FINAL
Site Inspection Report
Austin Bergstrom Army Aviation Support Facility
Austin, Texas

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

June 2023

Prepared for:

Army National Guard Bureau
111 S. George Mason Drive
Arlington, VA 22204

UNCLASSIFIED

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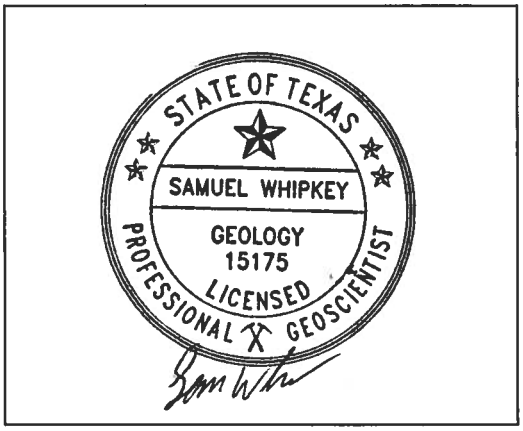

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Acronyms and Abbreviations

%	percent
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
ABIA	Austin-Bergstrom International Airport
AECOM	AECOM Technical Services, Inc.
AFB	Air Force Base
AFFF	aqueous film-forming foam
AFRC	Armed Forces Reserve Center
AOI	Area of Interest
ARNG	Army National Guard
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
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
JVMF	Joint Vehicle Maintenance Facility
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specific
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
OSD	Office of the Secretary of Defense
OWS	oil-water separator
PA	Preliminary Assessment
PAL	Project Action Limit
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
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
SWMU	Solid Waste Management Unit
TCEQ	Texas Commission on Environmental Quality
TOC	total organic carbon
TPP	Technical Project Planning
TXARNG	Texas Army National Guard
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
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 four 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 screening levels (SLs) for relevant compounds. This SI was completed at the Austin Bergstrom Army Aviation Support Facility (AASF) in Austin, Texas and determined further investigation is warranted for each of the four AOIs. The Austin Bergstrom AASF will also be referred to as the "facility" throughout this document.

The Austin Bergstrom AASF occupies approximately 57 acres of land at the Austin Bergstrom International Airport in Austin, Texas. The facility includes three hangars, a Joint Vehicle Maintenance Facility, and an Armed Forces Reserve Center. The Austin Bergstrom AASF is tasked with providing hangar, administrative, and supply and maintenance shop spaces to service aircraft, serve peacetime missions, and perform the necessary tasks that improve the units' readiness.

The PA identified four AOIs for investigation during the SI phase. SI sampling results from the four 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 for each of the four AOIs.

[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	Groundwater – Facility Boundary	Future Action
1	Maintenance Hangar	◐	●	●	Proceed to RI
2	Wash Rack	◐	●	●	Proceed to RI
3	Fixed Wing Support Hangar	◐	●	●	Proceed to RI
	Storage Hangar	◐	●	●	Proceed to RI
4	Hazardous Materials Storage Building	◐	●	●	Proceed to RI
	Fuel Station	◐	●	●	Proceed to RI

Legend:
N/A = not applicable
● = 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 Austin Bergstrom Army Aviation Support Facility (AASF) in Austin, Texas. The Austin Bergstrom 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 Austin Bergstrom AASF (AECOM Technical Services, Inc. [AECOM], 2020) that identified four 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

Austin Bergstrom AASF, home to the Texas ARNG (TXARNG), is within the southwest portion of the Austin-Bergstrom International Airport (ABIA) in Austin, Texas. The facility is 8 miles southeast of downtown Austin and is situated at the intersection of Burleson Road and Emma Browning Avenue (**Figure 2-1**). TXARNG leases approximately 57 acres of land at ABIA. The facility consists of three hangars (a Fixed Wing Support Hangar, Maintenance Hangar, and a Storage Hangar), which were built in 2003-2004, as well as a Joint Vehicle Maintenance Facility (JVMF) and an Armed Forces Reserve Center (AFRC), which were built in 2011-2012. The Austin Bergstrom AASF is tasked with providing hangar, administrative, and supply and maintenance shop spaces to service aircraft, serve peacetime missions, and perform the necessary tasks that improve the units' readiness.

