940	0	0.22	0.01		1.16
C-8-1	1.33	<	0.264	0.0247	1.47	2.82	<	0.912	0	0.21	0.01		6.65
C-8-2	2.58			0.150	1.57	4.30	<	0.758	0	0.33	0.01		17.3
C-8-3	1.22			0.324	1.44	2.98	<	0.738	0	0.24	0.02		6.13
C-8-4	2.72	<	0.278	0.128	3.07	5.92	<	0.714	0	0.44	0.02		11.8
C-8-5	2.54			0.325	1.71	4.58	<	0.847	0.0000	0.36	0.02		14.9
C-64-1	1.63	<	0.383	0.0605	1.39	3.08	<	0.923	0	0.23	0.01		1.09
C-64-2	1.73	<	0.179	0.000	1.36	3.09	<	0.703	0	0.23	0.01		1.07
C-64-3	2.23	<	0.184	0.0615	1.24	3.53	<	0.744	0	0.27	0.01		0.804
C-64-4	1.30	<	0.156	0.0520	0.779	2.13	<	0.727	0	0.16	0.01		1.25
C-64-5	2.09	<	0.212	0.122	1.20	3.41	<	0.777	0	0.26	0.01		1.94
C-4-1	0.933	<	0.275	0.267	1.22	2.42	<	0.764	0	0.19	0.01	<	0.369
C-4-2	1.71	<	0.342	0.0877	1.66	3.46	<	0.778	0	0.26	0.01		0.529
C-4-3	1.60	<	0.268	0.170	0.968	2.74	<	0.776	0	0.21	0.01		0.941
C-4-4	1.31	<	0.340	0.155	0.884	2.35	<	0.827	0	0.18	0.01		8.58
C-4-5	1.58	<	0.205	0.0754	0.955	2.61	<	0.748	0	0.20	0.01		5.70
C-55-1	0.889	<	0.211	0.166	0.742	1.80	<	0.786	0	0.14	0.01	<	0.379
C-55-2	1.66	<	0.308	0.0846	0.969	2.71	<	0.796	0	0.21	0.01	<	0.384
C-55-3	1.33	<	0.226	0.0831	1.09	2.50	<	0.798	0	0.19	0.01		1.01
C-55-4	2.45	<	0.360	0.154	1.32	3.92	<	0.793	0	0.30	0.01		3.34
C-55-5	1.90	<	0.328	0.0691	1.48	3.45	<	0.725	0	0.26	0.01		5.63
C-15-1	1.77	<	0.269	0.268	1.18	3.22	<	0.726	0	0.25	0.01		1.32
C-15-2	1.82	<	0.253	0.145	0.960	2.93	<	0.774	0	0.23	0.01	<	0.357
C-15-3	1.70	<	0.251	0.144	1.30	3.14	<	0.753	0	0.24	0.01		1.15
C-15-4	2.24	<	0.329	0.150	1.70	4.09	<	0.739	0.000	0.31	0.01		1.34
C-17-1	4.37			0.283	2.28	6.93	<	0.806	0	0.53	0.02		11.4
C-17-2	5.18			0.357	2.16	7.70	<	0.808	0	0.60	0.02		10.1
C-17-3	0.862	<	0.401	0.0376	1.33	2.23	<	0.727	0	0.17	0.01		1.09
C-17-4	3.92			0.289	2.06	6.27	<	0.757	0	0.48	0.02		6.39
C-17-5	2.43			0.252	1.46	4.14	<	0.779	0	0.32	0.02		6.94
C-23-1	1.54			0.164	0.863	2.57	<	0.658	0	0.20	0.01		3.99
C-23-2	1.63			0.213	1.00	2.84	<	0.679	0.108	0.23	0.01	<	0.378
C-23-3	1.79			0.199	1.04	3.03	<	0.688	0	0.24	0.01	<	0.381
C-23-4	1.83	<	0.346	0.242	0.792	2.86	<	0.733	0.108	0.23	0.01		2.28
C-22-5	1.43	<	0.194	0.129	1.71	3.27	<	0.751	0	0.25	0.01		1.18
C-22-6	1.27	<	0.284	0.0781	1.09	2.44	<	0.693	0	0.19	0.01		1.00
C-22-7	1.59			0.198	0.801	2.59	<	0.706	0	0.20	0.01	<	0.367
C-22-8	2.51	<	0.322	0.279	1.18	3.97	<	0.706	0	0.31	0.01		2.46
C-23-9	1.93	<	0.246	0.0390	1.10	3.07	<	0.703	0	0.23	0.01		1.10
C-22-10	1.85			0.180	0.936	2.97	<	0.738	0	0.23	0.01	<	0.375
C-22-11	1.60	<	0.325	0.0515	1.11	2.76	<	0.676	0	0.21	0.01		1.78
C-61-1	1.77	<	0.349	0.0554	0.87	2.70	<	0.716	0.0848	0.21	0.01	<	0.384
C-61-2	1.76	<	0.194	0.0648	1.01	2.83	<	0.699	0	0.22	0.01		1.06
C-61-3	0.662	<	0.249	0.0395	0.957	1.66	<	0.683	0	0.12	0.01		1.76
C-61-4	1.15			0.305	0.670	2.13	<	0.711	0	0.17	0.01	<	0.356
C-61-5	1.78	<	0.262	0.0415	1.08	2.90	<	0.685	0	0.22	0.01	<	0.375

Sample ID	Analyte (pCi/g)									SOF	SOF		mg/kg
	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.		Fluoride
C-7-1	1.18	<	0.191	0.134	1.00	2.31	<	0.790	0	0.18	0.01		6.96
C-7-2	1.64	<	0.238	0.0271	1.53	3.20	<	0.766	0	0.24	0.01		6.45
C-7-3	0.877	<	0.255	0.208	1.41	2.50	<	0.822	0	0.19	0.01		9.00
C-7-4	3.58	<	0.302	0.0139	2.45	6.04	<	0.802	0	0.45	0.02		6.36
C-7-5	2.07	<	0.248	0.215	1.84	4.13	<	0.829	0	0.32	0.02		9.94
C-10-1	1.43	<	0.193	0.152	1.45	3.03	<	0.825	0	0.23	0.01		7.13
C-10-2	1.43	<	0.173	0.0931	1.17	2.69	<	0.760	0	0.21	0.01		8.84
C-10-3	1.37	<	0.220	0.0207	1.43	2.82	<	0.796	0	0.21	0.01		6.42
C-10-4	1.58	<	0.223	0.101	1.52	3.20	<	0.805	0	0.24	0.01		8.28
C-11-5	1.58	<	0.264	0.0791	1.29	2.95	<	0.763	0	0.22	0.01		8.04
C-11-6	2.10	<	0.231	0.0106	1.35	3.46	<	0.749	0	0.26	0.01		3.66
C-11-7	1.62	<	0.180	0.0661	1.82	3.51	<	0.857	0	0.26	0.01		4.58
C-11-8	1.97	<	0.120	0.0400	1.83	3.84	<	0.776	0	0.29	0.01		10.5




C-22
0.25 5
0.19 6
0.20 7
0.31 8
0.21 11
0.23 10
C-23
0.20 1
0.23 2
0.24 3
0.23 4
0.23 9
C-61
0.22 2
0.12 3
0.21 1
0.22 5
0.17 4
C-64
0.23 2
0.27 3
0.23 1
0.26 5
0.16 4
C-4
0.26 2
0.21 3
0.19 1
0.20 5
0.18 4
ERT
0.35 3
8.72 2
0.13 1
C-9
0.28 2
0.28 3
0.30 1
0.22 5
0.24 4
S-5
0.21 3
0.24 2
0.30 1
BACK
FRONT (ENTRANCE)
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH


