FINAL
Site Inspection Report McEntire Army Aviation Support Facility, Eastover, South Carolina

Site Inspection for Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorohexanesulfonic acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene oxide dimer acid (HFPO-DA), and Perfluorobutanesulfonic acid (PFBS) at ARNG Installations, Nationwide

August 2023

Prepared for:

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Table of Contents

Appendices

Figures

Tables

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
EDR™	Environmental Data Resources, Inc.™
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
JNGB	Joint National Guard Base
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specification
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
SCARNG	South Carolina Army National Guard
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Executive Summary

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS). These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable screening levels (SLs) are provided in **Table ES-1**.

The PA identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the McEntire Army Aviation Support Facility (AASF) in Eastover, South Carolina and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1, AOI 2, and AOI 3. The McEntire AASF will also be referred to as the "facility" throughout this document.

The McEntire AASF is an enclave of the McEntire Joint National Guard Base, which is owned by the United States Air Force and affiliated with the South Carolina Air National Guard. The facility is located in Eastover, Richland County, South Carolina, near the geographical center of the state and roughly 12 miles southeast of the City of Columbia. The facility was built in 1961 and has undergone several additions and modifications since then. Building 465, erected in 1961, was the original hangar and flight operations building. A second hangar (Building 456) was added in 1991, and a third hangar (Building 457) was constructed in 2012. Presently, the three hangars are located adjacent to one another, along the aircraft apron. The 172.27-acre facility consists of these three hangars, an aircraft apron, flight operations offices, ground support equipment/ buildings, and a wash rack.

The PA identified three AOIs for investigation during the SI phase. SI sampling results from the three AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for AOI 1, AOI 2, and AOI 3.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table ES-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table ES-2: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Hangar 457	◐	●	Proceed to RI
2	Helicopter Apron and Hangar 456	◐	●	Proceed to RI
3	Building 467 and Wash Rack	●	●	Proceed to RI

Legend:
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the McEntire Army Aviation Support Facility (AASF) in Eastover, South Carolina. The McEntire AASF is also referred to as the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; United States [US] Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations.

1.2 SI Purpose

A PA was performed at McEntire AASF (AECOM Technical Services, Inc. [AECOM], 2020) that identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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2. Facility Background

2.1 Facility Location and Description

The McEntire AASF is an enclave of the McEntire Joint National Guard Base (JNGB), which is owned by the US Air Force and affiliated with the South Carolina Air National Guard (ANG) (**Figure 2-1**). The facility is located in Eastover, Richland County, South Carolina, near the geographical center of the state and roughly 12 miles southeast of the City of Columbia. The facility was built in 1961 and has undergone several additions and modifications since then. Building 465, erected in 1961, was the original hangar and flight operations building. A second hangar (Building 456) was added in 1991, and a third hangar (Building 457) was constructed in 2012. Presently, the three hangars are located adjacent to one another, along the aircraft apron. The 172.27-acre facility consists of these three hangars, an aircraft apron, flight operations offices, ground support equipment/ buildings, and a wash rack.

2.2 Facility Environmental Setting

The facility is located within the inner belt of the Coastal Plain, between the northeastern valley wall and the Congaree River floodplain (Leidos, 2019). The coastal plain consists of two significantly different landscapes, an inner belt and outer belt. The inner belt is predominately composed of cropland, with forest limited to small patches and hardwood "stringers" along creeks. An outer belt, sometimes called the "flatwoods", is primarily pine-dominated forest. Major floodplains bisect both belts, which are largely forested. The facility has an elevation from 250 to 260 feet above mean sea level, and there are several retention ponds around the facility. The facility property consists of impervious surfaces, such as the helicopter apron, along with a mixture of grassy areas and drainage swales. The surrounding area is mostly agricultural, with residential areas and commercial establishments spread throughout. The facility topography is presented in **Figure 2-2**.

2.2.1 Geology

McEntire AASF is situated on top of Pleistocene- and Pliocene-aged deposits. The surficial geology in the northern part of the facility consists of the Pliocene-aged Duplin Formation. The Duplin Formation is composed of red to brown to yellow, poorly sorted, medium-grained quartz sand to quartz granules with interstitial clay (Shelley, 2007). The central and southern areas of the facility are underlain by the Congaree River Valley terrace complex, which is a series of estuarine and fluvial deposits composed primarily of poorly to moderately sorted, medium to very coarse sand with varying amounts of clay grading upward to red clay and sandy clay. These deposits range up to around 50 feet in thickness in the vicinity of the facility (Shelley, 2007). Sand and clay surficial alluvial deposits are present to the east and west of the facility, near Cedar Creek and Dry Branch. Additionally, Pleistocene-aged Carolina bays are locally interspersed at McEntire AASF and are characterized as rounded depressions containing 3-5 feet of dark sandy clay to clayey sand (Shelley, 2007). Underlying the Cenozoic deposits are southwesterly dipping Cretaceous deposits that contain the regional aquifers (US Geological Survey [USGS], 2010). Generalized geologic features are presented on **Figure 2-3**.

During the SI, poorly graded, fine-grained sand was the dominant lithology of the unconsolidated sediments below McEntire AASF. Substantial quantities of silt and clay were noted, specifically, extensive layers of silty sand and low plasticity lean clay were also observed in the borings, with thicknesses ranging from 1 foot to 20 feet. Many of the logs also reported varying percentages of gravel included in the sand packages with subangular to subrounded fine to coarse gravel layer found at the groundwater table. These results and facility observations are consistent with the reported depositional environment of the region that is characterized by the Duplin Formation, estuarine and fluvial deposits of the Congaree River Valley terrace complex, surficial alluvial deposits near Cedar Creek and Dry Branch, and lastly, the Carolina bays. The borings were completed at depths between 40 and 50 feet below ground surface (bgs). Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

The hydrogeology at McEntire AASF is characterized by a sequence of aquifers. The uppermost aquifer is generally described as the surficial aquifer and is situated within permeable Quaternary sediments throughout the coastal plain (Aucott, 1996; USGS, 2010). The surficial aquifer near the facility is unconfined and approximately 10 feet thick. Consequently, groundwater moves laterally to surface water bodies and vertically to underlying hydrogeologic units (USGS, 2010). According to historical investigations at McEntire AASF, shallow, unconfined groundwater has been encountered at depths between 27 and 47 feet bgs, with groundwater flow in the southwest direction towards Cedar Creek and Dry Branch (Leidos, 2019).

The Crouch Branch aquifer (also referred to as Black Creek aquifer) underlies the Pleistocene and Pliocene-aged deposits but is unconfined at the facility due to the absence of the Lang Syne and Sawdust Landing formations (Shelley, 2007; USGS, 2010). The aquifer is situated within the late Cretaceous-aged clayey sands of the Peedee, Donoho Creek, and Bladen formations. Near the facility, the Crouch Branch aquifer ranges in thickness from approximately 200 to 300 feet. The top altitude of the aquifer is about 200 feet above mean sea level (USGS, 2010).

The McQueen Branch confining unit underlies the Crouch Branch aquifer and comprises various clay, calcareous clay, and carbonaceous clay formations, with thicknesses around 50 feet. The McQueen Branch aquifer (also referred to as Middendorf and Tuscaloosa aquifer in other studies) underlies the confining unit. The McQueen Branch aquifer is situated within late Cretaceous-aged units characterized by poorly sorted sand, clayey sand, and gravel. Near the facility, the McQueen Branch aquifer ranges in thickness from approximately 100 to 200 feet. The top altitude of the aquifer is around 0 to -200 feet above mean sea level. The Gramling confining unit confines the bottom of the McQueen Branch aquifer (USGS, 2010).

An Environmental Data Resources, Inc.™ (EDR™) report provided a well search for a 1-mile radius surrounding the facility. Using additional online resources, such as state and local Geographic Information System databases, wells were researched to a 4-mile radius of the facility. There are no drinking water wells at the McEntire AASF; drinking water is provided by the City of Columbia. The City of Columbia sources its water from the Broad River Diversion Canal and Lake Murray, located approximately 13 miles and 26 miles northwest of the facility, respectively (City of Columbia, 2014). The City of Columbia has been testing their finished drinking water and source water for PFAS on a biannual schedule. As of April 2021, the finished drinking water from the Broad River Diversion Canal had combined PFOA and PFOS levels of 14.54 and 15.3 parts per trillion, and 15 of 29 PFAS compounds tested were detected at low levels in the source water samples (City of Columbia, 2021). The facility is currently supplied by the municipal water, which was sampled on 13 January 2022 to assess usability for decontamination of drilling equipment (see **Section 5.1.3**).

Additional public supply, industrial, irrigation, and domestic wells are located within a 0.5- to 4-mile radius of the facility; completion depth of these wells is unknown. Four domestic wells and four public supply wells are located downgradient from the facility, based on the southwestern groundwater flow direction (**Figure 2-3**).

Depths to water measured in March 2022 during the SI ranged from 34.31 to 40.90 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the groundwater flow direction at the facility is to the southwest, consistent with the findings from previous investigations at the AASF.

2.2.3 Hydrology

The Wateree River and Congaree River are major waterways that flow to the east and the south of the facility, where they eventually converge to make the southeastern point of Richland County. The facility is located within two small drainage basins (**Figure 2-5**) that are part of the Congaree River drainage basin. This basin is part of the larger Santee River Basin, which incorporates major metropolitan areas in the Carolinas such as Charlotte, Spartanburg, Greenville, Columbia, and Charleston (USGS, 2010).

Surface water and stormwater at the facility drain via Cedar Creek to the south and southwest through a series of retention ponds and swales that surround the facility. The swales and stormwater infrastructure discharge to Cedar Creek through Outfall #007, located off-facility to the southwest. The outfall is a concrete pipe crossing South Carolina Road near the Church Gate exit of the JNGB. The total area draining to Outfall #007 is 305 acres, with 35 percent (%) impervious area, including 172.27 acres of the facility. To the west of the facility, a small unnamed pond exists downgradient from the stormwater outfall (Leidos, 2019).

A wastewater treatment plant exists at the ANG facility that is part of the McEntire JNGB. The plant treats wastewater from both the ANG and ARNG AASF sanitary sewer system and receives an average throughput of 15,000 gallons per day. Sludge from the three associated sludge drying tanks is reportedly disposed of off-site. Treated effluent is monitored for contaminants and condition before it is discharged to an unnamed channel that leads to Cedar Creek (Leidos, 2019). Surface water features are shown on **Figure 2-5**.

2.2.4 Climate

The climate of Eastover, South Carolina is characterized by short, mild winters with little to no snowfall. Summers tend to be long and hot, with abundant rainfall. The normal annual precipitation is 44.6 inches. Summer temperatures peak in July, with an average high of 93 degrees Fahrenheit (°F) and an average low of 72 °F. Winter temperatures are lowest in January, with an average high of 56 °F and an average low of 34 °F. Snowfall is rare, and the region typically receives only about 1.5 inches of snowfall annually (National Weather Service Forecast Office, 2018).

2.2.5 Current and Future Land Use

The McEntire AASF is currently a controlled access facility as part of the McEntire JNGB. The AASF supports rotary aircraft operations and includes hangar space, a parking apron, flight ramp, wash rack, armory building, operations and maintenance support buildings, and taxiway connecting to the ANG runway. The area surrounding the facility is rural and residential, with mostly agricultural land use. Reasonably anticipated future land use is not expected to change from the current land use described here.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

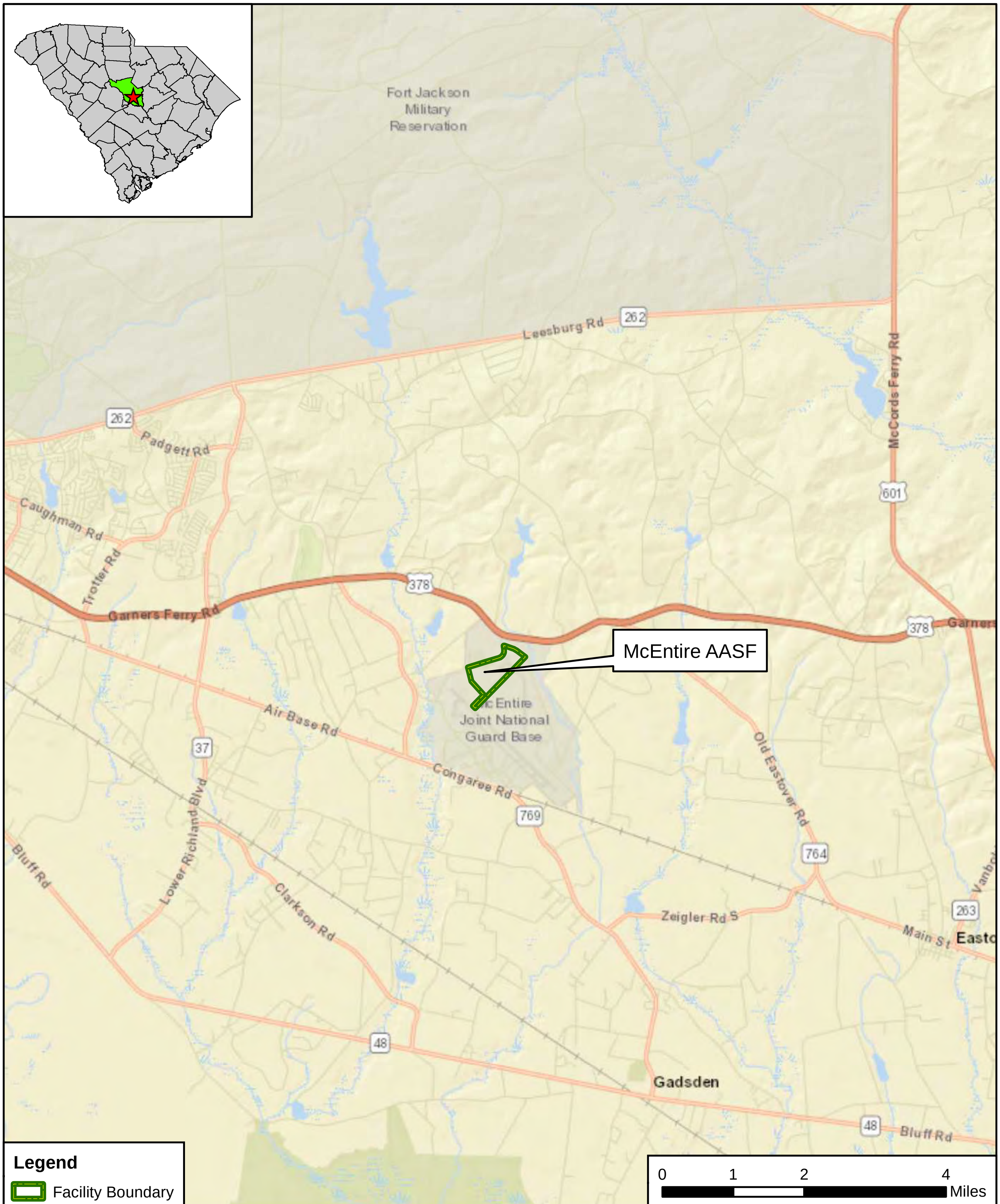
A wildlife survey has not occurred at the facility, and the facility does not have any significant areas of habitat. The following species have not been identified at the facility but may be present in the surrounding area.

The following amphibians, birds, crustaceans, fishes, plants, insects, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Richland County, South Carolina (US Fish and Wildlife Service [USFWS], 2022).