2.2 Facility Environmental Setting

Austin Bergstrom AASF is in central Texas, approximately 150 miles northwest of the Gulf of Mexico. The facility is situated approximately 2.8 miles southwest of the Colorado River, with Onion Creek running along the southern boundary. The facility is located at approximately 500 feet above sea level, and the soil is described as silty clay with moderate infiltration rates (Environmental Data Resources, Inc.™, 2019). The topography of the facility is generally level, sloping slightly to the south (**Figure 2-2**).

2.2.1 Geology

Austin is located along the Balcones Fault Zone, with the physiographic provinces of the Edwards Plateau to the west, and the Backland Prairie to the east. The regional geology consists of Quaternary terrace deposits over Cretaceous sedimentary bedrock (Young, 1977).

The facility is underlain by Quaternary fluviatile terrace deposits composed of gravel, sand, silt, and clay (Garner and Young, 1976; Texas Bureau of Economic Geology, 1981; US Geological Survey [USGS], 1993). An SI performed at the Former Bergstrom Air Force Base (AFB), located 1-mile north of the facility, interpreted the terrace deposits as being composed of predominantly clay up to 26 feet below ground surface (bgs) before transitioning into a clayey gravel for an additional 4 feet (Amec Foster Wheeler, 2016). The Cretaceous-aged Navarro and Taylor Groups underly the terrace deposits. These units are similar and are often undivided when mapped. The Navarro Group is composed of dark gray to brown, silty, calcareous, montmorillonitic clay, whereas the Taylor Group is described as dark gray to green-gray, calcareous, montmorillonitic clay (Garner and Young, 1976). The geology at the facility is shown on **Figure 2-3**.

Soil borings completed during the SI found lean clay with sand and gravel as the dominant lithology of the unconsolidated sediments below the Austin Bergstrom AASF. The borings were completed at depths between 24 and 28 feet bgs. Layers of sand, gravel, and silt were also observed in the boring logs at thicknesses ranging from a few inches to several feet. These observations are consistent with the understood fluviatile terrace depositional environment. Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

The facility is underlain by the regional Trinity Aquifer, which is about 1,500 feet bgs (Garner and Young, 1976; Texas Water Development Board, 2011). The Trinity Aquifer extends across much of the central and northeastern part of the state and is composed of several smaller aquifers

contained within the Trinity Group. These aquifers consist of limestones, sands, clays, gravels, and conglomerates. The Trinity Aquifer is one of the most extensive and highly used groundwater resources in Texas. Although its primary use is for municipalities, the Trinity Aquifer is also used for irrigation, livestock, and other domestic purposes. The Trinity Aquifer is confined by the Navarro-Del Rio confining unit, which consists of the Navarro Group, Taylor Group, Austin Group, Eagle Ford Group, Buda Limestone, and Del Rio Clay and is typically greater than 1,200-feet thick (Barker and Ardis, 1996).

Groundwater at Austin Bergstrom AASF is first encountered in the shallow unconfined aquifer within the terrace deposits. The wells near the facility are likely screened in shallow terrace or alluvial deposits. Groundwater in the shallow fluviatile terrace deposits aquifer is present within the clayey gravel, at a depth of approximately 20 to 25 feet bgs. Recharge primarily occurs through percolation from the surface and through stream channels. Groundwater flow in the shallow aquifer has been measured to the east and northeast at FT023P, a fire training area (FTA) operated by the former Bergstrom AFB and located approximately 1 mile north of the facility (Amec Foster Wheeler, 2016). A groundwater gradient determination was conducted at the former Bergstrom AFB in 1995 and found that groundwater at the Austin Bergstrom AASF flows to the south-southeast. The variation in flow direction in the vicinity of the facility is considered to be primarily related to the thickness of the terrace deposits above the Taylor Marl (Law Environmental, Inc., 1995).

The facility obtains its drinking water from the City of Austin, which acquires water from surface water intakes from the lower Colorado River as it flows through Lake Travis and Lake Austin. A query of the Texas Water Development Board Submitted Driller's Reports Database identified one industrial water supply well, 4 domestic wells, and 27 monitoring wells within a 1-mile radius of the facility. The industrial water supply well is 35 feet bgs and is located southeast of the facility. The four domestic wells are located between 0.3 and 0.6 miles northeast and southeast of the facility and range from 35 to 70 feet bgs. The majority of the monitoring wells are located to the south of the facility, along the perimeter of the Travis County Landfill. Additionally, there are four monitoring wells to the northwest of the facility that are owned by Sunland Group; the monitoring wells are between 26 and 121.5 feet bgs. Wells within a 4-mile radius are shown on **Figure 2-3**.