C-55
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0.19 3
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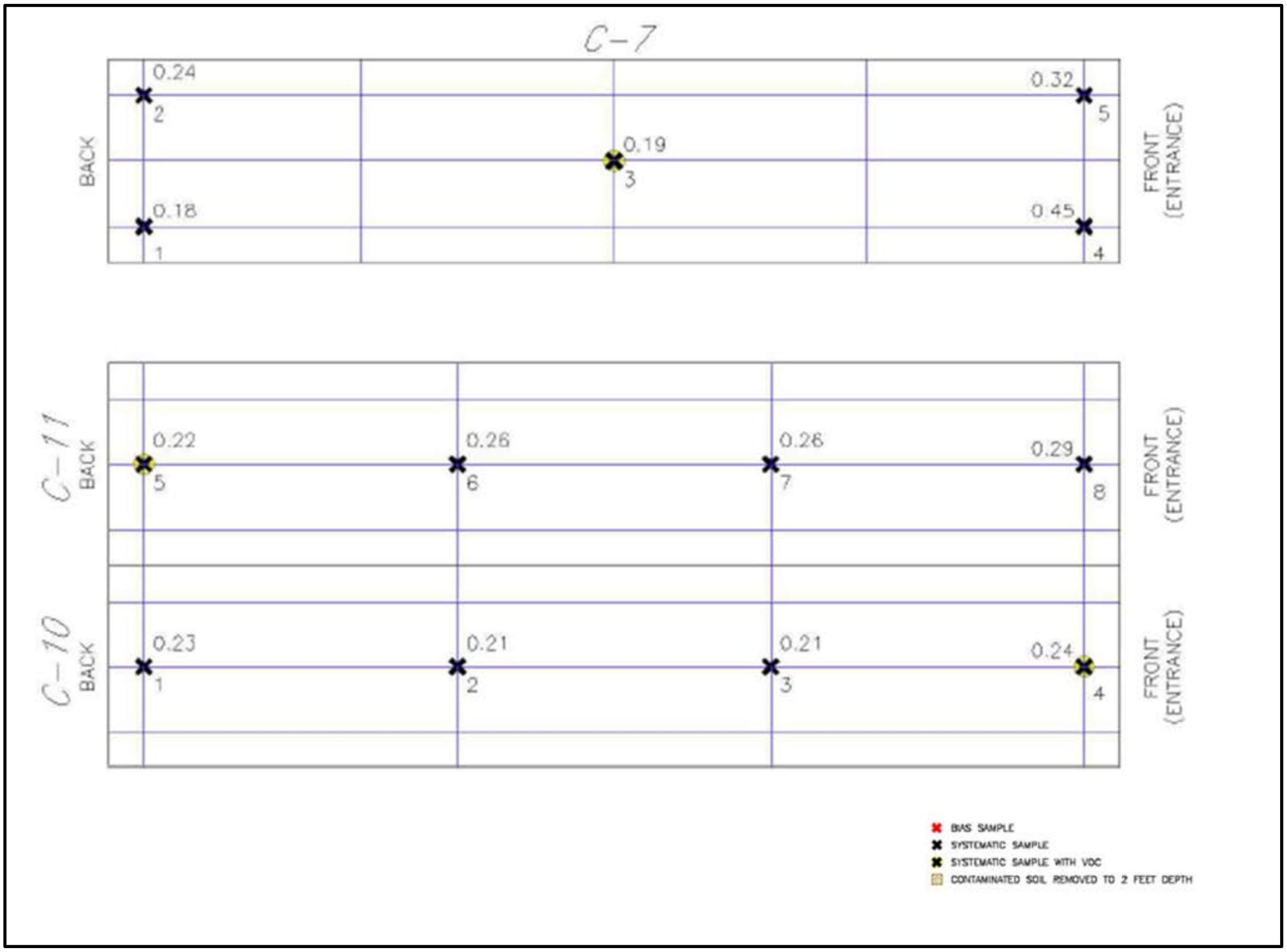
0.26 5
0.30 4
C-17
0.60 2
0.17 3
0.53 1
0.32 5
0.48 4
C-34
0.16 2
0.19 3
0.20 1
0.19 5
0.12 4
C-38
0.25 2
0.18 3
0.14 1
0.13 5
0.18 4
S-38
0.13 2
0.40 3
0.29 1
0.97 5
0.33 4
C-47
0.25 5
0.17 6
0.17 7
0.22 8
C-15
0.25 1
0.23 2
0.24 3
0.31 4
C-8
0.33 2
0.24 3
0.21 1
0.36 5
0.44 4
BACK
FRONT (ENTRANCE)
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

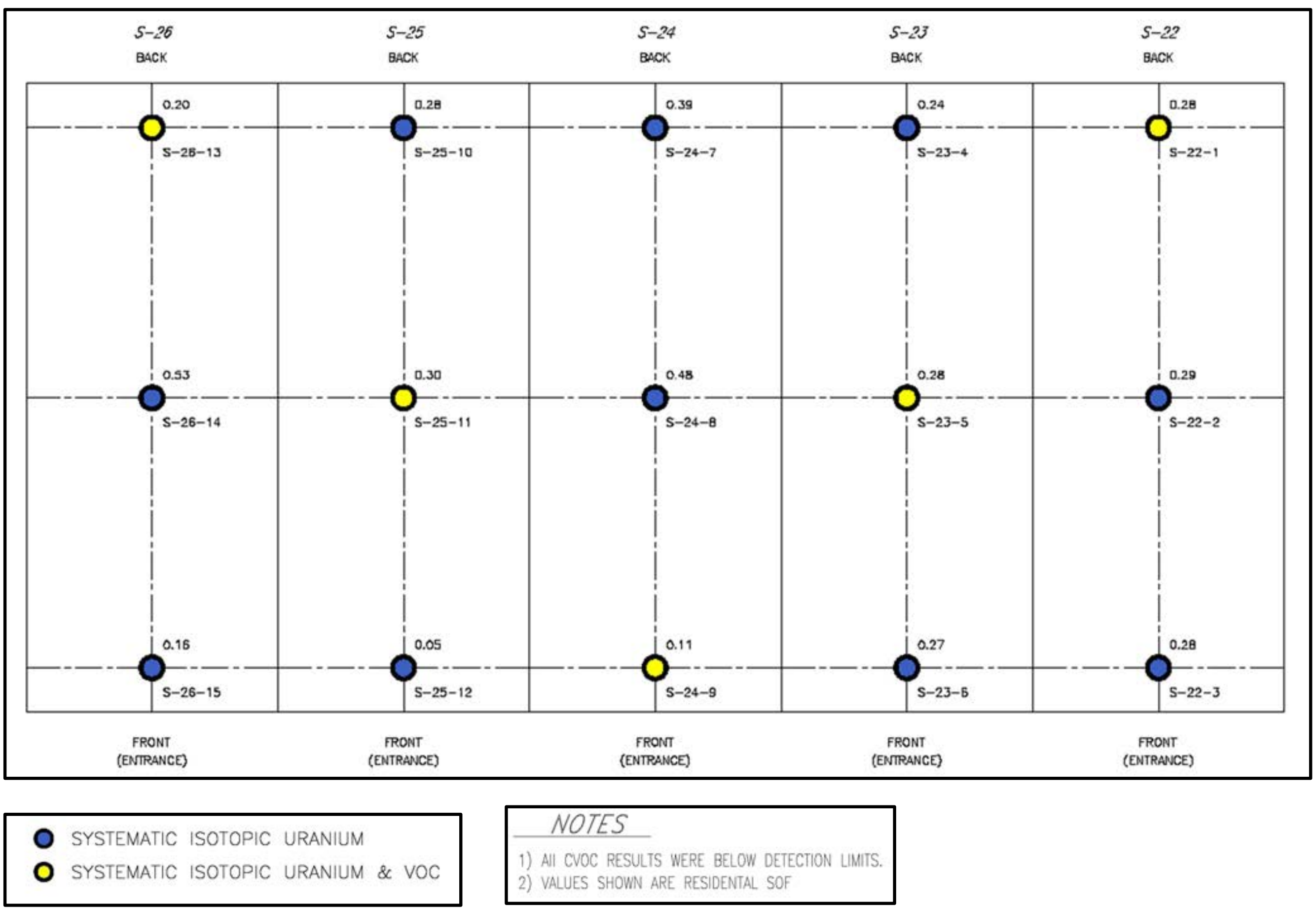

C-7
BACK
FRONT (ENTRANCE)
0.24
2
0.32
5
0.19
3
0.18
1
0.45
4
C-11
BACK
FRONT (ENTRANCE)
0.22
5
0.26
6
0.26
7
0.29
8
C-10
BACK
FRONT (ENTRANCE)
0.23
1
0.21
2
0.21
3
0.24
4
BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

Areas of No Impact

Sealand Containers S-22, S-23, S-24, S-25 and S-26

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *August 2021 Consent Agreement Progress Report* (LTR-RAC-21-62, Westinghouse, 2021c).

Sample ID	Analyte (pCi/g)											SOF	SOF
		U-234 DL	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
S-22-1			1.78	<	0.384	0.0716	1.85	3.70	<	0.530	0.0303	0.28	0.01
S-22-2			1.99			0.147	1.58	3.72	<	0.506	0.0640	0.29	0.01
S-22-3			2.11	<	0.231	0.0834	1.54	3.73	<	0.505	0	0.28	0.01
S-23-4			1.51	<	0.222	0.181	1.37	3.06	<	0.519	0.101	0.24	0.01
S-23-5			1.88	<	0.276	0.112	1.58	3.57	<	0.541	0.0880	0.28	0.01
S-23-6			1.62	<	0.235	0.0637	1.92	3.60	<	0.467	0.0394	0.27	0.01
S-24-7			2.85			0.133	2.13	5.11	<	0.484	0	0.39	0.02
S-24-8			3.33	<	0.301	0.196	2.77	6.30	<	0.481	0	0.48	0.02
S-24-9			0.626	<	0.153	0.0200	0.792	1.44	<	0.541	0.121	0.11	0.01
S-25-10			1.77	<	0.331	0.0897	1.89	3.75	<	0.501	0	0.28	0.01
S-25-11			1.88			0.201	1.72	3.80	<	0.488	0.109	0.30	0.02
S-25-12	<	0.351	0.220	<	0.169	0.000	0.481	0.70	<	0.472	0	0.05	0.00
S-26-13			1.18	<	0.309	0.0429	1.42	2.64	<	0.471	0.0111	0.20	0.01
S-26-14			3.63	<	0.252	0.225	3.07	6.93	<	0.487	0	0.53	0.02
S-26-15			0.922	<	0.274	0.000	1.24	2.16	<	0.486	0	0.16	0.01