- **Amphibians:** Chamberlain's Dwarf salamander, *Eurycea* chamberlaini (under review)
- **Birds:** Red-cockaded woodpecker, *Picoides borealis* (endangered); Wood stork, *Mycteria americana* (threatened); Bald eagle, *Haliaeetus leucocephalus* (recovery); Golden-winged warbler, *Vermivora chrysoptera* (under review)
- **Crustaceans:** Little River crayfish, *Cambarus spicatus* (under review)
- **Fishes:** Robust redhorse, *Moxostoma robustum* (under review)
- **Flowering Plants:** Georgia aster, *Symphyotrichum georgianum* (resolved taxon); Ciliate-leaf tickseed, *Coreopsis integrifolia* (under review); Carolina birds-in-a-nest, *Macbridea caroliniana* (not listed); Bog spicebush, *Lindera subcoriacea* (under review); Purpledisk honeycombhead, *Balduina atropurpurea* (resolved taxon); Rough-leaved loosestrife, *Lysimachia asperulaefolia* (endangered); Canby's dropwort, *Oxypolis canbyi* (endangered); Smooth coneflower, *Echinacea laevigata* (threatened); Spathulate seedbox, *Ludwigia spathulate* (status undefined)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Tricolored bat, *Perimyotis subflavus* (proposed endangered); Little brown bat, *Myotis lucifugus* (under review)
- **Reptiles**: Southern hognose snake, *Heterodon simus* (resolved taxon)

2.3 History of PFAS Use

Three AOIs were identified in the PA where AFFF may have been used, stored, disposed, or released historically at the McEntire AASF (AECOM, 2020). AFFF releases from fire suppression systems have historically occurred within two hangars at the facility, and AFFF was also released due to fire training activities at the wash rack and two fire emergency responses at the helicopter apron. Additional AFFF releases may also have occurred from incidental spills due to AFFF storage in Tri- Max™ 30 carts. The potential release areas were grouped into three AOIs based on preliminary data and presumed groundwater flow directions. A description of each AOI is presented in **Section 3**.



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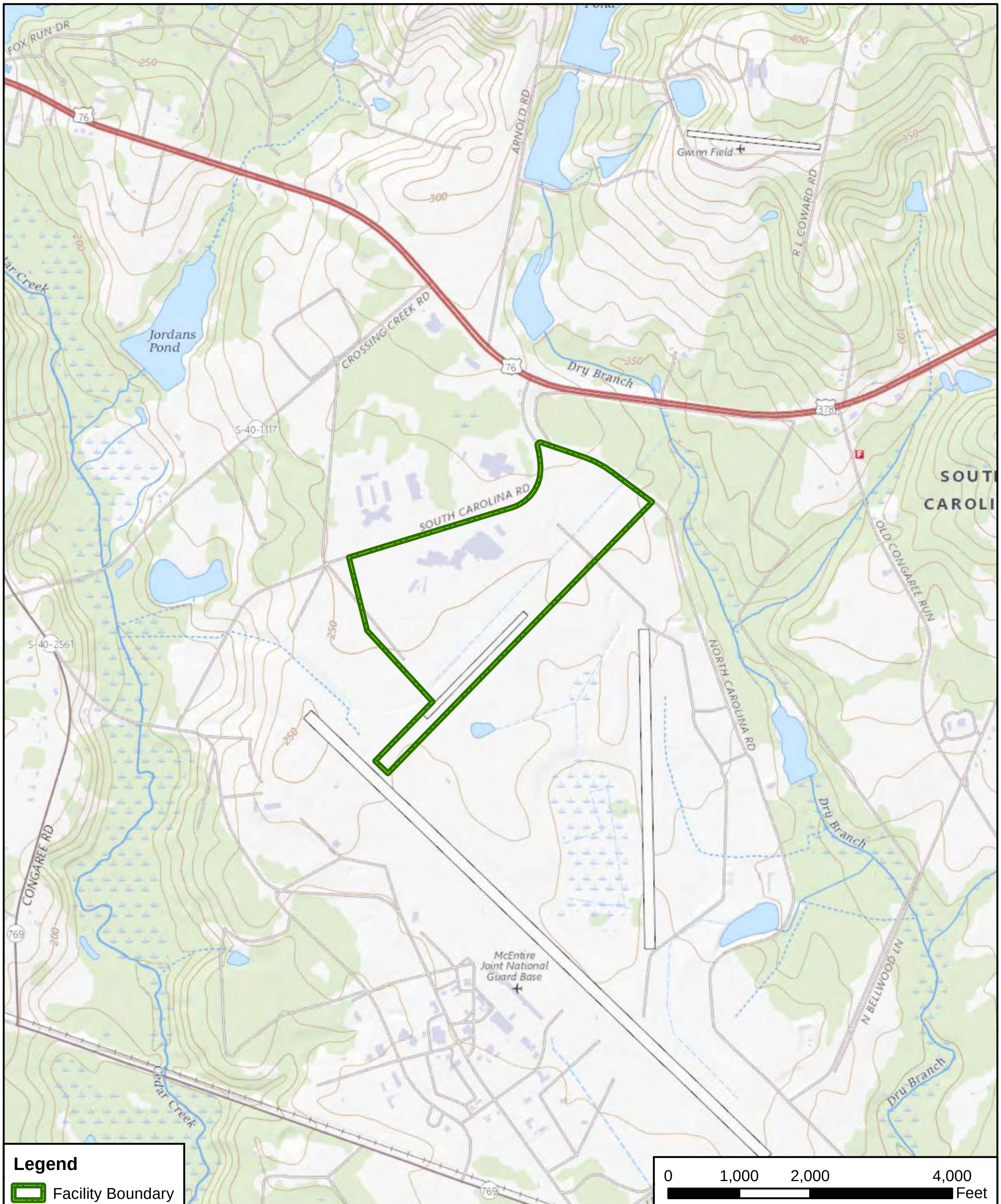
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/31/2022

N

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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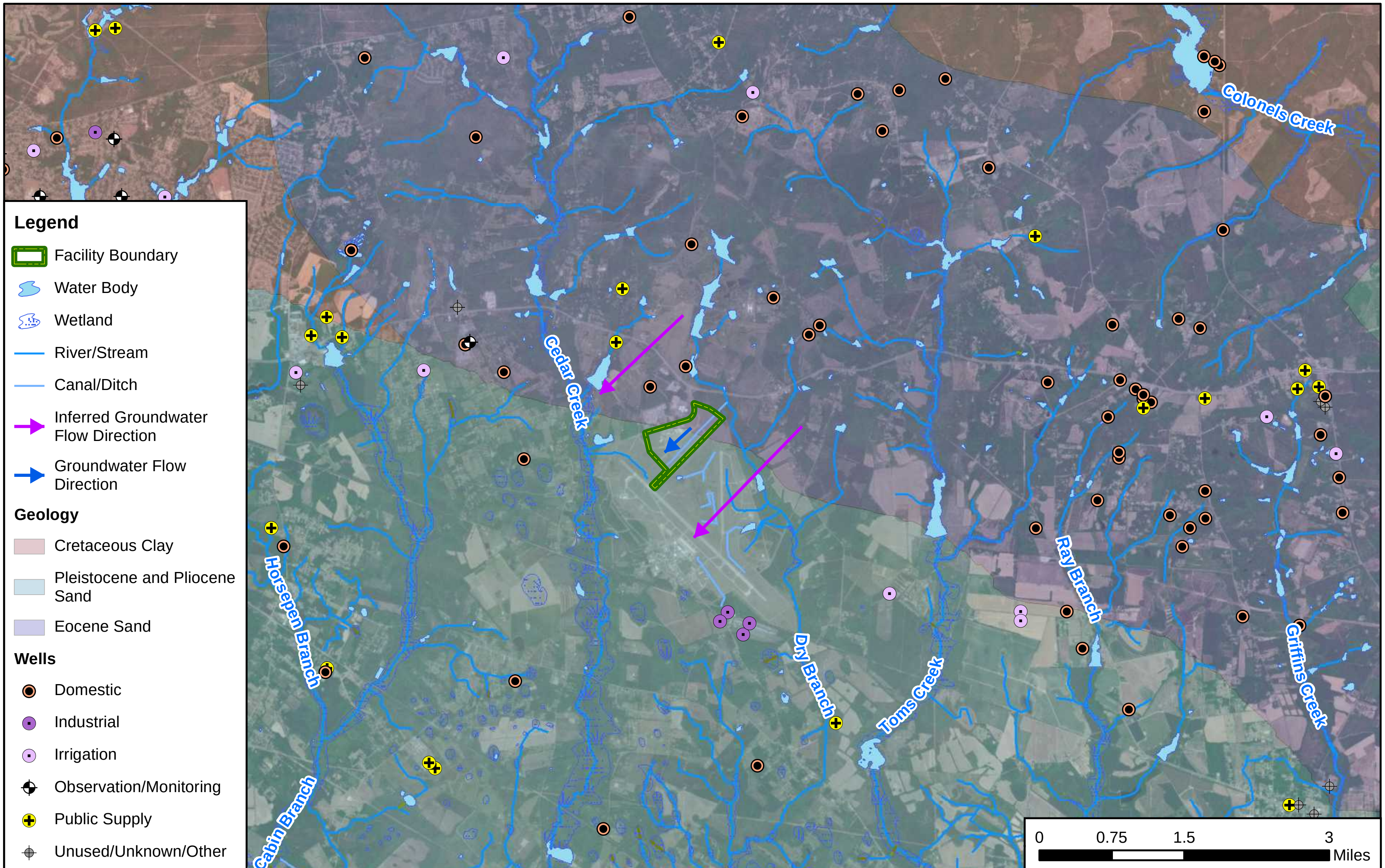
Facility Topography

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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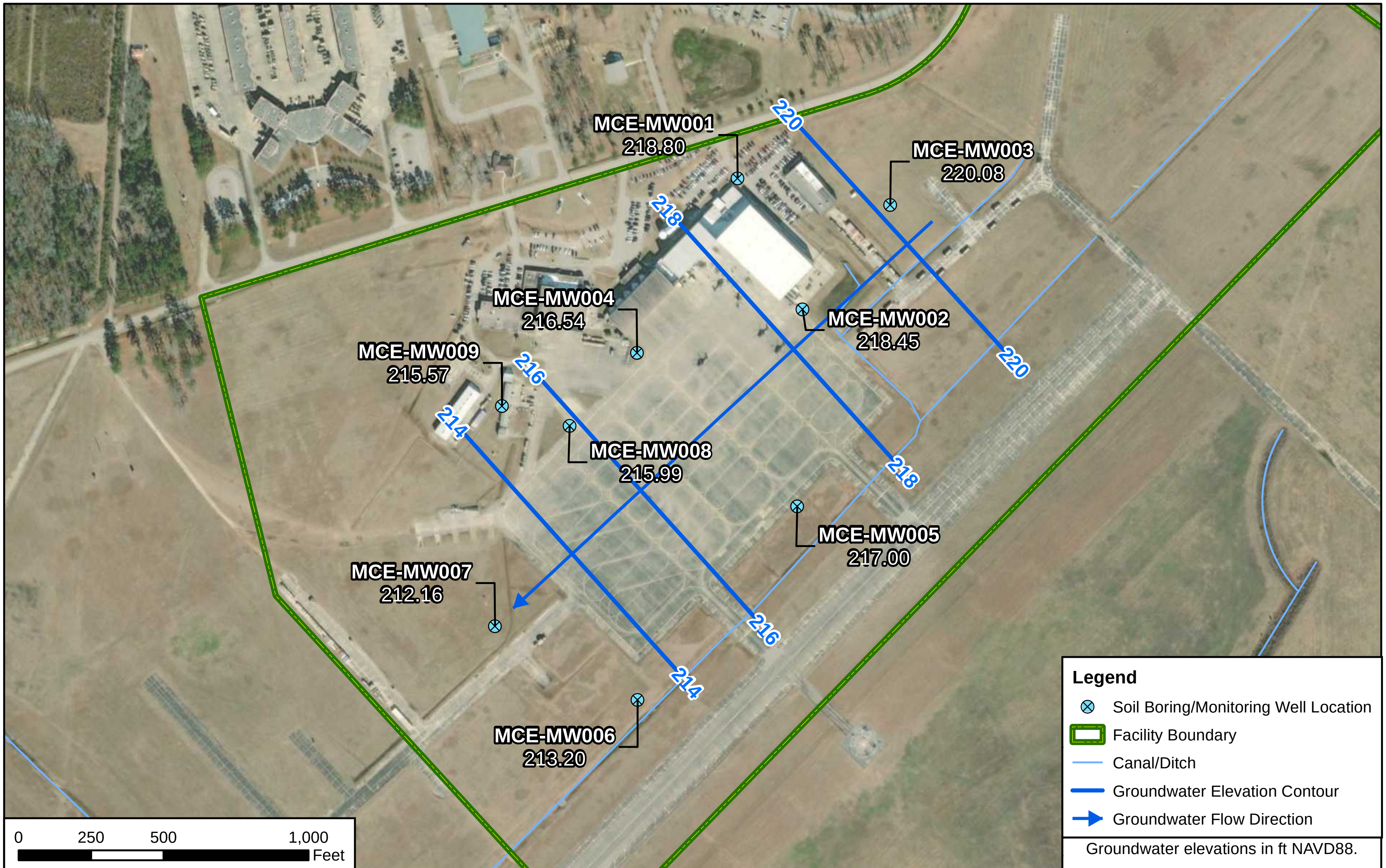
Groundwater Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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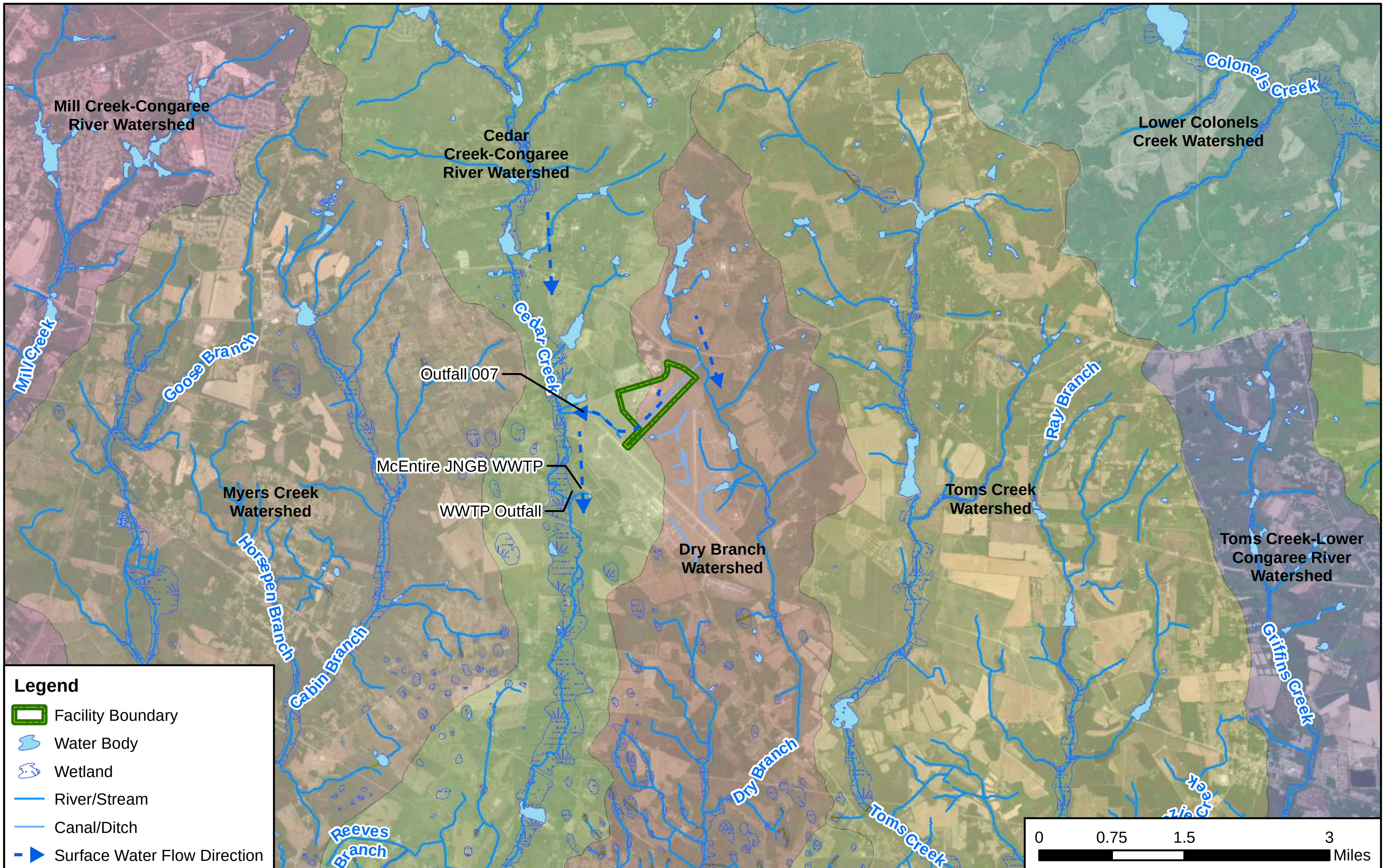
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/14/2022

Groundwater Elevations, March 2022

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

Surface Water Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, six potential release areas were identified at McEntire AASF and grouped into three AOIs (AECOM, 2020). The potential release areas and adjacent sources are shown on **Figure 3-1**.