Depths to water measured in June 2021 during the SI ranged from 14.36 to 19.21 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate groundwater flow direction is generally to the southeast.

2.2.3 Hydrology

After reviewing the Topography and Storm Water Drainage System (ABIA, 2019) and the engineering drawings of the 24-inch and 30-inch reinforced concrete pipe Discharge Outlet Plans (Jose I. Guerra, Inc., 2010), it was determined that surface water collects on the paved area to the west of the Maintenance Hangar and flows via large diameter underground piping south to the holding tank and oil-water separator (OWS) (**Figure 2-5**). Water then flows to the northeast, where it joins with other storm water from contributing portions of the north side of the facility. The comingled storm water then travels through underground piping to the JVMF Complex Pond. The JVMF Complex Pond consists of a water quality pond and a retention pond. After the storm water moves through the retention pond, it flows southwest through underground piping to the AFRC Pond. From the AFRC Pond, storm water from light rain events flowed to Outfall #2, which is located to the east of General Aviation Avenue. At Outfall #2, storm water was discharged and allowed to infiltrate into the subsurface. This outfall was capped and removed from service in 2018. During heavier rain events, water flows to Outfall #1, located south of Burleson Road, and is discharged to Onion Creek. Although rainwater may have carried contaminants to Outfalls #1 and #2, it is more likely that AFFF release events resulted in contaminants collecting in the JVMF Complex Pond and the AFRC Pond and penetrating the subsurface in these two areas.

In addition, it was determined from on-site interviews that wastewater that collects in the wash rack either flows to the storm water drainage system (described above) or flows through an oil/sand filter and then discharges to the sanitary sewer system. The position of the diverter valve at the wash rack determines whether wastewater flow travels to the storm water drainage system or to the sanitary sewer.

2.2.4 Climate

The climate of Austin is humid subtropical, with hot summers and mild winters, and with warm spring and fall transitional periods. Temperatures reach their peak in August, with normal highs ranging from 95 degrees Fahrenheit (°F) to 98°F in 2021, and lows averaging 73°F. Average annual rainfall is approximately 36 inches, with May, October, and June typically being the wettest months of the year (National Weather Service Forecast Office, 2022). Precipitation in the spring and summer usually results from thunderstorms (National Oceanic and Atmospheric Administration, 2022).

2.2.5 Current and Future Land Use

The Austin Bergstrom AASF currently includes three aircraft hangars. The facility also houses the JVMF and the AFRC. Current land use in the direct vicinity of the Austin Bergstrom AASF includes the ABIA to the north (formerly the Bergstrom AFB) and a park to the south, across Burleson Road. To the east and west is mostly undeveloped land. The Travis County Landfill is located approximately 0.5 miles southwest of the facility. No future changes to the current use were noted during personnel interviews.