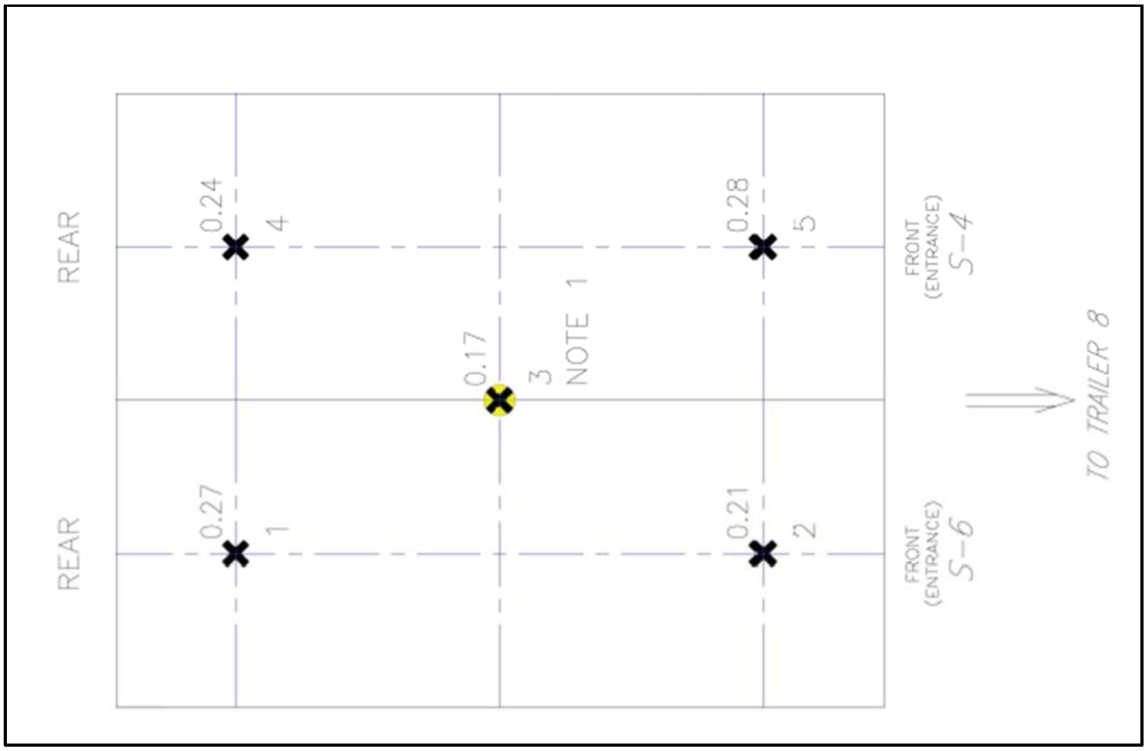


Areas of No Impact

Sealand Containers S-04 and S-06

The soil underneath these sealands was not impacted (as detected by the HP radiological surveys) and sample results were below RUSL. Refer to correspondence previously submitted to the Department for more information entitled *March 2022 Consent Agreement Progress Report* (LTR-RAC-22-22 Westinghouse, 2022).

Sample	Analyte (pCi/g)									SOF	SOF
ID	U-234		U-235 DL	U-235	U-238	Sum U		Tc-99 DL	Tc-99	Resid.	Ind.
S-6-1	1.68	<	0.231	0.229	1.51	3.42	<	0.734	0	0.27	0.01
S-6-2	1.39	<	0.247	0	1.45	2.84	<	0.771	0	0.21	0.01
S-4/6-3	1.36	<	0.141	0.0471	0.813	2.22	<	0.706	0	0.17	0.01
S-4-4	1.65	<	0.216	0.0984	1.41	3.16	<	0.667	0	0.24	0.01
S-4-5	1.60	<	0.213	0.211	1.86	3.67	<	0.686	0	0.28	0.02



BIAS SAMPLE
SYSTEMATIC SAMPLE
SYSTEMATIC SAMPLE WITH VOC
CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

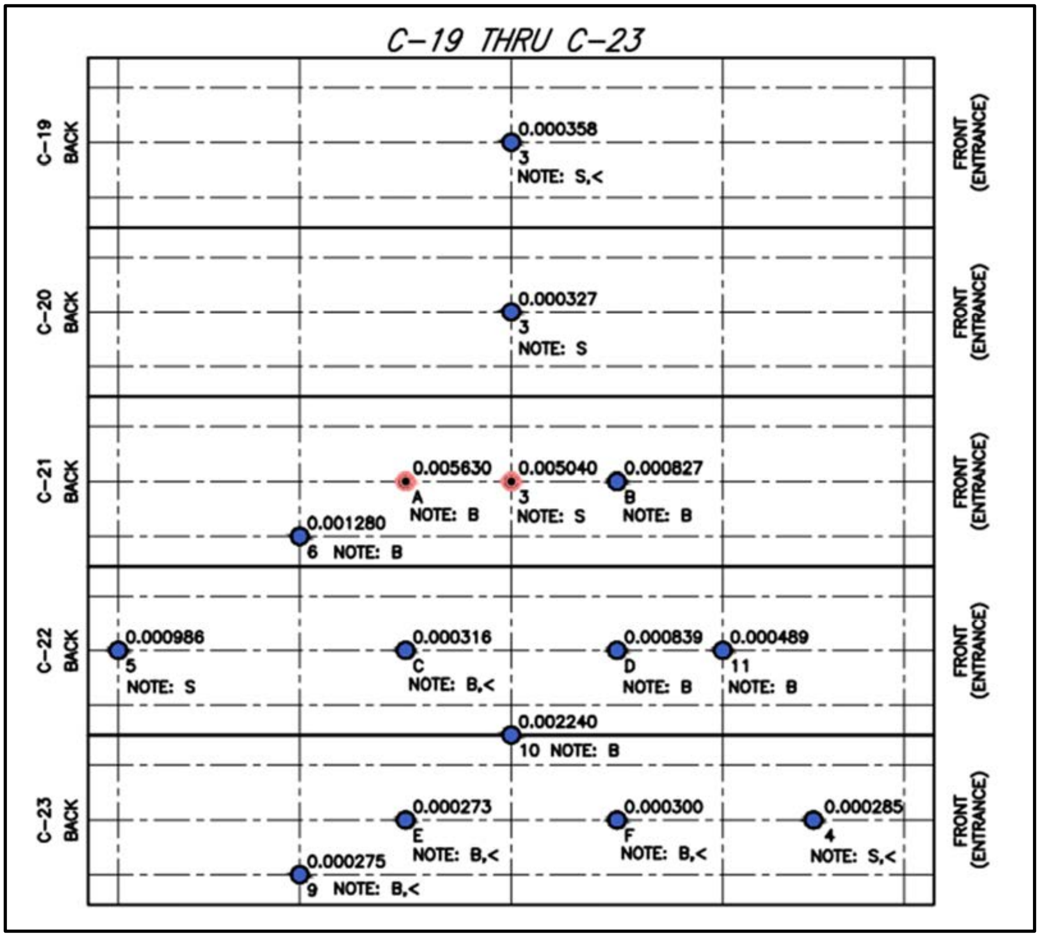
NOTES
1) PCE IS NON-DETECTABLE: <0.299 ug/kg
2) RESULTS AT EACH SAMPLE POINT ARE RESIDENTIAL SUM OF FRACTIONS.

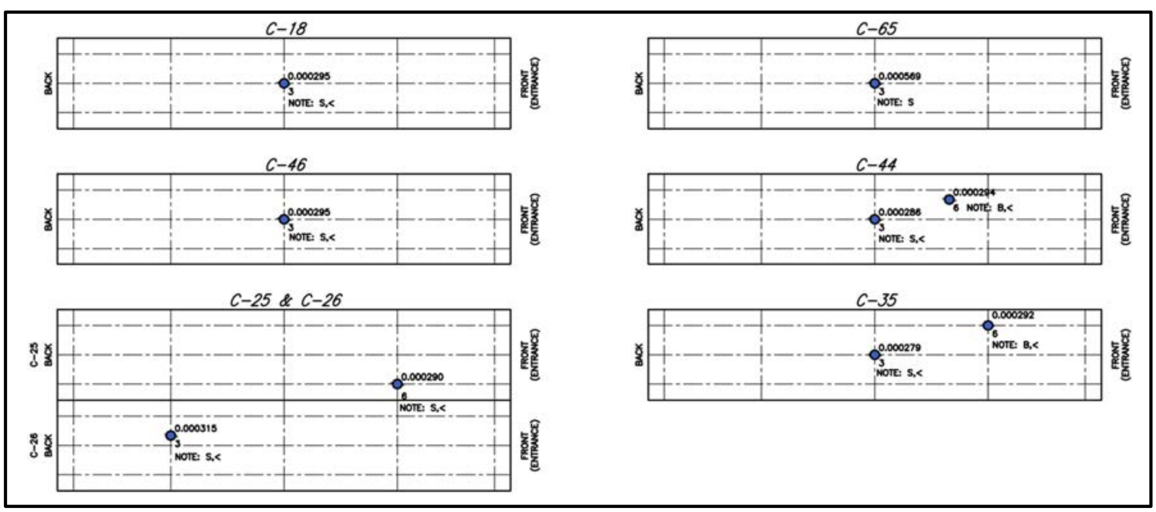
Summary of all SSAOU PCE Results

Below is a consolidated table of the PCE detections in soil in the SSAOU. This data was submitted in LTR-RAC-21-01, *December 2020 Consent Agreement Progress Report* dated January 8, 2021 (Westinghouse, 2021a). The GEL analytical results are included in Appendix A of the December 2020 progress report. As discussed previously, soil impacted with PCE above the RSL below C-21 was removed until analytical results were below RSL.