3.1 AOI 1 Hangar 457

AOI 1 encompasses the areas associated with the AFFF fire suppression system within the hangar and utility room of Hangar 457. Four separate AFFF releases have occurred and are associated with AOI 1. One incident in 2013 occurred during a flow test of the fire suppression system; it resulted in AFFF released through an exterior door and onto the asphalt outside of the northern wall of the hangar, where it drained into the stormwater system. A second incident that occurred in 2013 involved a malfunction of one of the nozzle heads in the hangar suppression system, which released 5-gallons of AFFF that were subsequently squeegeed out of the hangar and into the stormwater trench drain southwest of the hangar doors. Sometime after 2013, two leaks have occurred in the suppression system that released AFFF to the utility room floor and through an exterior pipe, into the grassy area outside of the building at the north corner of Hangar 457. AFFF in the utility room drained to the sanitary sewer through a floor drain; it is possible that AFFF was also mopped up and discharged at the same location as the flow test.

The releases occurred both within and outside the hangar, and cleanup efforts also facilitated the movement of released AFFF into outside storm drains. The storm drains lead to a stormwater retention pond, located adjacent to the hangar, before being discharged to Outfall #007.

3.2 AOI 2 Helicopter Apron and Hangar 456

AOI 2 encompasses the helicopter apron and the area associated with the AFFF suppression system release from Hangar 456. A malfunction of the system in July 2015 caused a release of an unknown volume of AFFF from one of the nozzles in the hangar. The AFFF was pushed outside the hangar and was allowed to drain through the surrounding storm grates. This water would have drained to the stormwater swales, where it would have infiltrated or have been transported off-facility to Outfall #007. Released AFFF also got onto three of the helicopters and several tools, which were rinsed off on the wash rack. The wash rack water drains to the sanitary sewer.

Two emergencies on the helicopter apron, one fire sometime in the 1990’s and one fire in 2010, were responded to by AASF personnel with mobile Tri-Max™ 30 units and resulted in approximately 30-gallon and 5-gallon AFFF releases, respectively. Sheet flow from the helicopter apron travels toward the southeast, to the series of stormwater swales, where it can infiltrate or be discharged to Outfall #007.

3.3 AOI 3 Building 467 and Wash Rack

AOI 3 encompasses Building 467 and the wash rack. Building 467 is a shed-like structure that historically stored four Tri-Max™ 30 carts from the 1990s until 2010. AFFF filling and transfers to the Tri- Max™ 30 carts may have occurred in Building 467 and resulted in spills or leaks. The building does not have any floor drains, and surface drainage would have been captured by surrounding stormwater drains and the wash rack drain. The stormwater drains are connected to the series of swales, where the water will either infiltrate or discharge off-facility via Outfall #007.

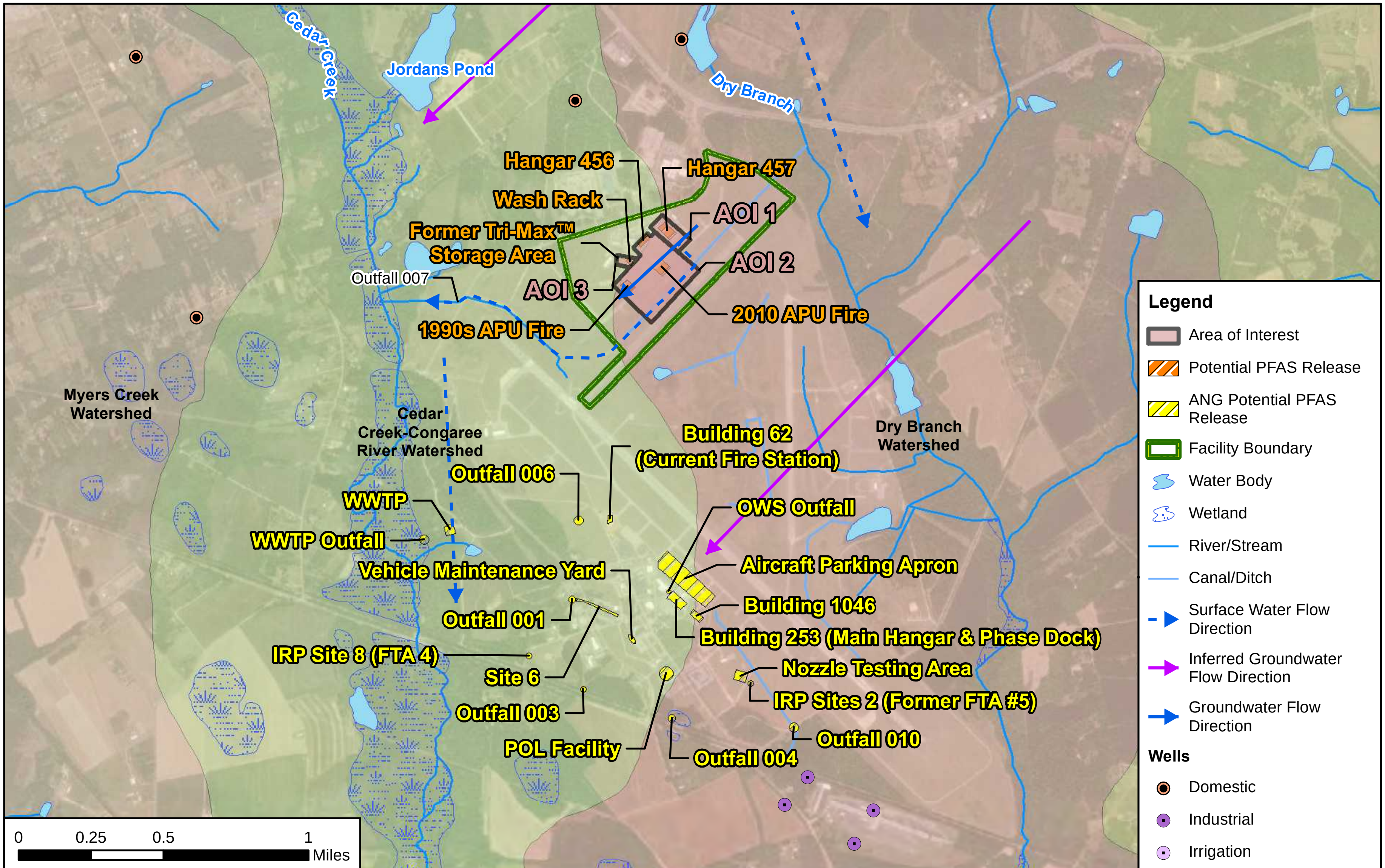
The wash rack was formerly used on an annual basis as an FTA from the 1990s to sometime in the 2000s, possibly as late as 2010. The releases occurred directly to the asphalt in the wash rack and drained through a storm grate before entering a diversion structure where the position of a valve determines the fate of the drain water. During the AFFF releases, the valve diverted the water to the sanitary sewer after passing through an oil-water separator. Sometime in July 2015, helicopters and tools located in Hangar 456 were washed in the wash rack after being covered in AFFF from a malfunction of the suppression system in the hangar. The AFFF rinsate was diverted to the sanitary sewer. Due to the AFFF releases at the wash rack, it is possible that residual PFAS on the asphalt in the wash rack were inadvertently transported with other drained water to the stormwater outfall, sanitary sewer, or a holding tank used to capture rinsate containing oil and grease. The sanitary sewer connects to the wastewater treatment plant at the ANG facility, and treated effluent is discharged to an unnamed channel that leads to Cedar Creek (Leidos, 2019).

3.4 Adjacent Sources

Off-facility, potential adjacent sources were identified at McEntire JNGB during the PA and are not associated with ARNG activities. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and will not be investigated as part of this SI.

3.4.1 McEntire JNGB

The McEntire AASF is an enclave of McEntire JNGB, with the remaining areas affiliated with the South Carolina ANG. The ANG Firefighting unit provides mutual aid to the AASF; however, AASF personnel confirmed that the ANG firefighters never applied AFFF on the AASF property. The ANG fire station is located to the northwest of the control tower and currently stores AFFF and AFFF-charged equipment. An SI for PFAS was performed at the McEntire JNGB in 2018. The SI investigated 17 potential release locations affiliated with ANG activities and identified exceedances of the screening criteria for PFOS/PFOA for groundwater or surface water at 11 potential release locations (Leidos, 2019). Those potential release locations are shown on **Figure 3-1**.



CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	8/31/2022	GIS BY	MS	8/31/2022
SCALE	1:31,680	CHK BY	BW	8/31/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/31/2022

N

Area of Interest

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 Problem Statement

ARNG will recommend an AOI for Remedial Investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based SLs. The SLs are presented in **Section 6.1** of this report.

4.2 Information Inputs

Primary information inputs included:

- The PA for McEntire AASF (AECOM, 2020);
- Analytical data collected as part of SI sampling efforts at McEntire JNGB (Leidos, 2019);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The scope of the SI was vertically bounded as follows: groundwater (48 feet bgs), soil from direct-push technology (DPT) borings (50 feet bgs), and surface soil (0 to 2 feet bgs). The temporal boundaries of the study were limited by seasonal conditions; the field work for the scope was performed in Spring 2022.

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2021).

4.5 Data Usability Assessment

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the SI QAPP Addendum (AECOM, 2021).

5. Site Inspection Activities

This section describes the environmental investigation and sampling activities that occurred as part of the SI. The SI sampling approach was based on the findings of the PA and implemented in accordance with the following approved documents:

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Final Preliminary Assessment Report, McEntire Army Aviation Support Facility, South Carolina* dated October 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, McEntire Army Aviation Support Facility, Eastover, South Carolina* dated November 2021 (AECOM, 2021); and
- *Final Site Safety and Health Plan, McEntire Army Aviation Support Facility, South Carolina* dated January 2022 (AECOM, 2022).

The SI field investigation activities were conducted from 7 to 25 March 2022 and consisted of utility clearance, direct push boring, soil sample collection, permanent monitoring well installation, groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021).

The following samples were collected during the SI and analyzed for a subset of 18 compounds by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15 to fulfill the project DQOs:

- Thirty-one (31) soil samples from nine boring locations and four hand auger locations;
- Nine groundwater samples from nine permanent monitoring wells;
- Seventeen (17) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, land survey data are provided in **Appendix B3**, a Nonconformance Corrective Action Report is provided in **Appendix B4**, and water well records are provided in **Appendix B5**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

In preparation for the SI field activities, project team members participated in Technical Project Planning (TPP) meetings, performed utility clearance, and sampled decontamination source water. Details for each of these activities are presented below.

5.1.1 Technical Project Planning

The US Army Corps of Engineers (USACE) TPP Process, Engineer Manual (EM) 200-1-2 (USACE, 2016) defines four phases to project planning: 1.) defining the project phase; 2.) determining data needs; 3.) developing data collection strategies; and 4.) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 13 September 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, South Carolina ARNG (SCARNG), USACE, and the South Carolina Department of Health and Environmental Control (SCDHEC). Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021).

A TPP Meeting 3 will be held (date to be determined) after the field event to discuss the results of the SI. Meeting minutes for TPP 3 will be included in **Appendix D** in a later version of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM placed a ticket with South Carolina 811, the local utility clearance provider, to notify them of intrusive work on 28 February 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 28 January 2022 with input from the AECOM field team and McEntire AASF facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

The potable water source at McEntire AASF was sampled on 13 January 2022 to assess usability for decontamination of drilling equipment. Results of the sample collected from a spigot located between Buildings 467 and 468 (MCE-PW-01) confirmed this source to be acceptable for use in this investigation at the time of sampling; therefore, it was used throughout the field activities. Specifically, the samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Borings were installed in grass areas where applicable, to avoid disturbing concrete or asphalt surfaces. Soil samples were collected via hand auger and DPT, in accordance with the SI QAPP Addendum (AECOM, 2021). A GeoProbe® 7822 dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and depths are provided **Table 5-2**.

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample at the 13-15 feet bgs interval between the surface and the groundwater table. At hand auger locations, one surface soil sample (0 to 2 feet bgs) was collected.

The soil cores were continuously logged for lithological descriptions by an AECOM field geologist using the Unified Soil Classification System (USCS). A photoionization detector (PID) was used to screen the breathing zone during boring activities as part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook (i.e., composition notebook). Depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

During the SI, poorly graded fine-grained sand was the dominant lithology of the unconsolidated sediments below McEntire AASF. Substantial quantities of silt and clay were noted, specifically, extensive layers of silty sand and low plasticity lean clay were also observed in the borings with thicknesses ranging from 1 foot to 20 feet. Many of the logs also reported varying percentages of gravel included in the sand packages. These results and facility observations are consistent with the reported depositional environment of the region that is characterized by the Duplin Formation, estuarine and fluvial deposits of the Congaree River Valley terrace complex, surficial alluvial deposits near Cedar Creek and Dry Branch, and lastly, the Carolina bays. The borings were completed at depths between 40 and 50 feet bgs.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/MS duplicates (MSDs) were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, equipment rinsate blanks were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

All soil borings shallower than 5 feet in depth were backfilled with native material. Soil borings deeper than 5 feet in depth were converted to permanent monitoring wells, as described in **Section 5.3.**

5.3 Monitoring Well Installation and Groundwater Sampling

During the SI, nine permanent monitoring wells were installed within, downgradient, or upgradient of potential source areas. The locations of the wells are shown on **Figure 5-1**.

Following soil sampling, soil boring boreholes were overdrilled using hollow stem auger drilling methods for monitoring wells. Nine 2-inch diameter monitoring wells were installed and constructed with Schedule 40 polyvinyl chloride, flush-threaded 10-foot sections of riser, 0.010-inch slotted well screen, and a threaded bottom cap. A filter pack of #2 silica sand was installed in the annulus around the well screen to a minimum of 2-foot above the well screen. A 2-foot-thick bentonite seal was placed above the filter sand and hydrated with distilled water. Bentonite grout was placed in the well annulus from the top of the bentonite seal to ground surface. The bentonite grout was allowed to set for 24 hours prior to well completion. All monitoring wells were completed with flush mount well vaults. Each well was sealed with an expansion plug cap and lock and identified with a monitoring well identification plate. The screen interval of each of the groundwater monitoring wells is provided in **Table 5-2**.