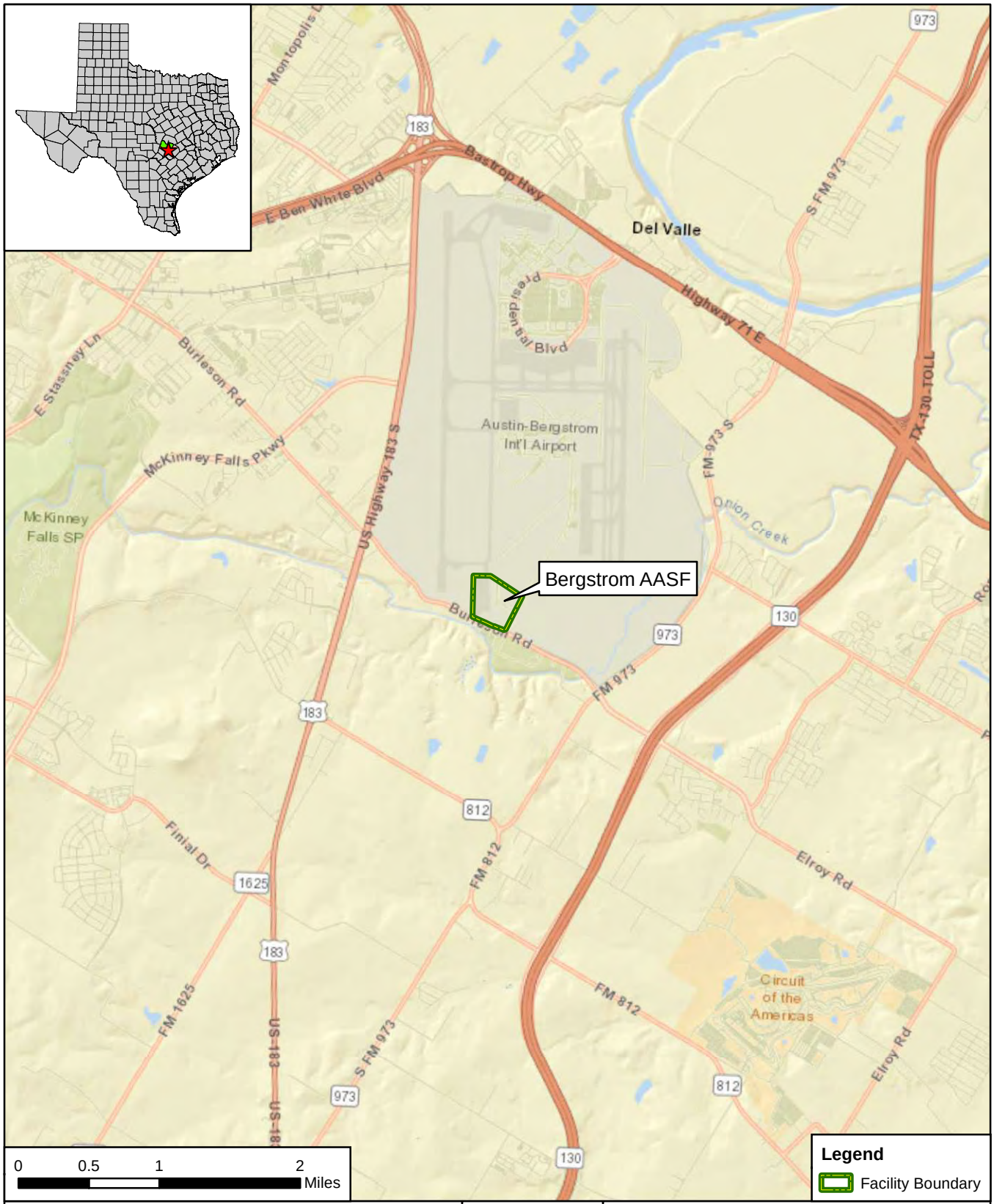
2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Travis County, Texas (US Fish and Wildlife Service [USFWS], 2022).

- **Amphibians:** Barton Springs salamander, *Eurycea sosorum* (endangered); Austin blind Salamander, *Eurycea waterlooensis* (endangered); Jollyville Plateau Salamander, *Eurycea tonkawae* (threatened); Georgetown Salamander, *Eurycea naufragia* (threatened)
- **Arachnids**: Bone Cave harvestman, *Texella reyesi* (endangered)*;* Tooth Cave Spider, *Neoleptoneta myopica* (endangered); Bee Creek Cave harvestman, *Texella reddelli* (endangered); Tooth Cave pseudoscorpion, *Tartarocreagris texana* (endangered)
- **Birds:** Red knot, *Calidris cantus rufa* (threatened); Golden-cheeked warbler, *Dendroica chrysoparia* (endangered); Piping Plover, *Charadrius melodus* (threatened); Whooping crane, *Grus Americana* (endangered)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate); Kretschmarr Cave mold beetle, *Texamaurops reddelli* (endangered); Tooth Cave ground beetle, *Rhadine persephone* (endangered)
- **Clams:** Texas fawnsfoot, *Truncilla macrodon* (proposed threatened); Guadalupe Orb, *Cyclonaias necki* (proposed endangered); false spike, *Fusconaia mitchelli* (proposed endangered); Texas pimpleback *Quadrula petrina* (proposed endangered); Texas fatmucket, *Lampsilis bracteata* (proposed endangered)
- **Flowering plants:** Bracted twistflower, *Streptanthus bracteatus* (proposed threatened)