SSAOU Tabulated Soil Sampling Results – Tetrachloroethylene Detections								
ID	< or =	Result (mg/kg)	Notes		ID	< or =	Result (mg/kg)	Notes
C-4-3	<	0.000273	Systematic		C-42-3	<	0.000279	Systematic
C-7-3	<	0.000315	Systematic		C-43-3	<	0.000309	Systematic
C-8-3	<	0.000321	Systematic		C-43-6	<	0.000280	Bias
C-9-3	<	0.000268	Systematic		C-44-3	<	0.000286	Systematic
C-10-4	<	0.000297	Systematic		C-44-6	<	0.000294	Bias
C-11-5	<	0.000274	Systematic		C-45-3	<	0.000305	Systematic
C-13-3	<	0.000320	Systematic		C-46-3	<	0.000295	Systematic
C-15-4	<	0.000281	Systematic		C-47-5	<	0.000265	Systematic
C-16-2	<	0.000369	Bias		C-49-3	<	0.000314	Systematic
C-16-3	<	0.000301	Systematic		C-51-16	<	0.000296	Bias
C-17-3	<	0.000285	Systematic		C-51-8	<	0.000399	Systematic
C-18-3	<	0.000295	Systematic		C-52-14	<	0.000304	Systematic
C-19-3	<	0.000358	Systematic		C-53-3	<	0.000294	Systematic
C-20-3	=	0.000327	Systematic		C-54-12	<	0.000268	Systematic
C-21-3	=	0.005040	Systematic; excavation required		C-55-3	<	0.000389	Systematic
C-21-6	=	0.001280	Bias		C-56-3	<	0.000291	Bias
C-21-A	=	0.005630	bias; excavation required		C-56-4	=	0.000277	Bias
C-21-B	=	0.000827	bias		C-57-3	<	0.000297	Systematic
C-22-10	=	0.002240	Bias		C-57-6	<	0.000281	Bias
C-22-11	=	0.000489	Bias		C-57-7	<	0.000280	Bias
C-22-5	=	0.000986	Systematic		C-57-8	<	0.000277	Bias
C-22-C	<	0.000316	bias		C-58-12	<	0.000301	Systematic
C-22-D	=	0.000839	bias		C-59-6	<	0.000426	Systematic
C-23-4	<	0.000285	Systematic		C-60-3	<	0.000277	Bias
C-23-9	<	0.000275	Bias		C-61-3	<	0.000281	Systematic
C-23-E	<	0.000273	bias		C-62-3	<	0.000388	Systematic
C-23-F	<	0.000300	bias		C-63-3	<	0.000278	Systematic
C-24-3	<	0.000295	Systematic		C-64-3	=	0.001490	Systematic
C-25+26-3	<	0.000315	Systematic		C-65-3	=	0.000569	Systematic
C-25+26-6	<	0.000290	Systematic		C-66-2	<	0.000272	Bias
C-28-13	<	0.000297	Systematic		C-66-3	<	0.000285	Systematic
C-28-19	<	0.000289	Bias		C-67-1	<	0.000371	Systematic
C-28-20	<	0.000289	Bias		C-69-4	<	0.000269	Systematic
C-29-12	<	0.000262	Systematic		C-71-8	<	0.000315	Systematic
C-30-18	<	0.000268	Bias		ERT-2	<	0.000240	Systematic
C-30-7	<	0.000273	Systematic		S-16-2	<	0.000256	Systematic
C-31-16	<	0.000291	Bias		S-3-2	<	0.000336	Systematic
C-31-17	<	0.000292	Bias		S-38-3	<	0.000330	Systematic
C-31-6	<	0.000282	Systematic		S-45-2	<	0.000262	Systematic
C-32-1	<	0.000300	Systematic		S-46-2	<	0.000359	Systematic
C-33-3	<	0.000298	Systematic		S-50-3	<	0.000346	Systematic
C-34-3	<	0.000286	Systematic		S-5-2	<	0.000309	Systematic
C-35-3	<	0.000279	Systematic		WEC1000-2	<	0.000270	Systematic
C-35-6	<	0.000292	Bias		WEC-1001-2	<	0.000270	Systematic
C-36-1	<	0.000336	Systematic		WEC400-2	<	0.000275	Systematic
C-37-6	<	0.000310	Systematic		WEC500-2	<	0.000275	Systematic
C-38-3	<	0.000307	Systematic		WEC700-2	<	0.000283	Systematic
C-39-3	<	0.000444	Systematic		WEC800-2	<	0.000279	Systematic
C-41-3	<	0.000268	Systematic					