Monitoring well MCE-003 was damaged in the process of installation. The monitoring well was installed at a total depth of 48 ft bgs, however upon gauging the total depth of the monitoring well was determined to be approximately 42 ft bgs. The drilling subcontractor had repeated issues with the well screen and/or casing seizing within the auger flights during removal of the tooling. This likely damaged the well screen allowing sand to infiltrate the well. The monitoring well was subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021) and South Carolina Well Standards and Regulations, R.61-71.H-I with neat cement grout. Upon completion of well abandonment, the ground surface was patched to match existing surrounding conditions. Monitoring well MCE-003 was then reinstalled approximately 7 ft to the southeast of the original boring.

Development and sampling of wells was completed in accordance with the SI QAPP Addendum (AECOM, 2021). The newly installed monitoring wells were developed no sooner than 24 hours following installation by pumping and surging using a variable speed submersible pump. Samples were collected no sooner than 24 hours following development via low-flow sampling methods using a QED Sample Pro® bladder pump with disposable PFAS-free, HDPE tubing. New tubing was used at each well and the pumps were decontaminated between each well. The wells were purged at a rate determined in the field to reduce draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured and monitored for stabilization using a water quality meter and recorded on the field sampling form (**Appendix B2**). Water levels were measured to the nearest 0.01 inch and recorded. Additionally, a subsample of each groundwater sample was collected in a separate container and a shaker test was completed to identify if there was any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 25 March 2022. Groundwater elevation measurements were collected from the nine new monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**. Depths to water measured in March 2022 during the SI ranged from 34.31 to 40.90 feet bgs, and the groundwater flow direction at the facility is to the southwest, consistent with the findings from previous investigations at the AASF.

5.5 Surveying

The northern side of each well casing was surveyed by South Carolina-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021). Survey data from the newly installed wells on the facility were collected on 24 March 2022 in the applicable Universal Transverse Mercator zone projection with North American Datum 83 2011 (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B3**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Non-hazardous solid IDW (i.e., soil cuttings) generated during SI activities was containerized in properly labeled 55-gallon drums. The IDW was stored at a location designated by the McEntire AASF Environmental Manager and SCARNG. ARNG will manage disposal of the solid IDW and will coordinate with SCDHEC to ensure proper disposal in accordance with state requirements and the Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018)

Liquid IDW generated during SI activities (i.e., purge water and decontamination fluids) was containerized in properly labeled 55-gallon drums. The liquid IDW will not be sampled and will assume the PFAS characteristics of the associated groundwater samples collected from the source locations. The containerized IDW will be temporarily stored onsite at a location designated by the McEntire AASF Environmental Manager and SCARNG until the analytical results for the associated groundwater samples are available. ARNG will manage and dispose of the liquid IDW under a separate contract in accordance with SOP No. 042A for Treating Liquid Investigation-Derived Material (purge water, drilling water, and decontamination fluids) (EA Engineering, Science, and Technology, Inc., 2021). ARNG will further coordinate with the SCDHEC to ensure proper disposal is in accordance with state requirements and the Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities were disposed of at a licensed solid waste landfill.

5.7 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 Deviations from SI QAPP Addendum

One deviation from the SI QAPP Addendum was identified during review of the field documentation. The deviation is noted below and is documented in Nonconformance and Corrective Action Report (**Appendix B4**):

- Due to a laboratory error, the grain size samples collected at locations AOI01-01, AOI02-04, and AOI03-01 could not be analyzed. This deviation was documented in a nonconformance and corrective action reported provided in **Appendix B4**

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, McEntire AASF, South Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-0-2	3/16/2022 8:40	0 - 2	x			
AOI01-01-SB-0-2-D	3/16/2022 8:40	0 - 2	x			FD
AOI01-01-SB-13-15	3/16/2022 9:15	13 - 15	x			
AOI01-01-SB-42-44	3/16/2022 9:55	42 - 44	x			
AOI01-02-SB-0-2	3/22/2022 9:25	0 - 2	x	x	x	
AOI01-02-SB-0-2-D	3/22/2022 9:25	0 - 2		x		FD
AOI01-02-SB-13-15	3/22/2022 10:00	13 - 15	x			
AOI01-02-SB-38-40	3/22/2022 10:40	38 - 40	x			
AOI01-02-SB-38-40-MS	3/22/2022 10:40	38 - 40	x			MS
AOI01-02-SB-38-40-MSD	3/22/2022 10:40	38 - 40	x			MSD
AOI01-03-SB-0-2	3/17/2022 16:05	0 - 2	x			
AOI01-03-SB-13-15	3/17/2022 16:45	13 - 15	x			
AOI01-03-SB-38-40	3/17/2022 17:20	38 - 40	x			
AOI01-04-SB-0-2	3/7/2022 13:45	0 - 2	x			
AOI02-01-SB-0-2	3/15/2022 8:30	0 - 2	x			
AOI02-01-SB-13-15	3/15/2022 8:50	13 - 15	x			
AOI02-01-SB-37-39	3/15/2022 9:35	37 - 39	x			
AOI02-02-SB-0-2	3/21/2022 13:40	0 - 2	x	x	x	
AOI02-02-SB-0-2-MS	3/21/2022 13:40	0 - 2		x		MS
AOI02-02-SB-0-2-MSD	3/21/2022 13:40	0 - 2		x		MSD
AOI02-02-SB-13-15	3/21/2022 14:20	13 - 15	x			
AOI02-02-SB-13-15-D	3/21/2022 14:20	13 - 15	x			FD
AOI02-02-SB-37-39	3/21/2022 14:50	37 - 39	x			
AOI02-03-SB-0-2	3/10/2022 8:15	0 - 2	x			
AOI02-03-SB-13-15	3/10/2022 8:45	13 - 15	x			
AOI02-03-SB-31-33	3/10/2022 9:20	31 - 33	x			
AOI02-04-SB-0-2	3/9/2022 8:50	0 - 2	x	x	x	
AOI02-04-SB-13-15	3/9/2022 9:15	13 - 15	x			
AOI02-04-SB-36-38	3/9/2022 10:10	36 - 38	x			
AOI02-05-SB-0-2	3/7/2022 14:55	0 - 2	x			
AOI02-05-SB-0-2-D	3/7/2022 14:55	0 - 2	x			FD
AOI02-06-SB-0-2	3/7/2022 15:30	0 - 2	x			
AOI02-07-SB-0-2	3/7/2022 15:55	0 - 2	x			
AOI03-01-SB-0-2	3/11/2022 8:20	0 - 2	x			
AOI03-01-SB-13-15	3/11/2022 9:00	13 - 15	x			
AOI03-01-SB-35-37	3/11/2022 9:45	35 - 37	x			
AOI03-02-SB-0-2	3/7/2022 12:50	0 - 2	x			
AOI03-02-SB-0-2-MS	3/7/2022 12:50	0 - 2	x			MS
AOI03-02-SB-0-2-MSD	3/7/2022 12:50	0 - 2	x			MSD
AOI03-02-SB-13-15	3/7/2022 13:30	13 - 15	x			
AOI03-02-SB-36-38	3/7/2022 14:00	36 - 38	x			
AOI03-02-SB-36-38-D	3/7/2022 14:00	36 - 38	x			FD

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, McEntire AASF, South Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Groundwater Samples						
MCE-MW001-032222	3/22/2022 15:45	NA	x			
MCE-MW002-032522	3/25/2022 16:40	NA	x			
MCE-MW003-032522	3/25/2022 19:25	NA	x			
MCE-MW003-032522-MS	3/25/2022 19:25	NA	x			MS
MCE-MW003-032522-MSD	3/25/2022 19:25	NA	x			MSD
MCE-MW004-031822	3/18/2022 13:00	NA	x			
MCE-MW005-032422	3/24/2022 16:30	NA	x			
MCE-MW005-032422-D	3/24/2022 16:30	NA	x			FD
MCE-MW006-031822	3/18/2022 10:00	NA	x			
MCE-MW007-031722	3/17/2022 15:35	NA	x			
MCE-MW008-031722	3/17/2022 17:15	NA	x			
MCE-MW009-031722	3/17/2022 13:35	NA	x			
Quality Control Samples						
MCE-PW-01	1/13/2022 10:40	NA	x			decontamination water sample
MCE-FRB-01	3/22/2022 12:00					
MCE-ERB-01	3/18/2022 14:45	NA	x			hand auger
MCE-ERB-02	3/22/2022 12:15	NA	x			drill-rod shoe
MCE-ERB-03	3/18/2022 13:20	NA	x			bladder pump
MCE-ERB-04	3/24/2022 10:00	NA	x			pressure washer wand from driller decontamination system

Notes:
bgs = below ground surface
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
NA = not applicable
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Permanent Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, McEntire AASF, South Carolina

Area of Interest	Boring Location	Well ID	Soil Boring Depth (feet bgs)	Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	MCE-MW001	50	38 - 48[1]	258.12	258.37	39.32	39.57	218.80
	AOI01-02	MCE-MW002	50	38 - 48[1]	256.88	257.17	38.43	38.72	218.45
	AOI01-03	MCE-MW003	50	38 - 48[1]	259.06	259.24	38.98	39.15	220.08
2	AOI02-01	MCE-MW004	45	34 - 44[1]	256.10	256.18	39.56	39.65	216.54
	AOI02-02	MCE-MW005	45	34 - 44[1]	251.17	251.32	34.17	34.31	217.00
	AOI02-03	MCE-MW006	40	29 - 39[1]	251.15	251.40	37.95	38.21	213.20
	AOI02-04	MCE-MW007	45	34 - 44[1]	251.02	251.29	38.86	39.13	212.16
3	AOI03-01	MCE-MW008	45	35 - 45	255.95	256.14	39.96	40.16	215.99
	AOI03-02	MCE-MW009	45	35 - 45	256.20	256.47	40.63	40.90	215.57

Notes:
[1] Permanent well screen set above total depth to capture groundwater interface

bgs = below ground surface
btoc = below top of casing
NAVD88 = North American Vertical Datum 1988

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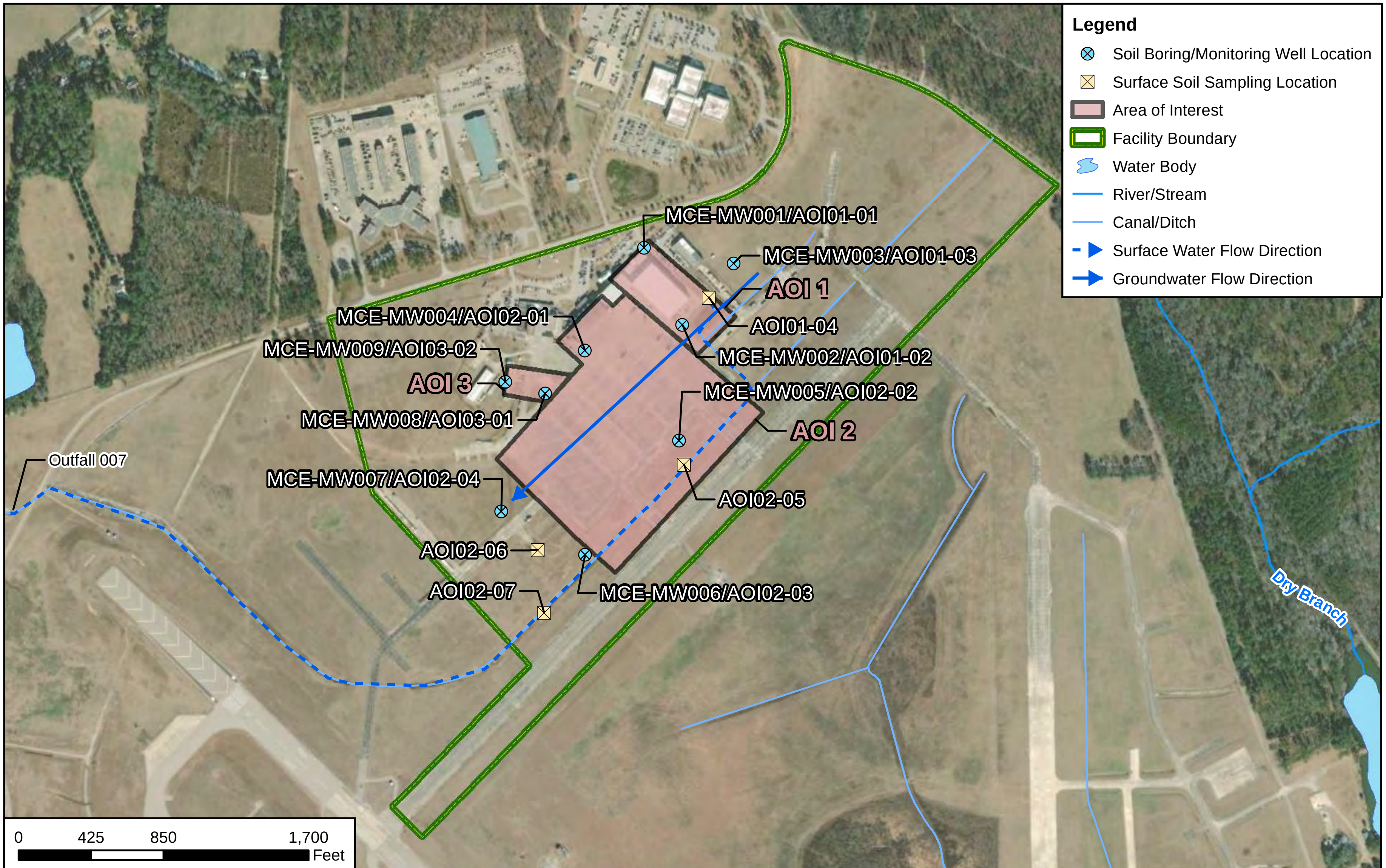

CLIENT	ARNG				Site Inspection Sample Locations
PROJECT	Site Inspection at McEntire AASF, SC				AECOM 12420 Milestone Center Drive Germantown, MD 20876
REVISED	10/12/2022	GIS BY	MS	10/12/2022	Figure 5-1
SCALE	1:10,200	CHK BY	BW	10/12/2022	
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022	

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.5**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 6 July 2022 (Assistant Secretary of Defense, 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1** below.

Table 6-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter
a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.
b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS..

The data in the subsequent sections are compared to the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the facility: the residential scenario is applied to surface soil results (0 to 2 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 Soil Physicochemical Analyses

To provide basic soil parameter information, soil samples were analyzed for TOC and pH , which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC and pH sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy, 2006; Guelfo and Higgins, 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC, 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Hangar 457. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Samples were collected from the surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (between 38 and 44 feet bgs) from boring locations AOI01-01 through AOI01-03. An additional surface soil sample was also collected from boring location AOI01-04.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil, at concentrations less than 1.18 micrograms per kilogram (µg/kg); all detected concentrations were below their SLs in surface soil by at least an order of magnitude. No relevant compounds were detected in shallow subsurface soil or deep subsurface soil.

6.3.2 AOI 1 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from permanent monitoring wells MCE-MW001 through MCE-MW003. PFOS and PFHxS exceeded their SLs at monitoring well MCE-MW002. PFOS was detected above the SL of 4 nanograms per liter (ng/L), at a concentration of 47.3 ng/L, and PFHxS was detected above the SL of 39 ng/L, at a concentration of 63.2 ng/L. PFOA, PFNA, and PFBS were also detected in groundwater, below their SLs.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil, below their SLs. PFOS and PFHxS were detected in groundwater, at concentrations above their

SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Helicopter Apron and Hangar 456. The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Samples were collected from the surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (between 31 and 39 feet bgs) from boring locations AOI02-01 through AOI02-04. Surface soil samples were also collected from boring locations AOI02-05 through AOI02-07.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil, at concentrations below the SLs. PFOS was the most frequently and highest detected compound, with a maximum concentration of 6.95 µg/kg.