2.3 History of PFAS Use

Six potential release areas where AFFF may have been used or released historically were identified at the Austin Bergstrom AASF during the PA (AECOM, 2020). Austin Bergstrom AASF includes three hangars: Maintenance Hangar, Fixed Wing Support Hangar, and Storage Hangar. All three hangars are equipped with fire suppression systems that utilized AFFF. Two releases of AFFF at the Maintenance Hangar have been recorded, in 2005 during a test of the fire suppression system and again in 2006 when a faulty sensor triggered the fire suppression system. Although there are no recorded releases of AFFF at the Fixed Wing Support Hangar or the Storage Hangar, it is believed both systems were tested in 2005 when the systems were installed, leading to a potential release of AFFF. Between 2005 and 2010, mobile fire extinguishers containing AFFF were stored near the Wash Rack. In 2009, AFFF was released at the Wash Rack during fire training activities. Additionally, AFFF has historically been stored at the Hazardous Materials Storage Building and the Fuel Station. No known releases of PFAS-containing material have been recorded at either area. The potential release areas were grouped into four AOIs, which are described in **Section 3**.



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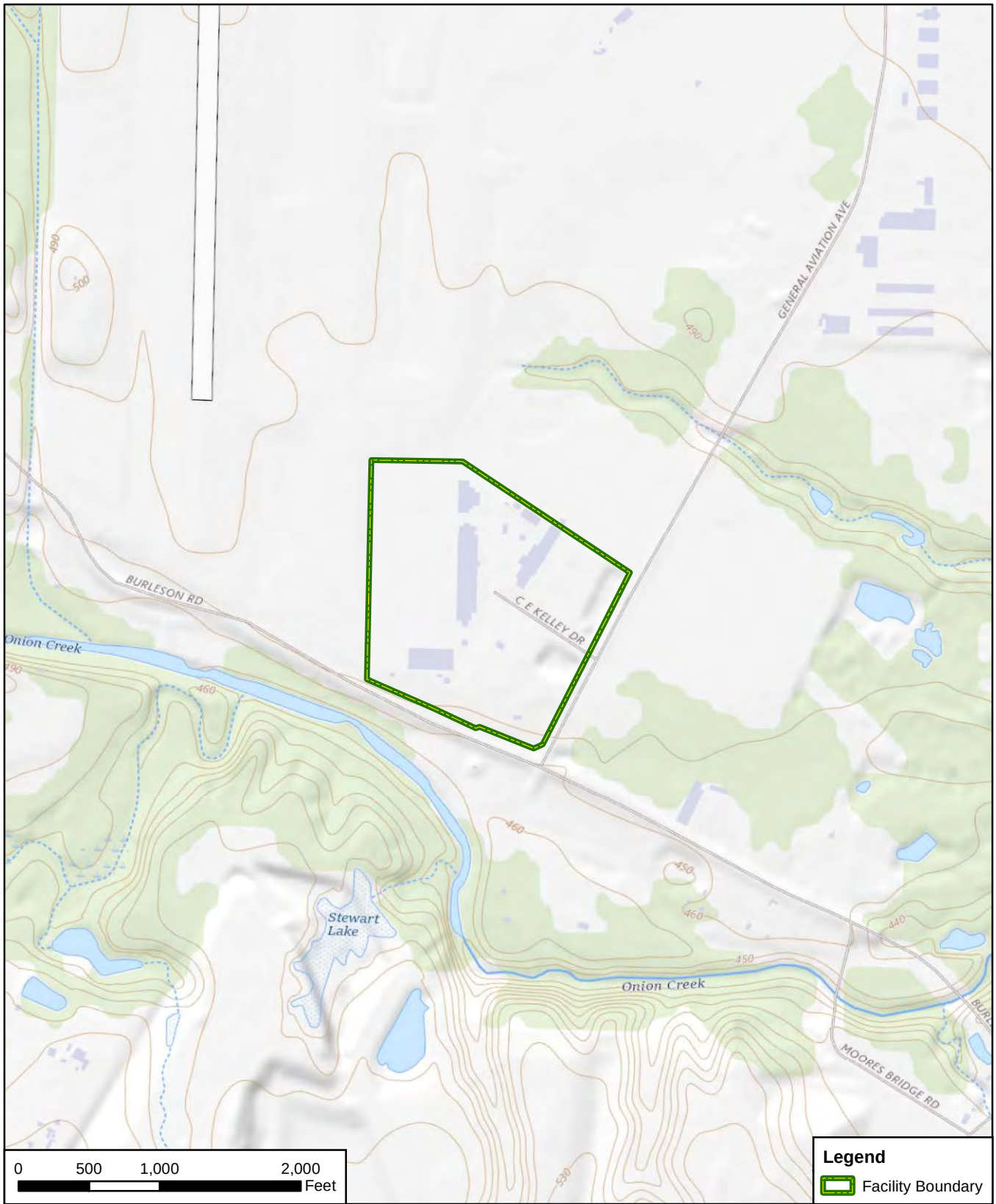
SCALE	1:63,360	CHK BY	MB	8/1/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/1/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	8/1/2022