PCE Residential Screening Level: 0.0023 mg/kg

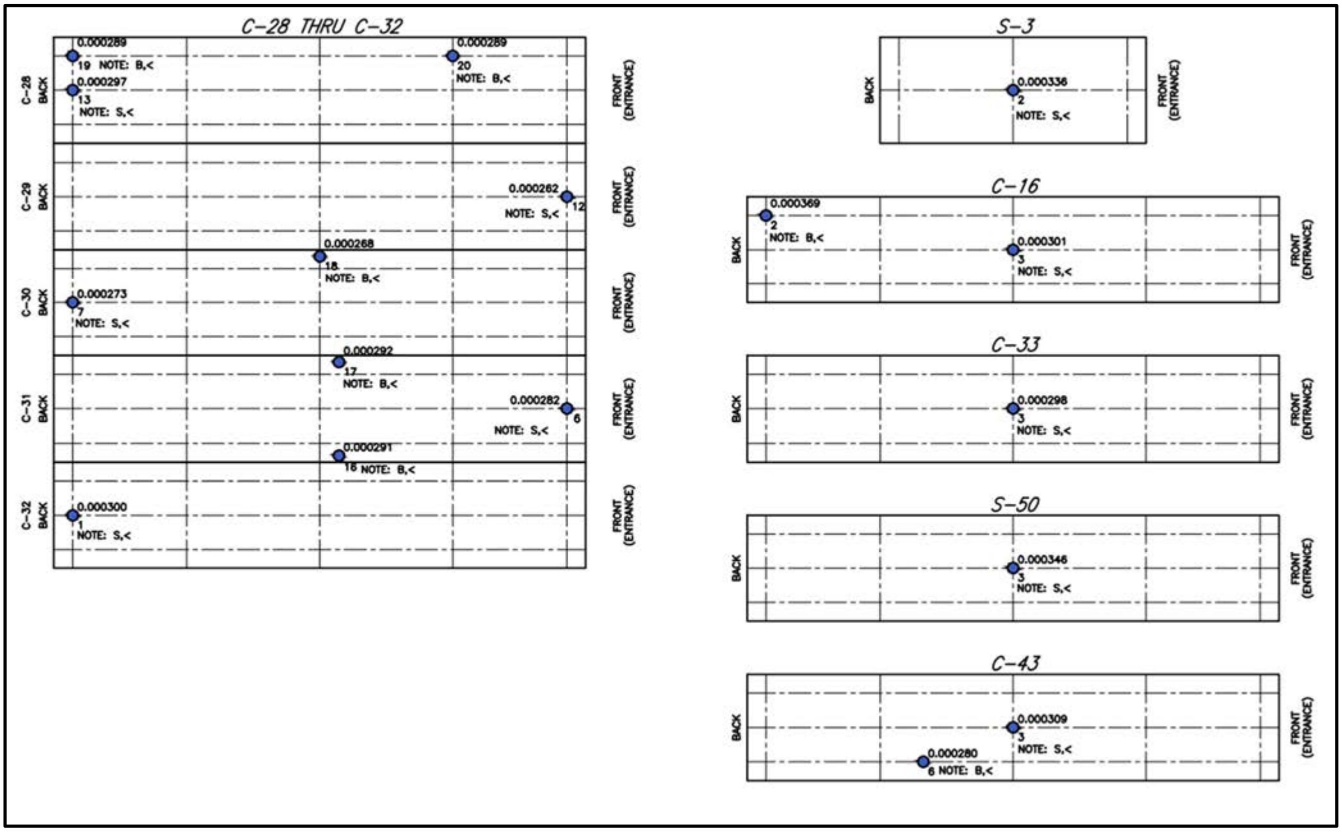


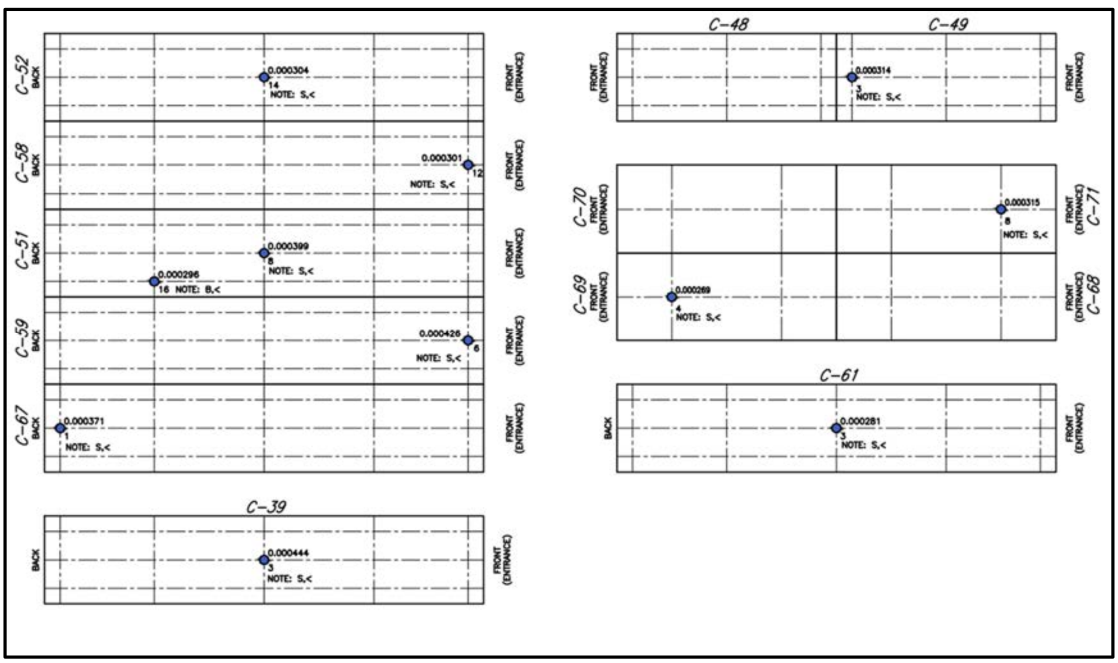


- VOC'S SAMPLED
- DOES NOT EXCEED LIMIT
- EXCEEDS 0.0023 PPM PCE LIMIT
- CONTAMINATED SOIL REMOVED TO 2 FEET DEPTH

NOTES

S SYSTEMATIC POINT
B BIAS POINT
< NON-DETECTED POINT





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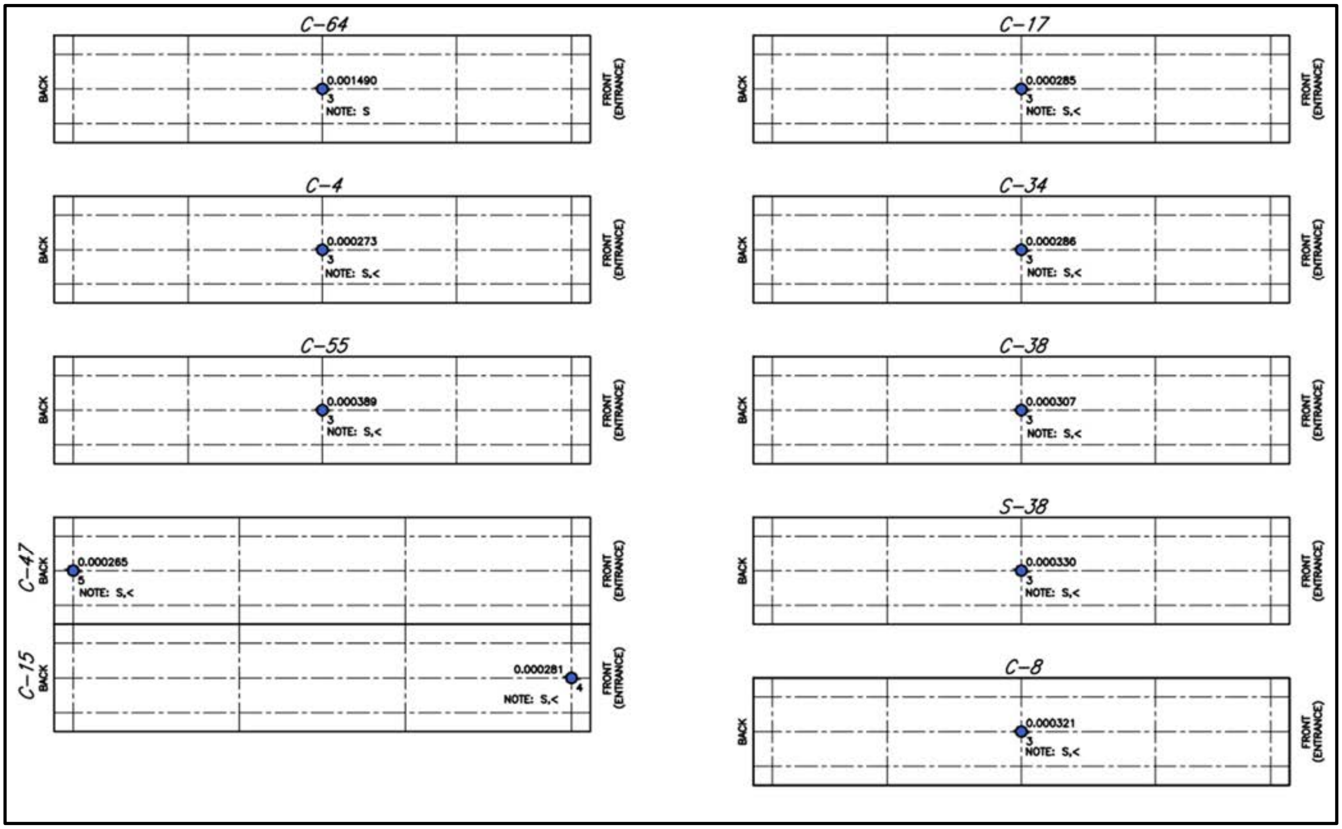

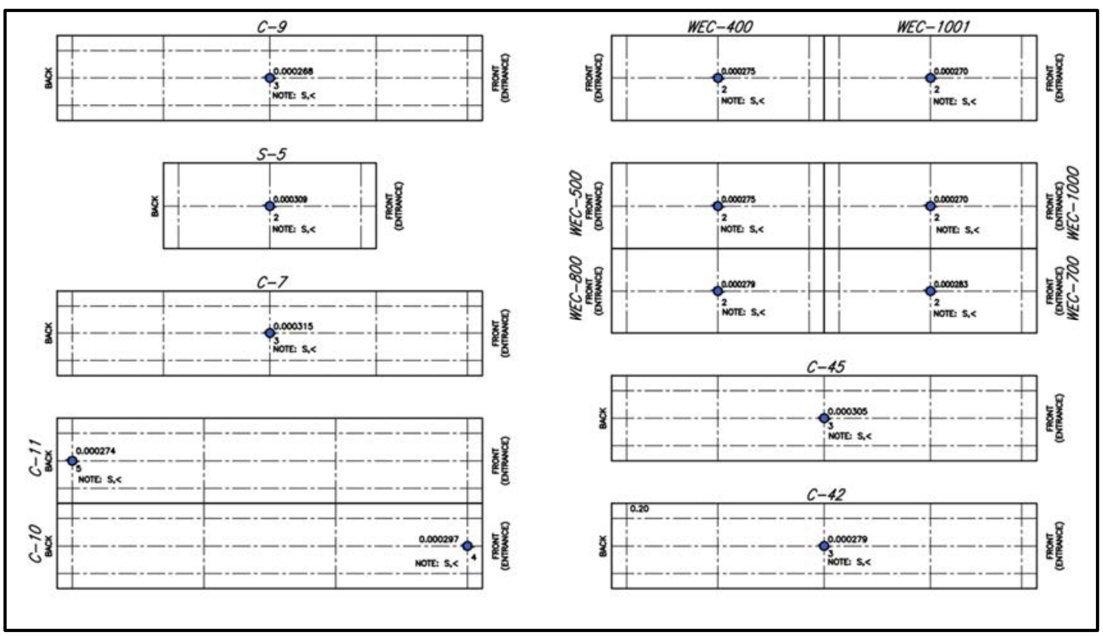

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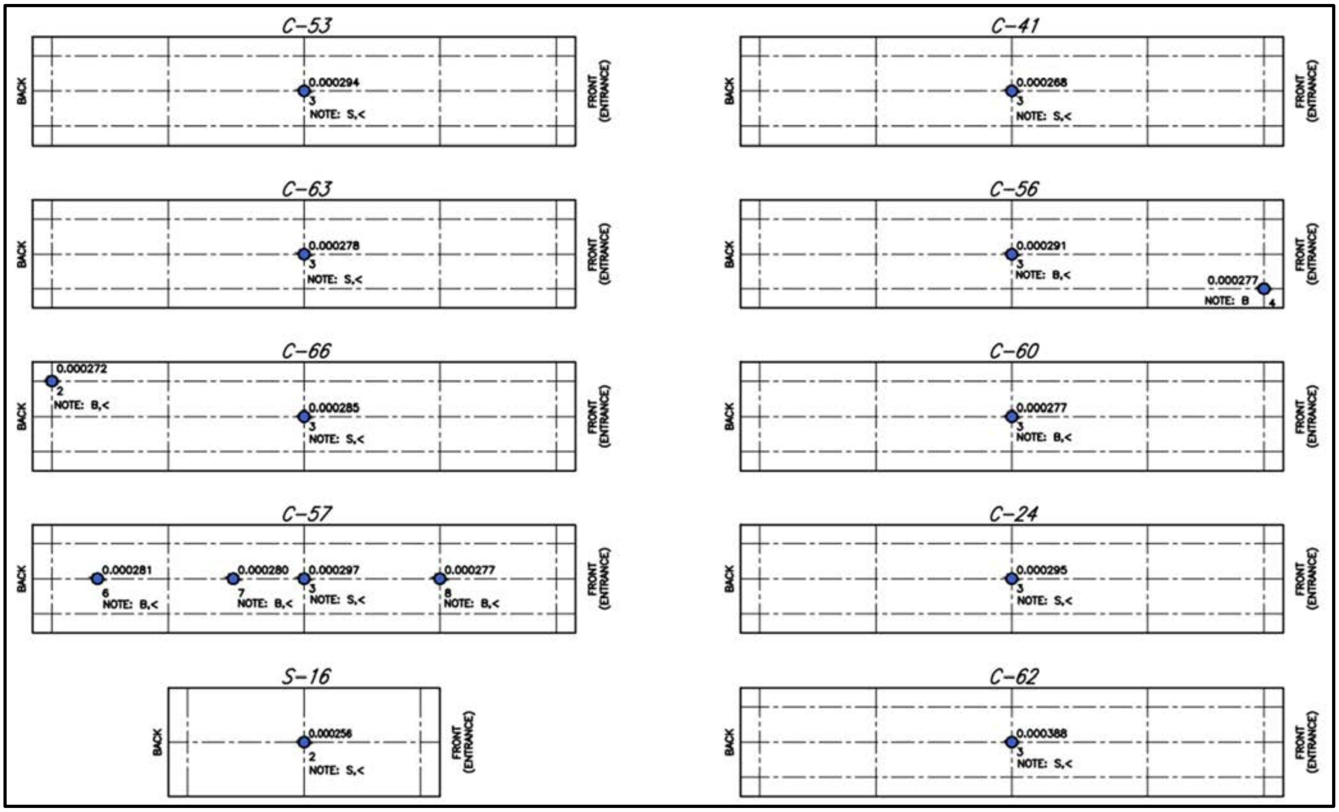