PFOS, PFHxS, and PFBS were detected in shallow subsurface soil at concentrations below the SLs, at maximum concentrations of 22.8 µg/kg, 0.792 µg/kg J (estimated), and 0.034 µg/kg J, respectively. In deep subsurface soil, PFOS, PFOA, PFHxS, and PFBS were detected at maximum concentrations of 6.48 µg/kg, 0.310 µg/kg J, 5.00 µg/kg, and 0.705 J µg/kg, respectively. All maximum concentrations in the shallow and deep subsurface soil were encountered at boring location AOI02-02, and no relevant compounds in subsurface soil were detected in boring locations AOI02-03 and AOI02-04.

6.4.2 AOI 2 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from permanent monitoring wells MCE-MW004 through MCE-MW007. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected above their SLs in groundwater at the following concentrations:

- PFOA was detected above the SL of 6 ng/L, at concentrations ranging from 22.1 to 392 ng/L.
- PFOS was detected above the SL of 4 ng/L, at concentrations ranging from 6.14 to 9,580 ng/L.
- PFHxS was detected above the SL of 39 ng/L, at concentrations ranging from 40.7 to 7,900 ng/L.
- PFNA was detected above the SL of 6 ng/L at MCE-MW005, with a concentration of 6.72 ng/L.
- PFBS was detected above the SL of 601 ng/L at MCE-MW005, with concentrations 1,040 ng/L and 1,150 ng/L (duplicate).

At least one SL exceedance was measured in groundwater at all monitoring wells, and the maximum concentrations were also encountered at monitoring well MCE-MW005 (corresponding with boring location AOI02-02).

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil below their SLs. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in groundwater, at concentrations above their SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 2 is warranted.

6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 3: Building 467 and Wash Rack. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.5.1 AOI 3 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Samples were collected from the surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (between 35 and 38 feet bgs) from boring locations AOI03-01 and AOI03-02.

PFOS was detected above the SL of 13 µg/kg in surface soil at AOI03-02, with a concentration of 20.2 µg/kg. PFOA, PFHxS, PFNA, and PFBS were detected at concentrations less than 0.596 J µg/kg and were below their SLs in surface soil by at least an order of magnitude.

PFOA, PFOS, PFHxS, and PFBS were detected in shallow subsurface soil, at concentrations less than 4.59 µg/kg, and were below their SLs by at least an order of magnitude. PFNA was not detected in shallow subsurface soil. AOI03-02 had the highest concentration detected in the shallow subsurface soil (PFOS at 4.59 µg/kg), where PFOS was also detected above the SL of 13 µg/kg in surface soil.

PFOA, PFOS, PFHxS, and PFBS were detected in deep subsurface soil, at concentrations less than 4.58 J µg/kg. PFNA was not detected in shallow subsurface soil.

6.5.2 AOI 3 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from permanent monitoring wells MCE-MW008 and MCE-MW009. PFOA, PFOS, and PFHxS were detected above their SLs in groundwater at both wells, at the following concentrations:

- PFOA was detected above the SL of 6 ng/L, at concentrations 221 ng/L and 70.3 ng/L.
- PFOS was detected above the SL of 4 ng/L, at concentrations 319 ng/L and 166 ng/L.
- PFHxS was detected above the SL of 39 ng/L, at concentrations 534 ng/L and 247 ng/L.

PFNA was not detected in groundwater, and PFBS was detected below the SL of 601 ng/L, at a maximum concentration of 34.2 ng/L. All maximum concentrations in groundwater were encountered at MCE-MW008.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOS was detected in soil above the SL. PFOA, PFOS, and PFHxS were detected in groundwater, at concentrations above their respective SLs. Based on the exceedances of the SLs in soil and groundwater, further evaluation at AOI 3 is warranted.

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Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, McEntire AASF

	Area of Interest	AOI01										AOI02							
	Sample ID	AOI01-01-SB-0-2		AOI01-01-SB-0-2-D		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI02-01-SB-0-2		AOI02-02-SB-0-2		AOI02-03-SB-0-2		AOI02-04-SB-0-2	
	Sample Date	03/16/2022		03/16/2022		03/22/2022		03/17/2022		03/07/2022		03/15/2022		03/21/2022		03/10/2022		03/09/2022	
	Depth	0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																			
PFBS	1900	ND	U	ND	U	0.023	J	ND	U	ND	U	0.027	J	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	0.376	J	0.065	J	0.096	J	0.824	J	0.422	J	0.043	J	0.037	J
PFNA	19	0.597	J	0.319	J	0.045	J	ND	U	0.022	J	ND	U	ND	U	ND	U	ND	U
PFOA	19	0.365	J	0.237	J	0.140	J	0.134	J	ND	U	0.397	J	ND	U	ND	U	ND	U
PFOS	13	0.095	J	ND	UJ	0.801	J	0.133	J	1.18		1.49		5.65		ND	U	0.117	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, McEntire AASF

	Area of Interest	AOI02								AOI03			
	Sample ID	AOI02-05-SB-0-2		AOI02-05-SB-0-2-D		AOI02-06-SB-0-2		AOI02-07-SB-0-2		AOI03-01-SB-0-2		AOI03-02-SB-0-2	
	Sample Date	03/07/2022		03/07/2022		03/07/2022		03/07/2022		03/11/2022		03/07/2022	
	Depth	0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)													
PFBS	1900	ND	UJ	0.036	J	ND	U	ND	U	ND	U	0.045	J
PFHxS	130	0.349	J	0.444	J	0.056	J	0.300	J	0.051	J	0.596	J
PFNA	19	ND	U	ND	U	0.035	J	0.052	J	ND	U	0.137	J
PFOA	19	ND	U	ND	U	0.120	J	ND	U	0.131	J	0.256	J
PFOS	13	2.36		2.61		0.877	J	6.95		0.839	J	20.2	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, McEntire AASF

	Area of Interest	AOI01						AOI02										AOI03			
	Sample ID	AOI01-01-SB-13-15		AOI01-02-SB-13-15		AOI01-03-SB-13-15		AOI02-01-SB-13-15		AOI02-02-SB-13-15		AOI02-02-SB-13-15-D		AOI02-03-SB-13-15		AOI02-04-SB-13-15		AOI03-01-SB-13-15		AOI03-02-SB-13-15	
	Sample Date	03/16/2022		03/22/2022		03/17/2022		03/15/2022		03/21/2022		03/21/2022		03/10/2022		03/09/2022		03/11/2022		03/07/2022	
	Depth	13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	25000	ND	U	ND	U	ND	U	ND	U	0.033	J	0.034	J	ND	U	ND	U	0.032	J	0.678	J
PFHxS	1600	ND	U	ND	U	ND	U	0.136	J	0.730	J	0.792	J	ND	U	ND	U	0.103	J	2.56	
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.868	J
PFOS	160	ND	U	ND	U	ND	U	ND	U	20.4		22.8		ND	U	ND	U	ND	U	4.59	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, McEntire AASF

Area of Interest	AOI01						AOI02								AOI03					
Sample ID	AOI01-01-SB-42-44		AOI01-02-SB-38-40		AOI01-03-SB-38-40		AOI02-01-SB-37-39		AOI02-02-SB-37-39		AOI02-03-SB-31-33		AOI02-04-SB-36-38		AOI03-01-SB-35-37		AOI03-02-SB-36-38		AOI03-02-SB-36-38-D	
Sample Date	03/16/2022		03/22/2022		03/17/2022		03/15/2022		03/21/2022		03/10/2022		03/09/2022		03/11/2022		03/07/2022		03/07/2022	
Depth	42-44 ft		38-40 ft		38-40 ft		37-39 ft		37-39 ft		31-33 ft		36-38 ft		35-37 ft		36-38 ft		36-38 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																				
PFBS	ND	U	ND	U	ND	U	0.262	J	0.705	J	ND	U	ND	U	0.047	J	0.508	J	1.03	J
PFHxS	ND	U	ND	U	ND	U	1.14		5.00		ND	U	ND	U	0.247	J	1.82	J	4.58	J
PFNA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U	0.310	J	ND	U	ND	U	ND	U	ND	UJ	0.154	J
PFOS	ND	U	ND	U	ND	U	1.13		6.48		ND	U	ND	U	0.600	J	0.497	J	1.04	J

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL
UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
µg/kg	micrograms per kilogram

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, McEntire AASF

	Area of Interest	AOI01						AOI02										AOI03			
	Sample ID	MCE-MW001-032222		MCE-MW002-032522		MCE-MW003-032522		MCE-MW004-031822		MCE-MW005-032422		MCE-MW005-032422-D		MCE-MW006-031822		MCE-MW007-031722		MCE-MW008-031722		MCE-MW009-031722	
	Sample Date	03/22/2022		03/25/2022		03/25/2022		03/18/2022		03/24/2022		03/24/2022		03/18/2022		03/17/2022		03/17/2022		03/17/2022	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																					
PFBS	601	0.728	J	8.96		ND	U	69.4		1040		1150		4.36		1.73	J	34.2		9.18	
PFHxS	39	ND	U	63.2		1.70	J	464		7070		7900		40.7		14.4		534		247	
PFNA	6	1.81	J	ND	U	ND	U	1.35	J	5.75		6.72		ND	U	ND	U	ND	U	ND	U
PFOA	6	0.912	J	5.40		ND	U	22.1		357		392		2.23	J	2.28	J	221		70.3	
PFOS	4	0.876	J	47.3		2.30	J	587		9090		9580		6.20		6.14		319		166	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022 Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MCE	McEntire
MW	monitoring well
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

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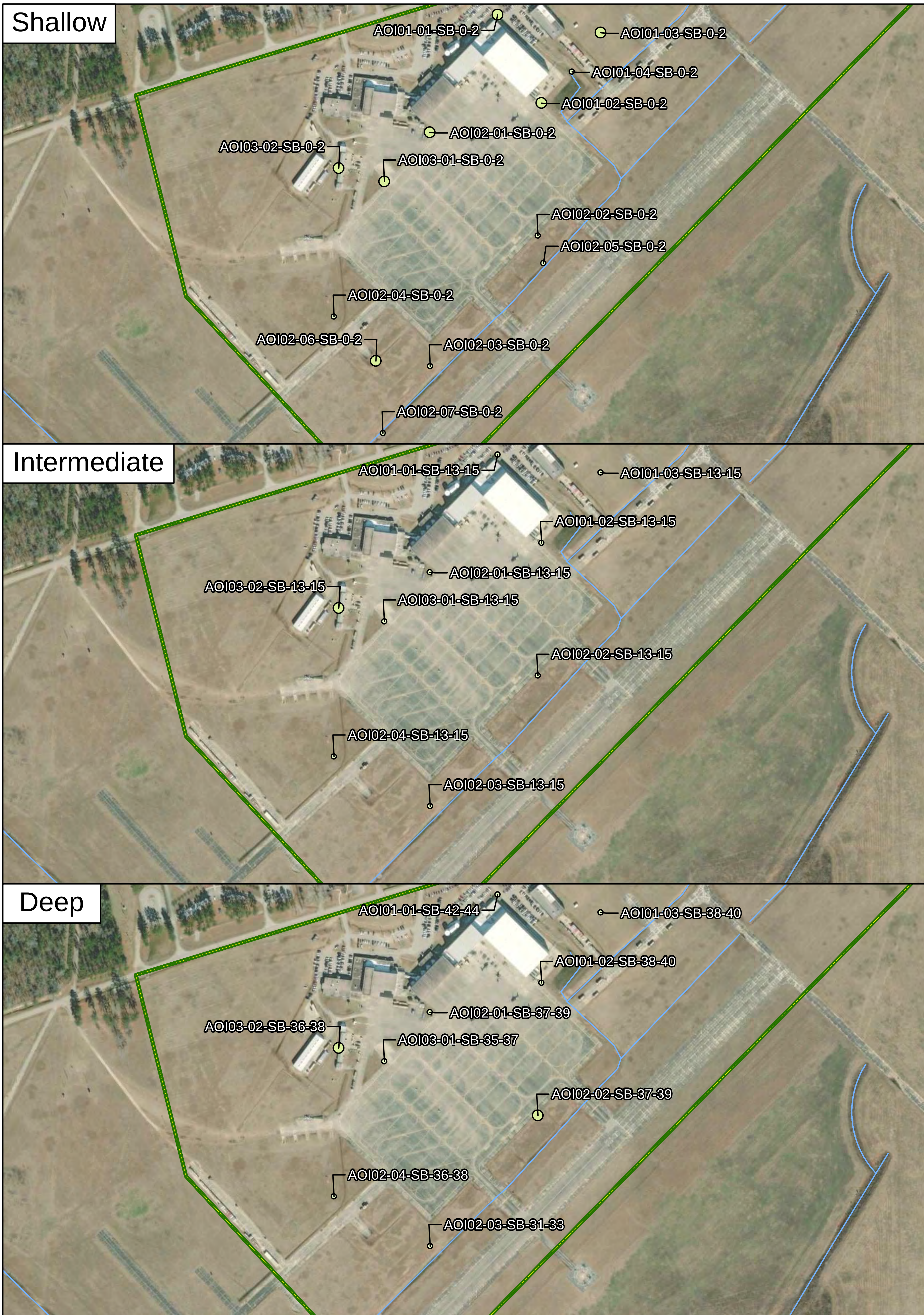

Facility Boundary
Canal/Ditch

PFOA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

PFOA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/12/2022	GIS BY	MS	10/12/2022
SCALE	1:6,000	CHK BY	BW	10/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022