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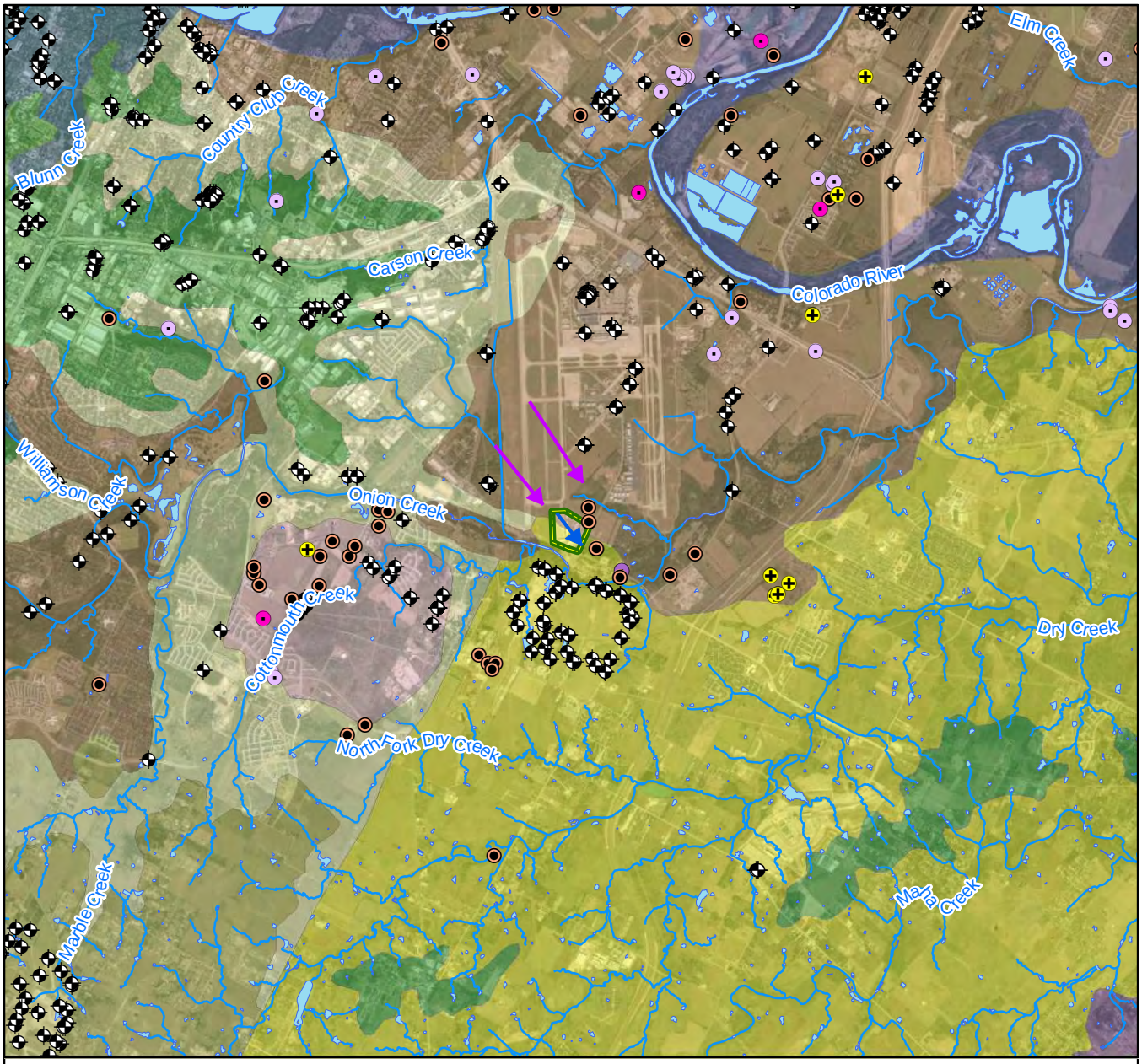
Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