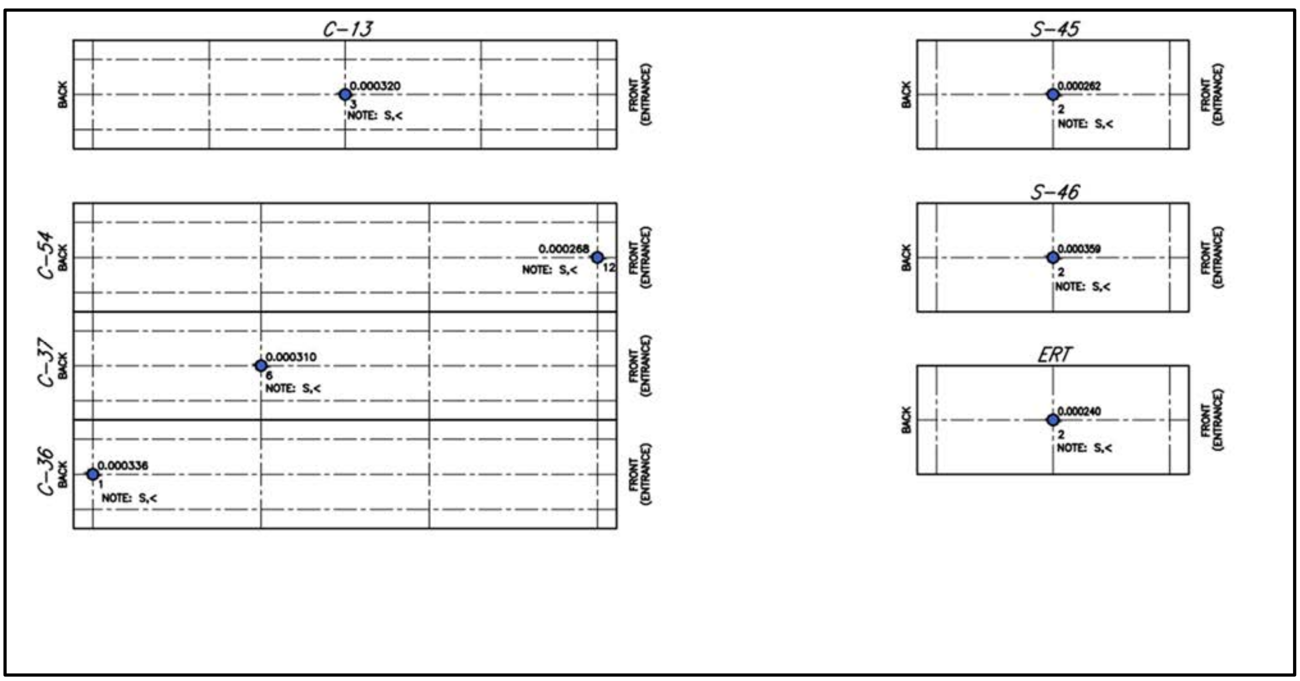

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B BIAS POINT
< NON-DETECTED POINT

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Appendix E
Remedial Investigation Methodologies

Remedial Investigation Methodologies

Utility Clearance

Reed Tech, Inc., a private utility location contractor, utilized a combination of electromagnetic survey and ground penetrating radar (GPR) to scan the proposed drilling locations for buried underground utilities. Additionally, prior to drilling each boring, three-inch diameter hand auger borings were completed to approximately five feet below land surface (BLS) or the boreholes were cleared to an approximate depth of 5 feet BLS using a vacuum extraction truck. Boring advancement was initiated once a location was cleared using these procedures. Utility clearance efforts completed by Columbia Fuel Fabrication Facility (CFFF), AECOM Technical Services, Inc. (AECOM), and Reed Tech, Inc. allowed intrusive boring/drilling to be completed without encountering and/or damaging any underground utilities.

Soil Boring Advancement Methods

Borings were advanced using a variety of tools and technologies including a stainless steel hand auger, direct push technology (DPT) using a Geoprobe^{TM} 7820 or 8041 drill rig, and a Geoprobe^{TM} 8140 or 8150 rotosonic drill rig. Three inch diameter, stainless steel hand augers were used to advance soil borings to allow collection of surface and shallow subsurface soil samples.

The Geoprobe™ 7820 and 8041 drill rigs allowed the collection of continuous soil core samples in acetate sleeves using a dual tube soil core sampling system or a single tube system with a piston point. Using the dual-tube system, a 2.25 inch outside diameter (OD) stainless steel core barrel fitted with a disposable acetate liner is advanced inside a slightly larger (3 inch OD) outer casing to the desired depth. The inner core barrel was retrieved from the borehole, leaving the outer core barrel in the borehole. Using the single-tube system, a 2.25 inch OD stainless steel core barrel is fitted with a disposable acetate liner. A piston point is held inside the liner and cutting shoe by rods extending to the drive head. When the sampler has been driven to the desired depth to begin soil sampling, a stop pin and extension rods are released, and the sample is driven. The core liner could then be cut open by field personnel allowing screening for the presence of volatile organic compounds using an organic vapor analyzer photoionization device (OVA PID), collection of samples for laboratory analysis, and/or visual examination of the contents.

Rotosonic drilling techniques were also utilized for advancement of soil and well borings. The sonic drilling technology allows collection of continuous soil cores utilizing a 10-foot long, four-inch inside diameter (ID) core barrel with a six-inch ID temporary (over-ride) casing. The boring advancement process using rotosonic drilling technology entails the advancement of the core barrel through a desired depth interval. Upon reaching the bottom of the interval a six-inch diameter outer casing was then advanced over the core barrel to the same depth. Once the outer casing was in place the core barrel was removed from the boring and the soil core was then dispensed from the core barrel into a clear polyethylene bag. Contents of the soil core bag were utilized by field personnel for screening for the presence of volatile organic compounds using an OVA PID, visual examination of the contents, and collection of soil samples, if necessary.

During Phase I and II of the RI, 19 and 43 borings, respectively, were advanced at the site using the techniques described above. Soil cores were collected from each boring for field screening with an OVA-PID, visually examined, classified, and described using the Unified Soil Classification System ([USCS], ASTM, 2017). These borings were used to collect groundwater samples, as described below in the Groundwater Screening Section, from temporary wells in sand zones where COPCs would most likely migrate. Lithologic borings not converted to a permanent monitoring well were abandoned in accordance with South Carolina Well Standards and Regulations (R.61-71(H)(2)(e). This included backfilling of a borehole with a bentonite-cement (up to 5% bentonite) grout to land surface.

Soil Gas Survey

In accordance with the *Phase II Remedial Investigation Work Plan* (AECOM, 2020), soil gas survey (SGS) samples were obtained during the first phase of the survey from 25 locations (SG-1 through SG-25) spaced on a generally 75-foot offset grid. Some locations had to be shifted from their proposed locations due to obstructions, however the alternate locations were typically within 5 to 10 feet of the originally proposed sample point.

The SGS devices remained in the ground for approximately 14 days to allow CVOC vapors to pass through the permeable membrane of the SGS vial and equilibrate. A sorbent material within the vial adsorbed concentrations of

CVOCs and this material was analyzed to assess the relative vapor concentration at each location. The initial phase of the SGS indicated two areas of higher subsurface vapor concentrations.

To refine the area for confirmatory soil sample collection, a second passive SGS phase was completed in the vicinity of the two areas of higher subsurface vapor concentrations. This phase included collection of samples from 28 SGS locations (SG-26 through SG-53) on a 25-foot offset grid.

Soil Sample Collection

During Phase I of the RI, 59 soil samples were collected from the 14 soil borings advanced (SS-1 through SS-14) to assess potential Tc-99 source areas. Four soil samples including a surface soil sample (collected from 0 to 1 ft BLS) and three subsurface soil samples (collected from 1-3 ft, 3-5 ft, and 5-7 ft BLS) were collected from each of the 14 borings. Sample collection, homogenization and containerization were completed for each sample in accordance with the procedures described in the *Final Remedial Investigation Work Plan* (AECOM, 2019a).

During Phase II of the RI, 32 subsurface soil samples were collected from 13 soil borings (SS-17 through SS-29) advanced in the primary SGS area. The confirmatory soil boring locations were selected based on the results of the SGS. Soil samples were collected for confirmatory laboratory analysis from the sample interval within each boring that had the highest OVA-PID reading and at the total boring depth of 8 feet BLS in accordance with the *Phase II Remedial Investigation Work Plan* (AECOM, 2020).

Groundwater Screening

Each screening boring was advanced using DPT or sonic drilling methods which allowed for the collection of continuous soil cores that were used to assess the subsurface lithology. Lithologic information as well as PID organic vapor screening results were used to determine intervals from which groundwater screening samples would be collected. Boring advancement, soil core evaluations, and screening for organic vapors were completed in accordance with procedures described in the *Final Remedial Investigation Work Plan* (AECOM, 2019a) and *Phase II Remedial Investigation Work Plan* (AECOM, 2020). Methods used to collect groundwater samples for the screening efforts are described below.