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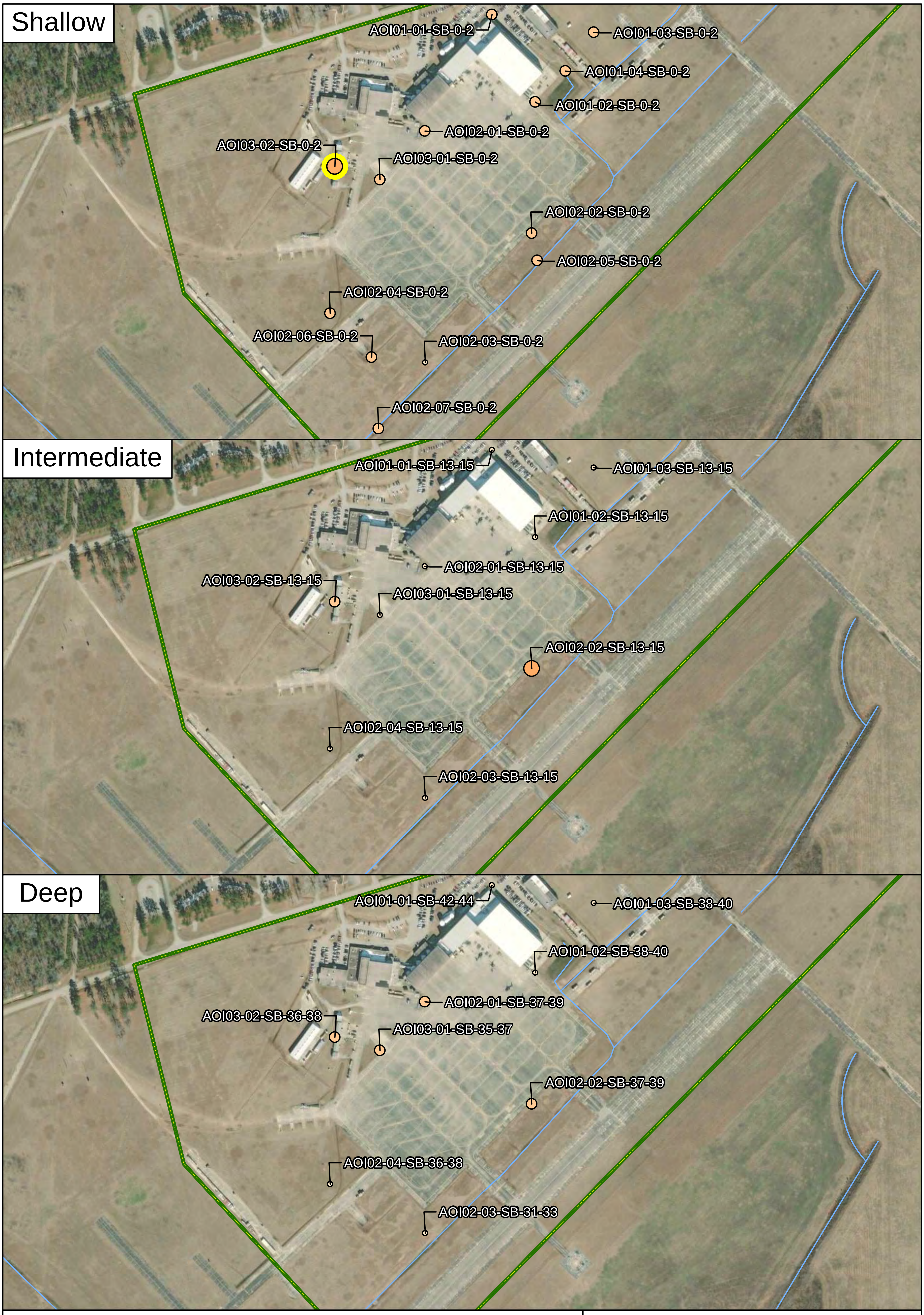
Figure 6-1



Facility Boundary
Canal/Ditch

PFOS Results (µg/Kg)
- ND
- >ND - 13
- >13 - 160
- >160 - 1,600
- >1,600

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

PFOS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/12/2022	GIS BY	MS	10/12/2022
SCALE	1:6,000	CHK BY	BW	10/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022

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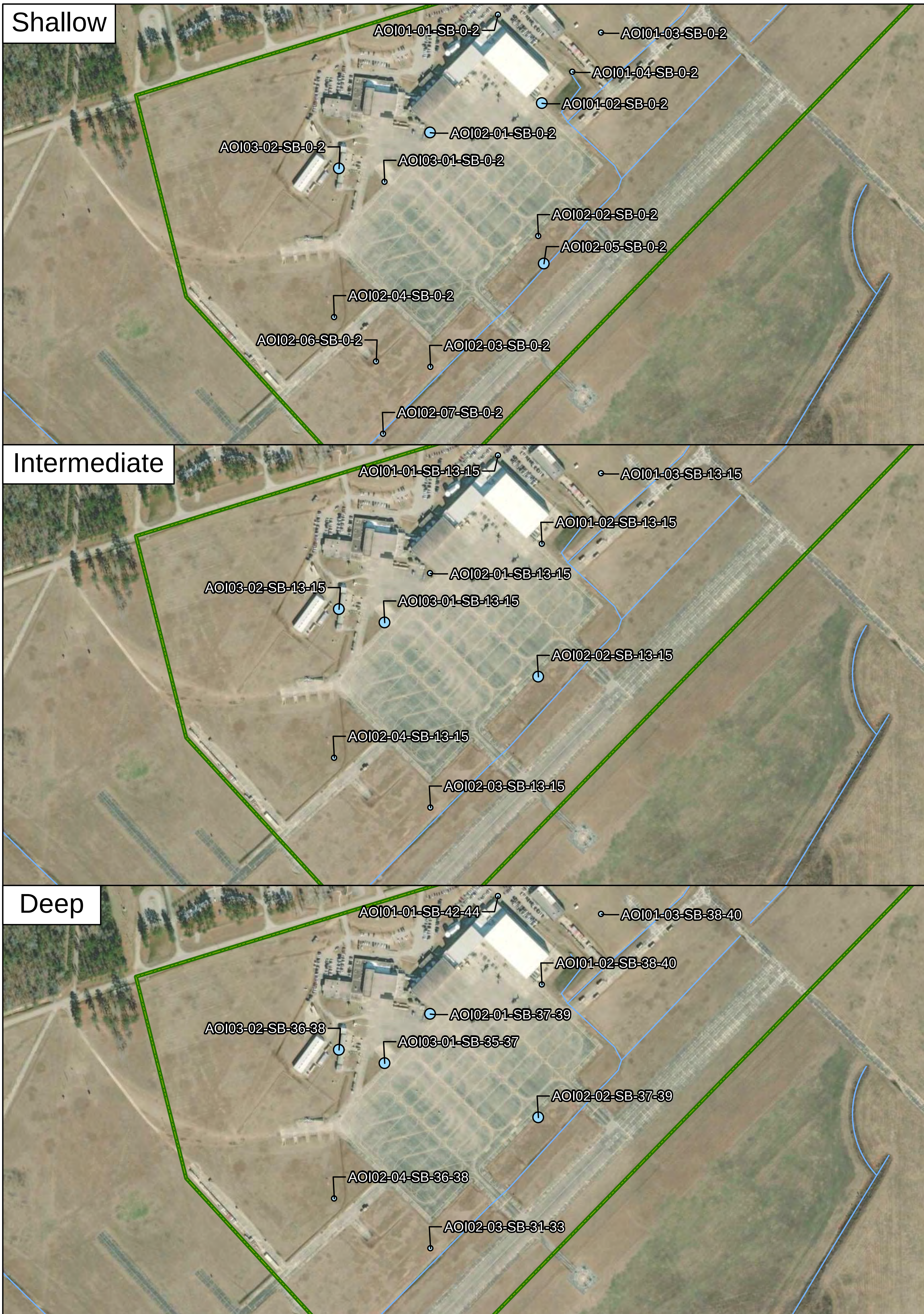
Figure 6-2



Facility Boundary
Canal/Ditch

PFBS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

PFBS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/12/2022	GIS BY	MS	10/12/2022
SCALE	1:6,000	CHK BY	BW	10/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022

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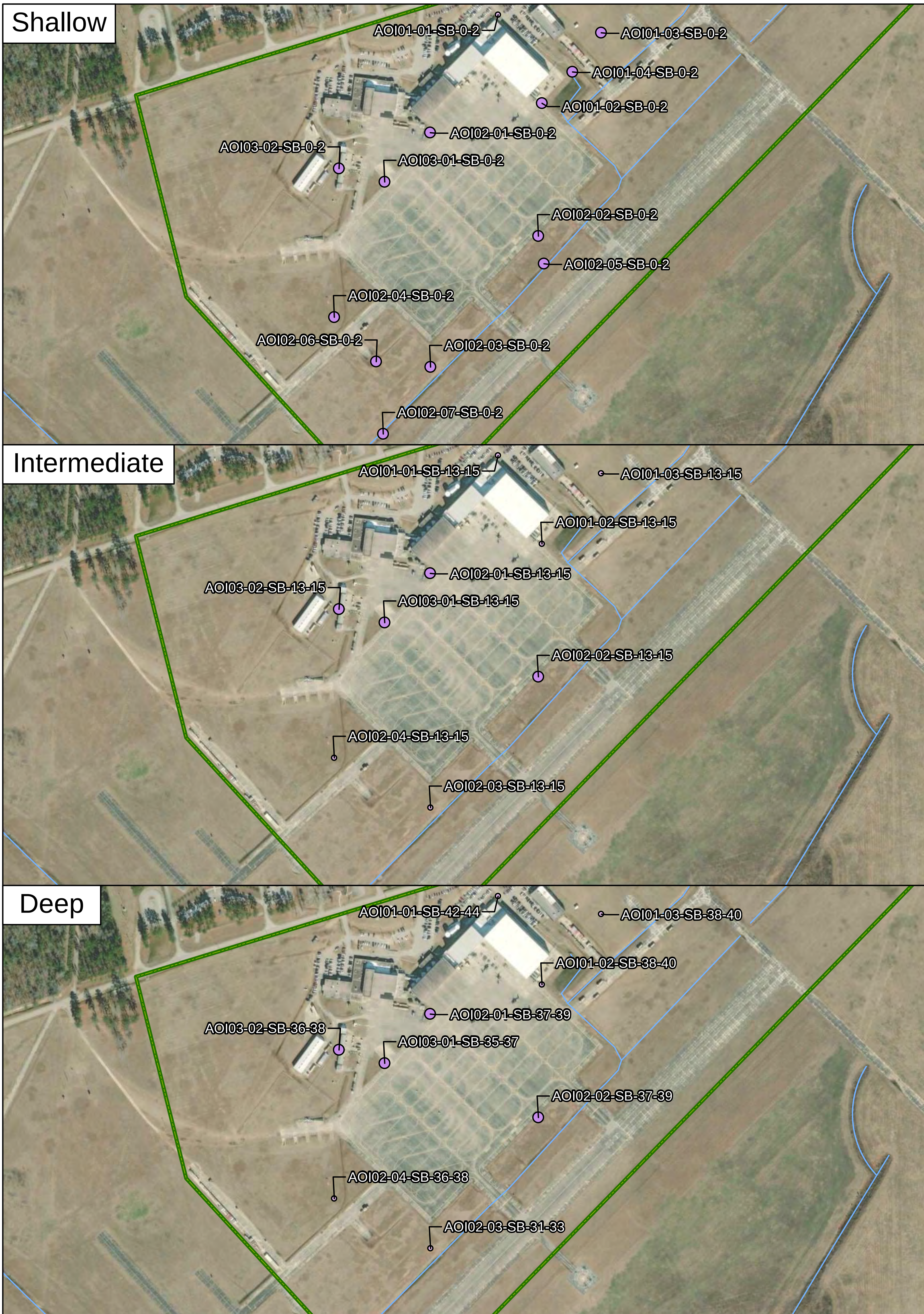
Figure 6-3



Facility Boundary
Canal/Ditch

PFHxS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 130
- >130 - 1,600
- >1,600

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

PFHxS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/12/2022	GIS BY	MS	10/12/2022
SCALE	1:6,000	CHK BY	BW	10/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022

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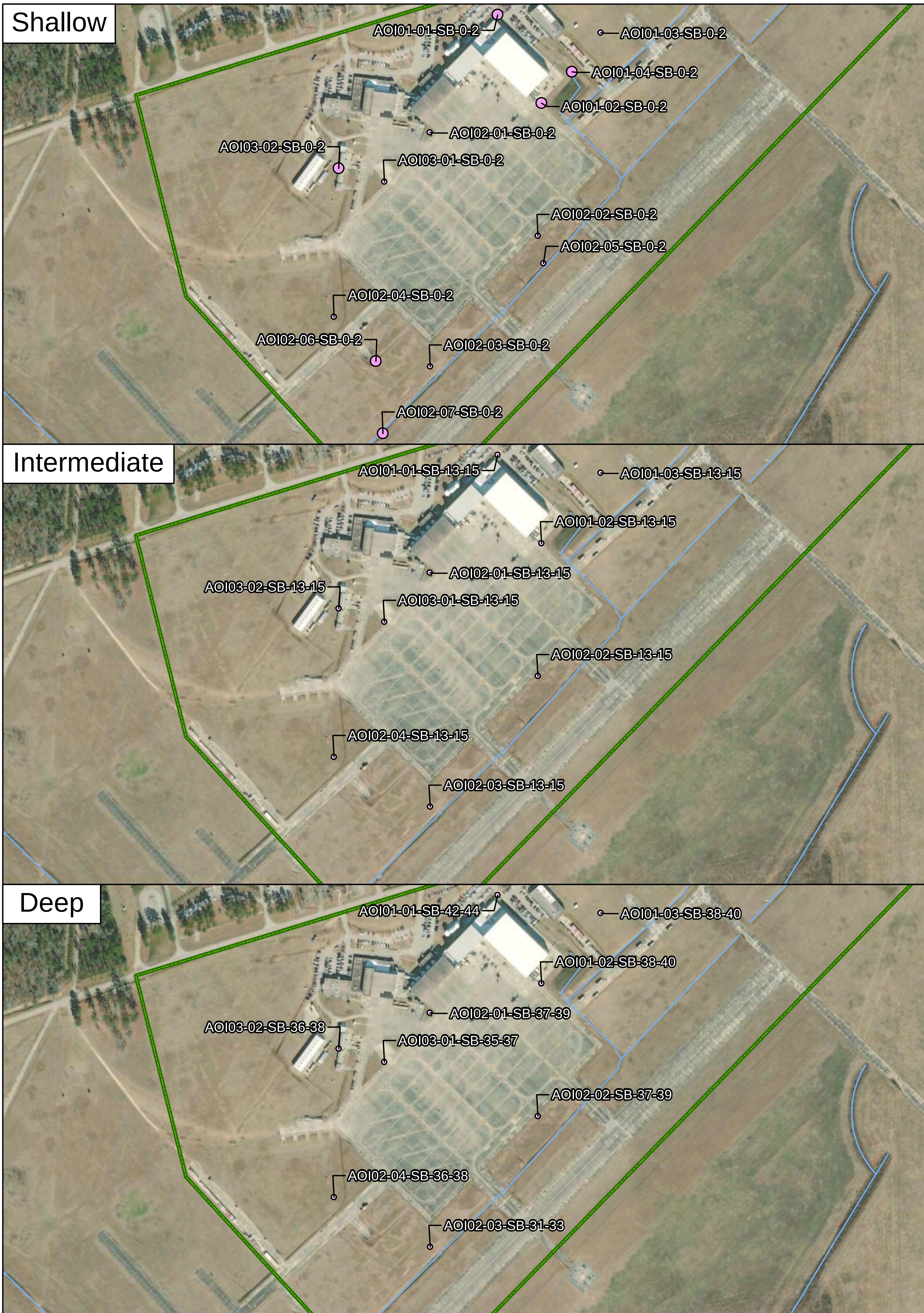
Figure 6-4



Facility Boundary
Canal/Ditch

PFNA Results (µg/Kg)
- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

PFNA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/12/2022	GIS BY	MS	10/12/2022
SCALE	1:6,000	CHK BY	BW	10/12/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/12/2022