Facility Boundary
Water Body
Stream/River
Groundwater Flow Direction
Inferred Groundwater Flow Direction

Geology

Alluvium
Fluvial Terrace Deposits
High Gravel Deposits
Midway Group
Cretaceous igneous rocks
Navarro Group and Marlbrook Marl, undivided
Pecan Gap Chalk
Ozan Formation
Austin Chalk

Wells

Domestic
Industrial
Irrigation
Stock
Public Supply
Monitoring Well

0 0.75 1.5 3 Miles

CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:95,040	CHK BY	MB	8/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/1/2022

N

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

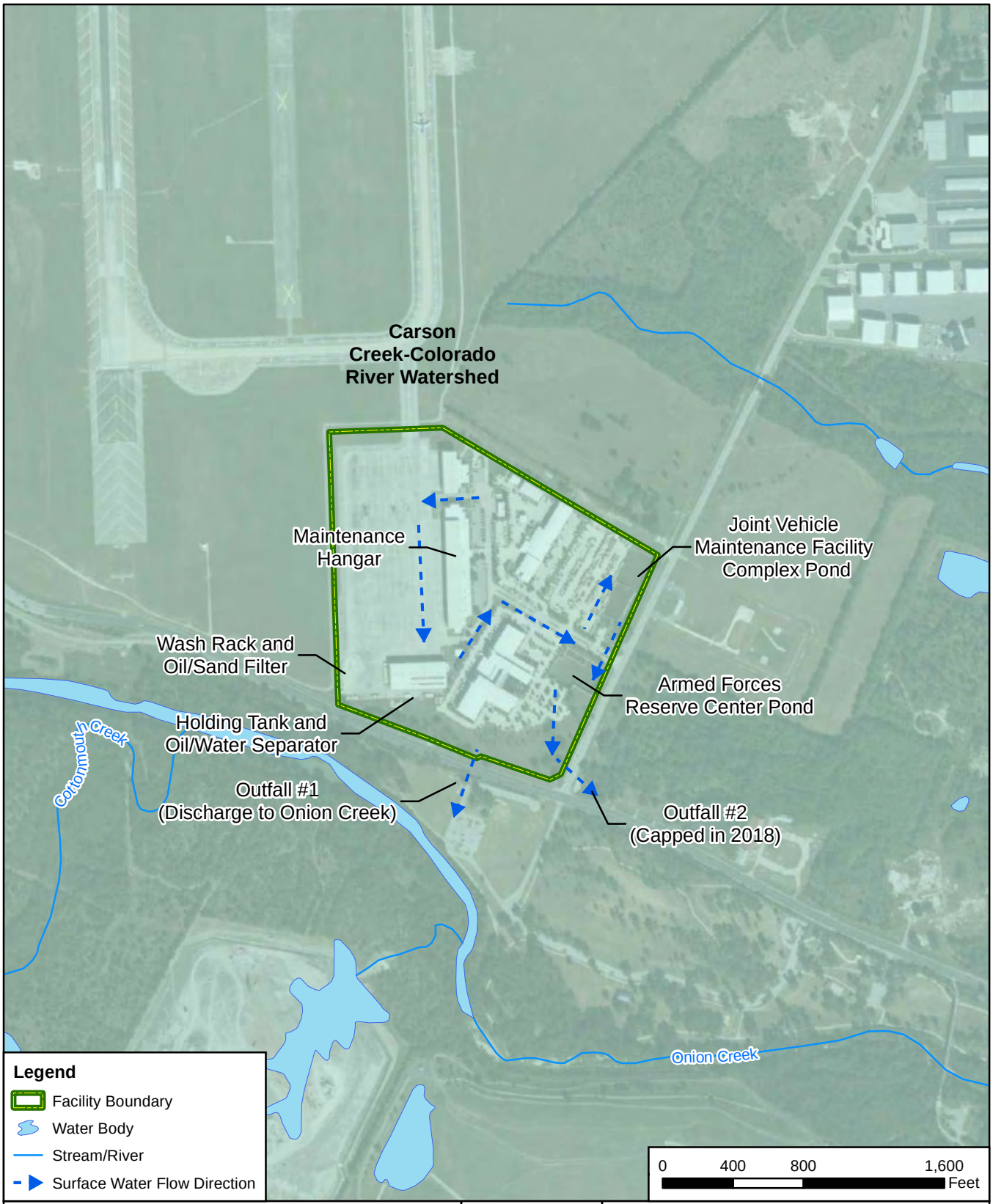
Figure 2-3

CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
REVISED	10/20/2022	GIS BY	MS	10/20/2022
SCALE	1:3,600	CHK BY	MC	10/20/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/20/2022

Groundwater Elevations, June 2021

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/1/2022

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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 Austin Bergstrom AASF and grouped into four AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Maintenance Hangar

AOI 1 is the Maintenance Hangar, which is used for helicopter maintenance. The Maintenance Hangar has a fire suppression system consisting of two 800-gallon AFFF tanks and a 100-gallon AFFF tank. In 2005, AFFF was released during testing of the newly installed fire suppression system. After testing, the foam was allowed to settle and was then pushed down the trench drain. The trench drain conveyed the foam to the holding tank, then the OWS, and then to the storm water drainage system.

On 13 February 2006, a faulty sensor triggered the fire suppression system and resulted in a release of AFFF that filled the hangar with approximately 5 feet of foam. Foam and water were directed to the holding tank on the south side of the complex. A third-party contractor pressure washed and cleaned the hangar, sampled/analyzed the spill residue and contents of the holding tank, pumped out the holding tank, and stored the solution in frac tanks to prevent rain from increasing the volume of solution in the holding tank. Once this task was completed, and the waste was characterized, the contractor disposed of the material. While AFFF was captured