Phase I Groundwater Screening

After review of the initial Phase I groundwater and lithologic data, CFFF with concurrence from the South Carolina Department of Health and Environmental Control (DHEC) implemented a limited groundwater screening effort that allowed comparison of groundwater conditions between the sands of the surficial aquifer and the sands within the floodplain aquifer. An *Additional Floodplain Assessment Plan* (AECOM, 2019b) was submitted to DHEC on August 2, 2019 and this plan was approved by DHEC on August 7, 2019.

Groundwater samples were collected in borings advanced near previous lithologic boring locations L-1 and L-8 through L-10 using a rotosonic drill rig. In addition, lithologic information and groundwater samples were also collected from multiple depth intervals within three new borings (L-17 through L-19) advanced in the floodplain.

Groundwater screening methodology using a rotosonic drill rig was as follows:

- Advancement of a 10 foot long 4-inch inner core barrel to desired depth;
- Advancement of an over-ride 6-inch casing to same depth as inner barrel;
- Removal of inner core barrel followed by lithologic descriptions of the soil core;
- Installation of 5-foot long, 2-inch diameter steel, slotted screen attached to a 2-inch diameter steel riser pipe to the bottom of the over-ride casing. The riser pipe was fitted with an inflatable packer that was connected to an air compressor at land surface via polyethylene air supply line;
- The over-ride casing was pulled up approximately five feet, exposing the screen interval to the bottom of the borehole, and the packer was inflated to seal off the over-ride casing above the bottom of the borehole and screen;
- A small submersible pump with disposable polyethylene tubing was lowered into the two-inch riser to a depth just above the screen interval and used to purge water from the aquifer. The purpose of the purging was to remove drilling fluids introduced to the aquifer and obtain groundwater samples that are representative of the water quality within each discrete screened interval.

- Water quality parameters were measured approximately every 5 minutes using a YSI water quality meter equipped with a flow-through cell and a HF Scientific turbidity meter. The water quality parameters included temperature, pH, specific conductivity (SC), dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity.
- Purging proceeded until water quality parameters stabilized. pH was required to be within 0.2 standard units (SU) and specific conductivity and temperature were within 3% of the previous reading. If water quality parameters did not stabilize (particularly when the borehole was pumped dry), the field geologist decided when purging was complete. Although turbidity was measured during the purging, it was not used as a stabilization parameter because these temporary wells did not have a sand pack to assist in the reduction of turbidity.
- Once field measurements indicated stable groundwater conditions were achieved, a groundwater sample was collected in laboratory supplied sample bottles.
- After the groundwater sample is collected, the boring was advanced to the next screening interval or properly abandoned if the total groundwater screening depth was reached.

Phase II Groundwater Screening

Upon completion of Phase I of the RI, CFFF and AECOM determined that additional data was required to delineate the extent of COPCs in groundwater beneath the site. Therefore, 43 lithologic/groundwater screening borings (L-20 through L-62) were advanced/sampled during Phase II of the RI in accordance with the DHEC approved *Phase II Remedial Investigation Work Plan* (AECOM, 2020).

Groundwater screening samples during phase II of the RI were collected using a DPT drill rig. DPT groundwater sample tooling consisted of a 2-inch outside diameter stainless steel drive rod with a 4-foot long, 1¼ inch diameter inner retractable screen. Once the DPT rods reached the desired screening depth, the rods were retracted four feet to expose the screen.

Groundwater was purged within the DPT rods using a peristaltic pump and dedicated tubing. Water quality parameters were measured approximately every five minutes using an In-Situ Aqua TROLL 600 water quality meter equipped with a flow-through cell. Groundwater samples were collected after the water quality parameters stabilized as described above.

Well Installation Methods

The monitoring wells were installed using either rotosonic or hollow stem auger drilling techniques. Well installations were completed in accordance with procedures specified in the *Final Remedial Investigation Work Plan* (AECOM, 2019) and the *Phase II Remedial Investigation Work Plan* (AECOM, 2020).

Monitoring wells consisted of schedule 40 polyvinyl chloride (PVC) slotted screen attached to a schedule 40 PVC riser pipe. Monitoring wells installed during the RI effort screened in the upper zone of the surficial aquifer have 10-foot screens and wells screened within the lower zone of the surficial aquifer have 5-foot screens with the exception of upper zone of the surficial aquifer monitoring wells W-96, W-97, W-100 and W-119. Monitoring wells W-96, W-97, and W-119 were installed with 5-foot screens to screen the same portion of the surficial aquifer where groundwater screening samples indicated impacts to groundwater. Due to the short thickness of the surficial aquifer in the vicinity of W-100, it was not possible to install an upper and lower zone of the surficial aquifer monitoring well pair without both wells having 5-foot screens.

Generally, monitoring wells installed within the operational area of the plant were completed as flush mount wells with a bolt down, steel well cover surrounded by a two foot by two foot (by six inch thick) concrete pad. Wells installed outside of the operational area were completed above-grade with a steel protective casing, also surrounded at land surface by a two foot by two foot (by six inch thick) concrete pad.

Well Development

Prior to the start of development, the depth to water and total depth of a well were measured and recorded on a monitoring well development log. An electric submersible pump with ½ inch diameter polyethylene tubing was lowered into the well and initially placed within 1-2 feet of the bottom of the well. Once the pump was turned on, a small volume of water was evacuated to allow collection of a sample used to measure water quality indicator parameters. Once this sample was collected the pump was then used to surge the well (pulled up and lowered back down through the screen interval) four to five times. This surging action agitated and mobilized/suspended any sediments/solids that collected in the well pipe and filter pack during installation. The initial surging action was followed by placement of the pump at the bottom of the screen interval and pumping to remove sediment from the well.

The surging action was performed periodically while the pump continued to operate. Water quality indicator parameters (e.g., pH, temperature, SC, DO, ORP, and turbidity) were measured during development using calibrated water quality meters. Development was performed until pH was within 0.2 SU, specific conductivity and temperature is within 3%, and the turbidity is <10 nephelometric turbidity units or is stable within 10% if greater than 10 nephelometric turbidity units (only if specifically approved by the Project Manager on a well by well basis) when compared to the previous reading. Water quality parameter measurements were documented on monitoring well development logs.

Monitoring Well Sampling

Prior to the monitoring well network sampling campaign, water levels were measured in each monitoring well using an electric water level indicator. The water levels were measured as quickly as practical on one day. The water level data was used to determine groundwater elevations and flow direction in each groundwater zone.

As indicated in the *Final Remedial Investigation Work Plan* (AECOM, 2019) and *Phase II Remedial Investigation Work Plan* (AECOM, 2020), low flow, low volume well purging and sampling procedures were used to sample the permanent monitoring wells. Either a peristaltic or a variable speed submersible pump were used to purge the permanent wells. Water quality parameters including pH, temperature, SC, DO, ORP, and turbidity were measured during purging using an Aqua TROLL 600 water quality meter.

Well purging efforts were performed until water quality parameters stabilized as described in the Phase I Groundwater Screening section above. Depth to water, depth to well bottom and water quality parameter measurements were documented on groundwater sampling logs generated while sampling at each well.

Private Water Well Sampling

Water well samples were collected from each well utilizing the procedures described in the *Final Remedial Investigation Work Plan* (AECOM, 2019B). This effort included well purging and measurement of water quality indicator parameters (pH, temperature, SC, DO, ORP, and turbidity). Groundwater sample stabilization for the private wells was the same as for the monitoring wells. Well purging and sample collection efforts at each water well were documented on groundwater sampling logs.

Hydraulic Data Collection and Conductivity Testing

Both falling and rising head tests were performed at each well. The slug test procedure initially included installation of a pressure transducer data logger (In-Situ Level TROLL® 700 or similar) into the well. The pressure transducer was programmed to measure a monitoring well's water level over a time interval.

Falling head tests were conducted by quickly inserting a 1.5 inch diameter, 60-inch length solid PVC cylinder (slug) into a well. As a result, water level within the well rises and is monitored over time as it declines back toward static level. Rising head tests were conducted by quickly removing the submerged slug from a well. The resulting water level declines and is monitored over time as it rises back to static level. The changes in water levels logged by the pressure transducer were downloaded for evaluation. The testing methods and data analysis followed the procedures described by Bouwer and Rice (1976) and Bouwer (1989).

Surface Water Sample Collection

Two background samples (SW-11 and SW-12) were collected from upstream locations within the Eastern Ditch where the ditches enter the northern side of the property from Bluff Road. Samples were also collected from four additional locations (SW-13, SW-14, SW-17 and SW-18) within the Eastern Ditch and two locations (SW-15 and SW-16) within the Middle Ditch. Surface water samples SW-19 and SW-20 were collected from Upper Sunset Lake. Surface water samples SW-21 and SW-22 were collected from within Lower Sunset Lake. Surface water sample SW-23 was collected in the Gator Pond.

In accordance with the *Final Remedial Investigation Work Plan* (AECOM, 2019), surface water (and sediment) sampling was performed from the most down-stream location to the most up-stream location to preclude disturbing sediments which could become suspended and wash downstream potentially biasing other samples.

Surface Water-Groundwater Interaction Evaluation

Groundwater quality and elevation data collected during the RI suggested that the Gator Pond influences COPC migration in groundwater in the vicinity of the pond. To better understand this influence, pressure transducers were installed in monitoring wells W-4/W-4R, W-15, W-16, W-27, and W-92 to assess the horizontal and vertical effect of this surface water body on the surficial aquifer. Pressure transducers measure the water level data in each of these wells every hour.