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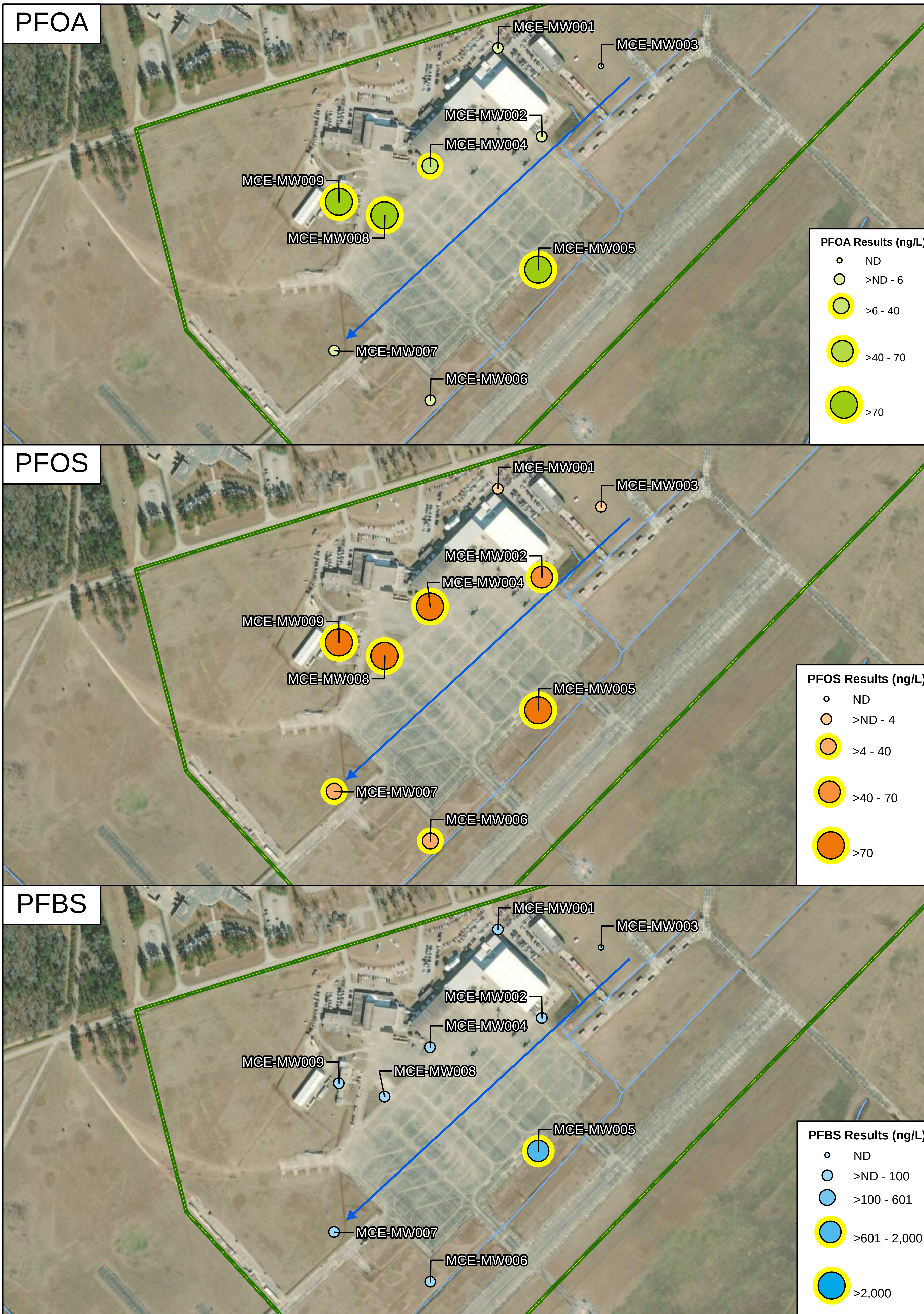
Figure 6-5



Facility Boundary
Canal/Ditch
Groundwater Flow Direction

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

PFOA, PFOS, and PFBS Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	10/6/2022	GIS BY	MS	10/6/2022
SCALE	1:6,000	CHK BY	BW	10/6/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/6/2022

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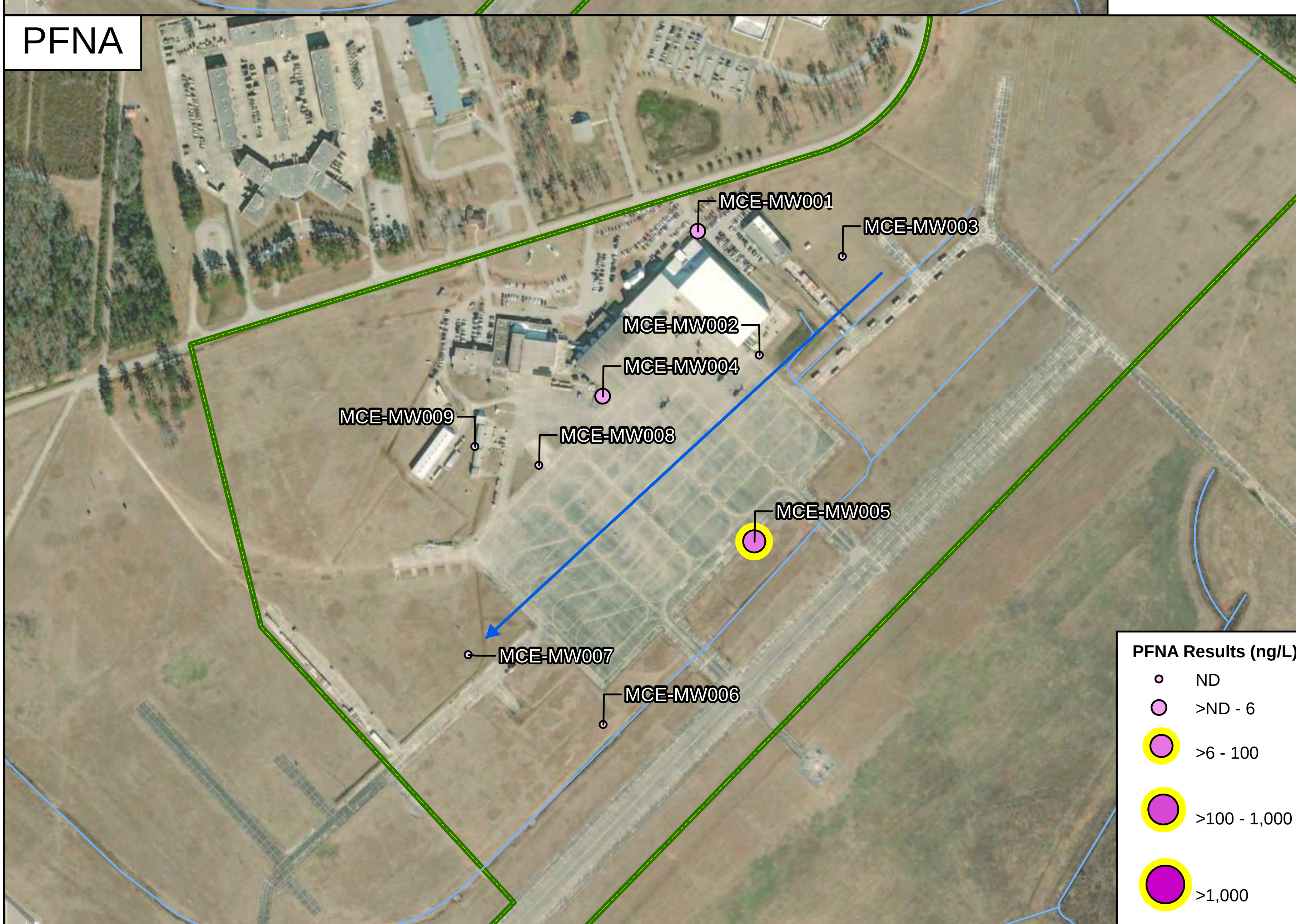
Figure 6-6



Facility Boundary
Canal/Ditch
Groundwater Flow Direction

N

0 250 500 1,000 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

PFHxS and PFNA Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at McEntire AASF, SC			
REVISED	9/1/2022	GIS BY	MS	9/1/2022
SCALE	1:6,000	CHK BY	BW	9/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/1/2022

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Figure 6-7

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-3**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

1. Contaminant source;
2. Environmental fate and transport;
3. Exposure point;
4. Exposure route; and
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with an incomplete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of relevant compounds above the SLs. Areas with an identified potentially complete pathway that have detections of the relevant compounds above the SLs may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in an RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1, AOI 2, and AOI 3 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Hangar 457, where four separate AFFF releases are known to have occurred from the AFFF fire suppression system within the hangar. The releases occurred both within and outside of the hangar, as cleanup efforts involved pushing the released AFFF into the outside storm drains. The storm drains release to the surrounding stormwater swales, where AFFF may infiltrate the soil or be transported off-facility via Outfall #007.

The relevant compounds were detected in surface and subsurface soil at AOI 1. No active construction was ongoing during site activities, but site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and construction workers are potentially complete. All other soil exposure pathways for site workers, construction workers, residents, and recreational users are considered incomplete, as the receptors are unlikely to encounter the media under current and/or future scenarios. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 encompasses the helicopter apron, the site of two separate fire emergencies involving AFFF response, and the area associated with the AFFF suppression system release from Hangar 456. Cleanup efforts from the fire suppression system release involved pushing the released AFFF into the outside storm drains and rinsing helicopters and tools off at the wash rack. The storm drains release to the surrounding stormwater swales, where AFFF may infiltrate the soil or be transported off-facility via Outfall #007.

The relevant compounds were detected in surface and subsurface soil at AOI 2. No active construction was ongoing during site activities, but site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and construction workers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion; therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. All other soil exposure pathways for site workers, construction workers, residents, and recreational users are considered incomplete, as the receptors are unlikely to encounter the media under current and/or future scenarios. The CSM for AOI 2 is presented on **Figure 7-2**.

7.1.3 AOI 3

AOI 3 encompasses Building 467 and the wash rack. The wash rack was formerly used on an annual basis as an FTA from the 1990s to sometime in the 2000s, possibly as late as 2010, and AFFF was stored in four Tri-Max™ 30 carts at Building 467. Known and potential AFFF releases identified at the facility occurred on both surface soil and paved surfaces. Releases to the paved surfaces could have migrated a short distance onto the surrounding surface soil or into the facility stormwater system.

The relevant compounds were detected in surface and subsurface soil at AOI 3. PFOS additionally exceeded the residential SL in surface soil. No active construction was ongoing during site activities, but site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and construction workers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion; therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. All other soil exposure pathways for site workers, construction workers, residents, and recreational users are considered incomplete, as the receptors are unlikely to encounter the media under current and/or future scenarios. The CSM for AOI 3 is presented on **Figure 7-3**.

7.2 Groundwater Exposure Pathway

The SI results in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors based on the aforementioned criteria.

7.2.1 AOI 1

PFOS and PFHxS were detected above their SLs in groundwater samples collected at AOI 1. The South Carolina Department of Natural Resources (SCDNR) well inventory shows that there are a few public supply wells and industrial wells south of the facility, beyond the McEntire AASF boundary (SCDNR, 2019; **Figure 2-3**). The few nearby small farms primarily use private groundwater wells to supply their daily water requirements. Four domestic wells and four public supply wells are located downgradient from the facility, based on the southwestern groundwater flow direction. The closest domestic well is approximately 2.4 miles downgradient and the closest public supply well is approximately 3.7 miles downgradient. Therefore, the exposure pathway to off-facility residents via ingestion of groundwater is potentially complete. Off-facility groundwater may also possibly or partially be impacted by off-facility sources not under control of ARNG as presented in **Section 3.4**. Due to the groundwater depths (38.72 to 39.57 feet bgs) measured at AOI 1, construction workers are unlikely to ingest shallow groundwater during construction activities, and the exposure pathway is incomplete for construction workers. Site worker groundwater ingestion exposure pathway is considered incomplete due to the lack of onsite drinking water wells. Off-facility recreational users are unlikely to encounter shallow groundwater, so that exposure pathway is also considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected above their SLs in groundwater samples collected at AOI 2. Public water system wells and domestic wells, as discussed in Section 7.2.1,are located within a 4-mile radius of the facility and are downgradient from AOI 2, based on the southwestern groundwater flow direction. Therefore, the exposure pathway for off-facility residents via ingestion of groundwater is considered potentially complete. Off-facility groundwater may also possibly or partially be impacted by off-facility sources not under control of ARNG as presented in **Section 3.4**. The groundwater ingestion exposure pathway is incomplete for site workers due to the lack of on-facility drinking water wells, and it is incomplete for construction workers due to the deeper groundwater depths (34.31 to 39.65 feet bgs) measured at AOI 2. Off-facility recreational users are unlikely to encounter shallow groundwater, so that exposure pathway is also considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.2.3 AOI 3

PFOA, PFOS, and PFHxS were detected above their SLs in groundwater samples collected at AOI 3. Public water system wells and domestic wells, as discussed in Section 7.2.1, are located within a 4-mile radius of the facility and are downgradient from AOI 3, based on the southwestern groundwater flow direction. Therefore, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete. Off-facility groundwater may also possibly or partially be impacted by off-facility sources not under control of ARNG as presented in **Section 3.4**. The groundwater ingestion exposure pathway is incomplete for site workers due to the lack of on-facility drinking water wells, and it is incomplete for construction workers due to the deeper groundwater depths (40.16 to 40.90 feet bgs) measured at AOI 3. Off-facility recreational users are unlikely to encounter shallow groundwater, so that exposure pathway is also considered incomplete. The CSM for AOI 3 is presented on **Figure 7-3**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in surface water and sediment were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria. At AOIs where surface water and sediment samples were not collected, data from downgradient AOIs or the SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

7.3.1 AOI 1

Cleanup efforts from the AFFF release incidents at AOI 1 involved pushing the released AFFF into the outside storm drains, which directly release to the surrounding stormwater swales. AFFF releases in the utility room also drained to the sanitary sewer through a floor drain. The sanitary sewer connects to the wastewater treatment plant at the ANG facility, and treated effluent is discharged to an unnamed channel that leads to Cedar Creek (Leidos, 2019).

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because the relevant compounds were detected in soil and groundwater at AOI 1, it is possible that those compounds may have migrated from soil and groundwater to the retention ponds and stormwater swales on-facility that drain off-facility to Cedar Creek via Outfall #007. Cedar Creek ultimately drains into the Congaree River, approximately 9-miles downstream. There is also potential for groundwater/surface water interaction due to the possible outcropping of the McQueen Branch aquifer near the facility (USGS, 2010). This possible migration of PFAS could result in potential exposure to site workers, construction workers, and recreational users via ingestion of surface water and sediment, or by secondary ingestion of contaminated fish by off-facility residents from the Congaree River, which is a popular location for recreational fishing.

Based on the results from source water sampling (see **Section 5.1.3** and **Appendix F**) and PFAS sampling of municipal water source (City of Columbia, 2021), relevant compounds have been detected in the facility's drinking water. The municipal water is sourced from surface water intakes more than 10 miles away to the northwest, receiving water from separate watersheds upstream of the facility; therefore, the relevant compounds detected in municipal water are unlikely attributable to ARNG activities, and thus not shown on **Figure 7-1**. However, the site worker exposure via ingestion of drinking water sourced from off-facility surface water is conservatively considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

Cleanup efforts from the AFFF release incidents at AOI 2 involved pushing the released AFFF into the outside storm drains, which directly release to the surrounding stormwater swales. Sheet flow from the helicopter apron also travels toward the southeast, to the series of stormwater swales, where it can infiltrate or be discharged to Cedar Creek via Outfall #007. Cedar Creek ultimately drains into the Congaree River approximately 9-miles downstream.

The relevant compounds were detected in soil and groundwater at AOI 2, and PFAS are water soluble and can migrate readily from soil to surface water via leaching and runoff. There is also potential for groundwater/surface water interaction due to the possible outcropping of the McQueen Branch aquifer near the facility (USGS, 2010). This possible migration of PFAS could result in potential exposure via ingestion of surface water and sediment, or by secondary ingestion of contaminated fish from the Congaree River, which is a popular location for recreational fishing. Relevant compounds have also been detected in the facility's drinking water, which is sourced from surface water intakes more than 10 miles away, although the detections are unlikely attributable to ARNG activities. Therefore, the surface water and sediment ingestion exposure pathways for site workers, future construction workers, residents, and recreational users are considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3.3 AOI 3

During the AFFF releases at the wash rack, the valve diverted the water to the sanitary sewer after passing through an oil-water separator. The sanitary sewer connects to the wastewater treatment plant at the ANG facility, and treated effluent is discharged to an unnamed channel that leads to Cedar Creek (Leidos, 2019). It is also possible that residual PFAS on the asphalt in the wash rack were inadvertently transported with other drained water to the stormwater outfall, sanitary sewer, or a holding tank used to capture rinsate containing oil and grease. Sheet flow from Building 467 also travels towards the surrounding stormwater drains and the wash rack drain. The stormwater drains are connected to the series of swales, where the water will either infiltrate or discharge off-facility to Cedar Creek via Outfall #007. Cedar Creek ultimately drains into the Congaree River approximately 9-miles downstream.