A pressure transducer is also attached to the staff gage in the Gator Pond. Using both top of casing elevation and the elevation of the top of the staff gage, groundwater and surface elevations were calculated. These data were used to develop groundwater and surface water elevation trend graphs. To assess the fluctuation of the surficial aquifer without the influence of surface water bodies above the bluff and what affect that may have on groundwater migration around the Gator Pond, pressure transducers were installed in monitoring well pair W-60 and W-61.

To assess surface water elevations and flow direction within Mill Creek, staff gages were installed in the canal, at the Entrance Dike, two within Upper Sunset Lake, in Lower Sunset Lake, and in Mill Creek beyond the Lower Sunset Lake Dike. During Phase II of the RI, AECOM installed pressure transducers at the Lower, Upper, Upper 2, Entrance and Canal staff gages to allow collection of real-time surface water elevation data from this portion of Mill Creek. This data has been evaluated to assess if “upstream” flow has been occurring from Upper Sunset Lake to the canal.

Additionally, pressure transducers were installed in piezometer PZ-1 and monitoring well W-96, W-104, W-105, W-124, W-125 and W-126 near Lower Sunset Lake to assess the groundwater to surface water interaction in this area. Because of the elevation of the screen of monitoring well W-92 (lower zone of the surficial aquifer) located between the Gator Pond and Lower Sunset Lake, this monitoring well was also used in this evaluation. These pressure transducers collect water level data that was converted to an elevation. Data collected from these locations were used to develop groundwater and surface water elevation trend graphs.

Sediment Boring Advancement

During Phase I of the RI, sediment samples were collected using a hand auger or multistage sediment sampler. Surficial sediment samples (0-6 inches) were collected using a hand auger in sediment sample locations SED-11 through SED-28 (sediment samples SED-25 through SED-28 are sludge samples from the East and Sanitary Lagoons) and SED-38 through SED-50.

A multistage sampler consists of a two-foot long stainless steel tube with an acetate sleeve inside. The multistage sediment sampler was attached to a slide hammer that was used to manually drive it into the sediment. Sediment samples from the core were collected at six-inch intervals (e.g. 0-6 inch, 6-12 inch) with a minimum of 1-foot of sediment core being collected.

During Phase II of the RI, both surface and subsurface sediment samples (collected from deeper intervals - ranging from between 6 and 24 inches) were obtained using Specialty Devices, Inc.’s Vibracore Mini sampler (Vibracore). The Vibracore contains a box that vibrates an aluminum tube into the sediment. The bottom of the aluminum tube was placed on top of the sediment surface and a mark was made on the rod connecting the vibrating box to the tube at a height 3 feet above the top of the surface water.

The aluminum tube was then vibrated into the sediment until the mark was at the top of the surface water. Once the aluminum tube was extracted, field personnel measured the amount of sediment within the tube. A minimum of 2 feet of sediment was measured in each tube.

A hand auger was also used during Phase II of the RI to collect sediment samples from the Middle Ditch at sediment sample locations SED-16, SED-60 and SED-61. These samples were collected in six-inch intervals to a depth of 12 inches BLS.

Sediment Sample Collection

When the multistage sampler was removed from the subsurface, the acetate sleeves were extracted. The sleeves were cut open to allow visual examination of the sediment and collection of samples. The multistage sampler was used to collect sediment samples SED-29 through SED-37 and SED-51 through SED-56.

After field personnel assessed the thickness of sediment with the Vibracore tube, the tube was cut into 6 inch sections. The Vibracore was used to collect sediment samples SED-19 through SED-50, SED-57 through SED-68 and B1 through B8.

Sediment samples to be analyzed for VOCs were immediately collected after the sleeves and tubes were cut open. Once the VOC samples were collected, the remaining material was placed on dedicated HDPE mixing squares and homogenized in accordance with the procedures discussed and/or referenced in the *Final Remedial Investigation Work Plan* (AECOM, 2019). After homogenization was complete sediment was distributed to appropriate remaining sample containers.

Quality Assurance and Quality Control

The sample quality assurance (QA) and quality control (QC) processes during the RI included field documentation, usage and calibration of field measurement devices, usage of designated sampling nomenclature, sample collection and field QC sampling, handling, and shipping procedures, sample custody and documentation, laboratory handling, and data management. These processes were completed in accordance with processes described in the *Final Remedial Investigation Work plan* (AECOM, 2019).

Field documentation and data management efforts included collection and management of field measurements and observations using standardized field forms and electronic recording devices. Field equipment used to collect data (including a PID, water quality meter, and turbidity meter) were calibrated prior to each use (usually at the beginning of each day). Instruments were calibrated, maintained, and operated in accordance with the manufacturer's specifications.

Information about locations, field measurements, samples, laboratory tests, and data results is maintained in the site's EQuIS database, managed by AECOM. Access to the database is restricted to project personnel, and the ability to view and/or add or change data were granted to only those individuals designated to perform those tasks. Original data documents and electronic files have been archived in the computerized project filing system.

Sample identification information was assigned in accordance with guidance provided in the *Final Remedial Investigation Work Plan* (AECOM, 2019).

Sample Point Location and Surveying

Surface water and sediment sample locations were surveyed using submeter GPS methods. Borings, wells, staff gages and sample locations on land were surveyed by South Carolina Registered Land Surveyors using survey-grade equipment.

Surveying was performed by AECOM and survey data was reviewed and saved in the site's EQuIS database in accordance with QA procedures. Horizontal locations were reported in South Carolina State Plane Coordinates referenced to the North American Datum of 1983 to the nearest 0.01 foot. Elevations were referenced to the North American Vertical Datum of 1988 to the nearest 0.01 foot.

Equipment Decontamination

In accordance with the *Final Remedial Investigation Work Plan* (AECOM, 2019) drilling equipment and reusable equipment was cleaned between borings and/or sample locations. This included hand augers, Geoprobe™, and rotosonic drilling tools (core barrels, drive rods casing), hollow stem augers, soil and sediment sampling tools, well development and sampling equipment (water level meters, submersible pumps, flow though cells for water quality meters). Decontamination procedures used for these various pieces of equipment are described in the *Final Remedial Investigation Work Plan* (AECOM, 2019).

Investigative Derived Waste Management

Solid IDW was containerized in Department of Transportation (DOT) approved 55-gallon drums and temporarily staged at a central location pending results of laboratory analyses and selection of final disposition according to CFFF procedures RA-136 (Westinghouse, 2021), *Soil Sampling and Disposal* and RA-433, *Environmental Remediation* (Westinghouse, 2022).

Soil cuttings generated during soil and well boring efforts were containerized individually. Cuttings from separate locations were not combined/mixed in a drum. A composite sample was collected from each drum containing soil IDW and analyzed as specified in the *Final Remedial Investigation Work Plan* (AECOM, 2019).

Liquid IDW, consisting of drilling fluids, decontamination water, and well development/purge water, was containerized in totes provided by CFFF and staged at a central location pending results of laboratory analyses. Fluid IDW was processed through the CFFF wastewater treatment system once CFFF received approval from DHEC.

Background Concentration Calculation

Surface water and sediment data were compared to background values in addition to regulatory screening values. Background surface water (SW-11 and SW-12) and sediment samples (SED-11 and SED-12) for the stormwater ditches were collected upstream in the Eastern Ditch in locations far enough away from the facility to not be impacted by operations. Background sediment samples for Mill Creek (including Upper Sunset Lake and Lower Sunset Lake) were collected from locations SED-51 through SED-56 for 2-Butanone, acetone, ammonia, nitrate, and fluoride and from locations SED-51 through SED-59 for U.

Background concentrations were calculated using two-times the mean concentration for detection and one-half of the reporting limit for non-detected results.

Pressure Transducer Data Download

During Phase II of the RI, pressure transducers were attached to staff gages in surface water bodies on the CFFF property, installed in monitoring wells and installed in a piezometer.

The transducers in the monitoring wells and the piezometer, its cable, and associated desiccant (keeps moisture from getting into the cable which could short circuit data transmission) are attached to the bottom of the monitoring well's expandable cap. When the cap was removed to download data from the transducer, field personnel collected a water level measurement in each well or piezometer for use in comparison to the transducer data as quality assurance measure.

To download data from the transducer, the expandable cap was removed from the top of the well to expose the semirigid cable, the desiccant was removed from the cable's end and a Wireless TROLL Com was connected to the end of the cable. The data was then transmitted by a Bluetooth connection to a tablet (iPad or similar tablet) containing the VuSitu mobile application. Once the data is downloaded, the communication device was removed, the desiccant placed back on the end of the cable, and upper foot or two of the cable was bent in a U shape to fit back into the well.

Because there was friction of the cable on the sides of the well due to the U shaped bend and the attachment to the well cap has a little room for movement, the transducer may not end up in the same exact position in the well as it was before the cap was removed. This shift in position in the well results in the transducer reading a higher or lower elevation than the actual surficial aquifer elevation in the well/piezometer. Comparing the field measured water elevation to the transducer data allows for adjustment of the transducer data, if necessary, to match and/or verify the field measured elevation thereby eliminating the error caused by the shift in the transducer's position in the well. Transducer and field measurements that were within 0.1 foot of each other did not require the data to be adjusted.

Each time data was download, field and transducer elevations were compared to ensure that each data set accurately reflected fluctuations in the surficial aquifer.

Transducers on the staff gages are connected via the same cable to a VuLink®. VuLink® is a data logger and cellular telemetry device manufactured by In-Situ Inc. to transmit data into the cloud where it can be accessed via the internet. The VuLink takes the place of the Wireless TROLL Com because field personnel can connect directly to the VuLink via Bluetooth on the tablet and download the transducer data.

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