The relevant compounds were detected in soil and groundwater at AOI 3, and PFAS are water soluble and can migrate readily from soil to surface water via leaching and runoff. There is also potential for groundwater/surface water interaction due to the possible outcropping of the McQueen Branch aquifer near the facility (USGS, 2010). This possible migration of PFAS could result in potential exposure via ingestion of surface water and sediment, or by secondary ingestion of contaminated fish from the Congaree River, which is a popular location for recreational fishing. Relevant compounds have also been detected in the facility's drinking water, which is sourced from surface water intakes more than 10 miles away, although the detections are unlikely attributable to ARNG activities. Therefore, the surface water and sediment ingestion exposure pathways for site workers, future construction workers, residents, and recreational users are considered potentially complete. The CSM for AOI 3 is presented on **Figure 7-3**.

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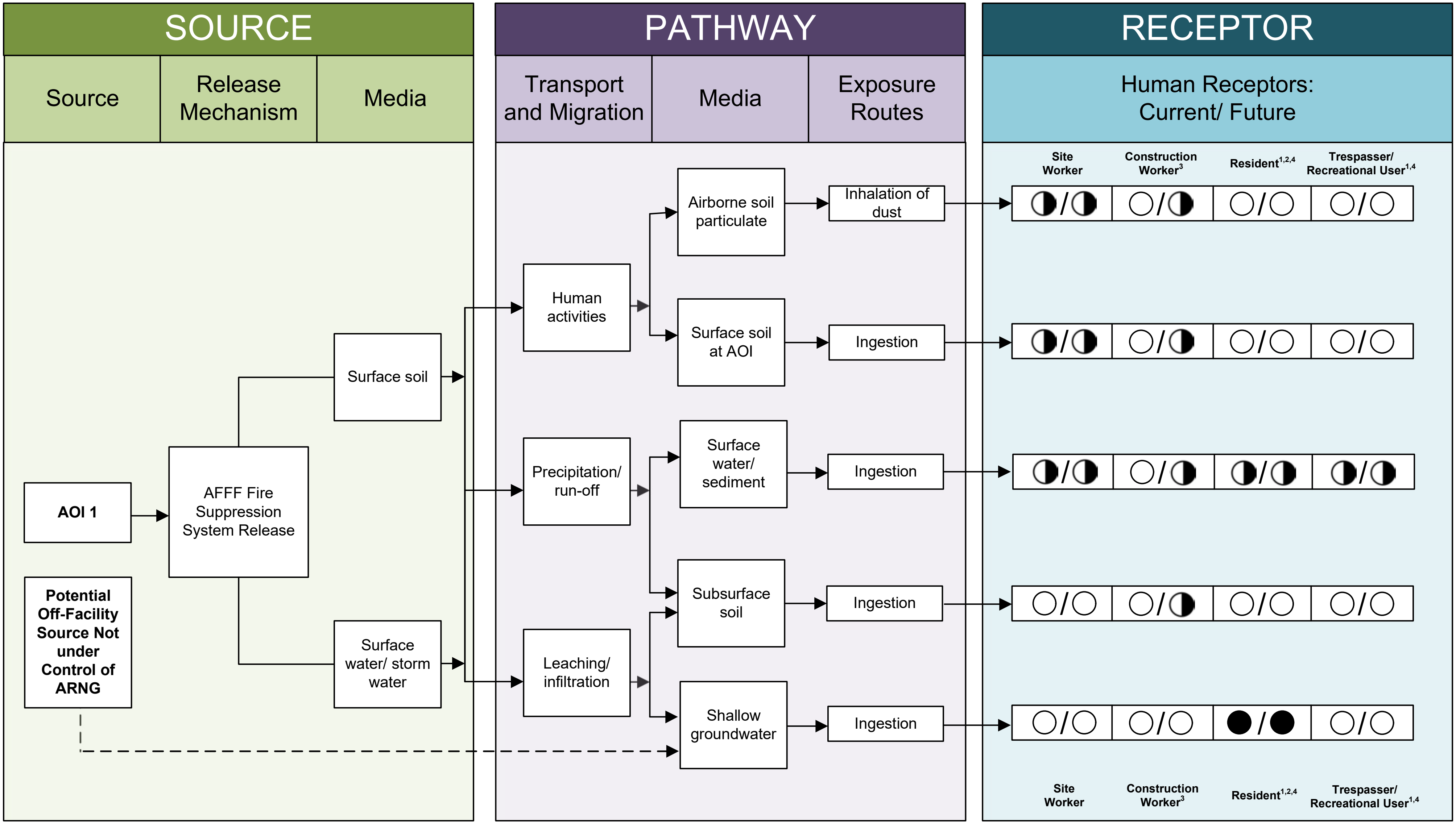


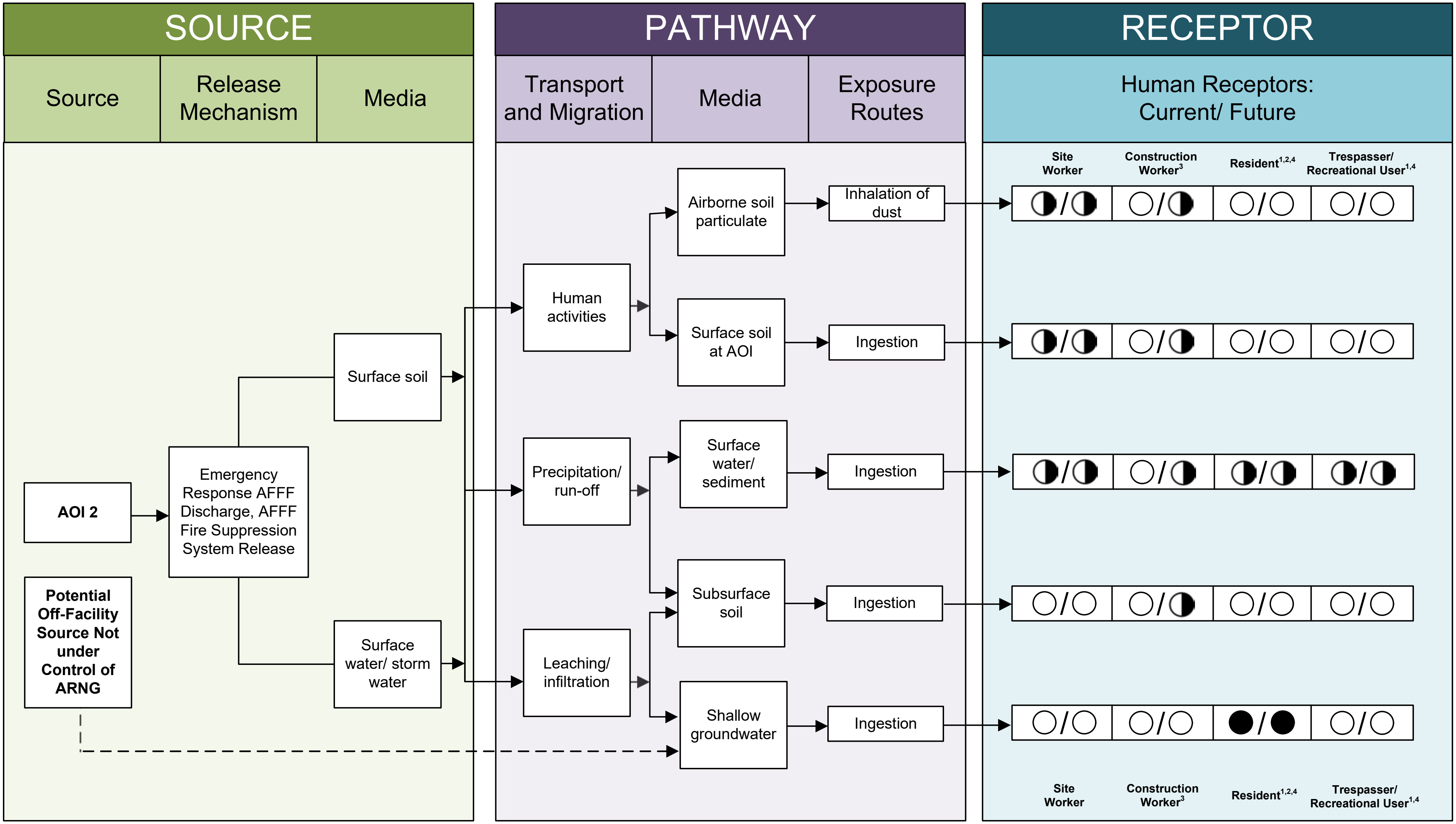
LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.
4. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-1
Conceptual Site Model, AOI 1
McEntire AASF



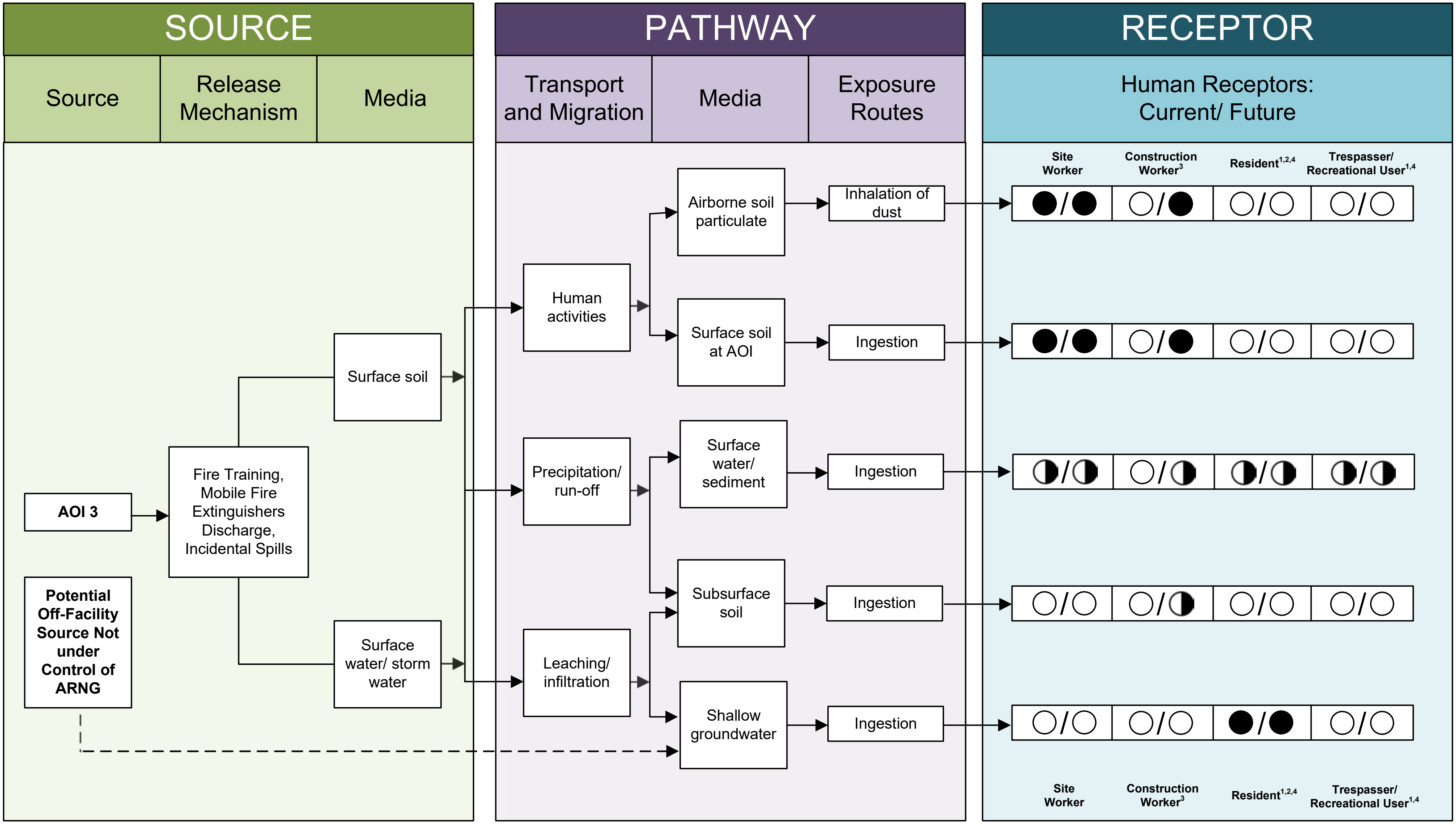
LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.
4. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-2
Conceptual Site Model, AOI 2
McEntire AASF



LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.
4. Human consumption of fish potentially affected by PFAS is possible.

Figure 7-3
Conceptual Site Model, AOI 3
McEntire AASF

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8. Summary and Outcome

This section summarizes SI activities and findings. The most significant findings are summarized in this section and are reproduced directly or abstracted from information contained in this report. The outcome provides general and comparative interpretations of the findings relative to the SLs.

8.1 SI Activities

The SI field activities were conducted from 7 to 25 March 2022 and consisted of utility clearance, direct push boring, soil sample collection, permanent monitoring well installation, groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- Thirty-one (31) soil samples from nine boring locations and four hand auger locations;
- Nine groundwater samples from nine permanent monitoring wells;
- Seventeen (17) QA/QC samples.

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOIs, which are described in **Section 7**.

8.2 Outcome

Based on the results of this SI, further evaluation under CERCLA is warranted in an RI for AOI 1, AOI 2, and AOI 3. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from AOI 1, AOI 2, and AOI 3 from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - The detected concentrations of the relevant compounds in soil at AOI 1 were below their SLs.
    - PFOS and PFHxS were detected above the SLs in groundwater at monitoring well MCE-MW002. PFOS exceeded the SL of 4 ng/L, at a concentration of 47.3 ng/L, and PFHxS exceeded the SL of 39 ng/L, at a concentration of 63.2 ng/L.
    - Based on the exceedances of the SLs in groundwater, further evaluation of AOI 1 is warranted in an RI.

- At AOI 2:
  - The detected concentrations of the relevant compounds in soil at AOI 2 were below their SLs.
  - PFOA, PFOS, PFHxS, PFNA, and PFBS were detected above their SLs in groundwater, at maximum concentrations of 392 ng/L, 9580 ng/L, 7900 ng/L, 6.72 ng/L, and 1150 ng/L, respectively.
  - Based on the exceedances of the SLs in groundwater, further evaluation of AOI 2 is warranted in an RI.
- At AOI 3:
  - PFOS in surface soil exceeded the SL of 13 µg/kg at boring location AOI03-02, with a concentration of 20.2 J µg/kg.
  - PFOA, PFOS, and PFHxS were detected above their SLs in groundwater, at maximum concentrations of 221 ng/L, 319 ng/L, and 534 ng/L, respectively.
  - Based on the exceedances of the SLs in soil and groundwater, further evaluation of AOI 3 is warranted in an RI.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS. **Table 8-1** summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

Table 8-1: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Hangar 457	◐	●	Proceed to RI
2	Helicopter Apron and Hangar 456	◐	●	Proceed to RI
3	Building 467 and Wash Rack	●	●	Proceed to RI

Legend:
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

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