at the holding tank, it is possible an unknown quantity of AFFF solution may have been released to the storm water drainage system before corrective measures were taken during the release. The material released during the spill was recorded as being Jet-X 2.75 percent (%) AFFF. While there is a record of the handling of the AFFF produced during the accidental release, there is no record of the handling and disposal of the AFFF produced from the first release in 2005. It is assumed that some quantity of AFFF was released into the storm water drainage system during both releases. Additionally, evidence of past AFFF spills on the sides of the 800-gallon tanks were observed during a visual site inspection, but no floor drains were observed in the room.

Water entering the storm water drainage system would flow to the JVMF Complex Pond, then to the AFRC Pond. Prior to 2018, surface water from the AFRC Pond was then conveyed to Outfall #2 during light storm events. During heavier events, water would have been conveyed to Outfall #1 into Onion Creek.

3.2 AOI 2 Wash Rack

AOI 2 is the Wash Rack. From 2005 to 2010, approximately 15 mobile Tri-Max™ units containing AFFF were present on site. In 2009, training activities occurred once or twice with a single Tri-Max™ unit. An unknown quantity of AFFF was released during these fire training events. Liquid that reaches the wash rack either travels to the holding tank, OWS, and storm water drainage system or is diverted to the oil/sand filter and sanitary sewer system, depending on the positioning of a diverter valve. The position of the diverter valve at the time of AFFF training is unknown. In 2009 or 2010, the Tri-Max™ units were replaced with Purple K units. The AFFF was containerized and removed from the facility by a contractor.

3.3 AOI 3 Fixed Wing Support Hangar and Storage Hangar

AOI 3 encompasses the Fixed Wing Support Hangar and the Storage Hangar. These two hangars are located approximately 1,000 feet apart but are grouped in the same AOI because of their similar site histories. Both hangars are equipped with AFFF fire suppression systems. One 100-

gallon tank, two 300-gallon tanks, and four 55-gallon drums of 3% AFFF are stored within the storage room of the Fixed Wing Support Hangar. The Storage Hangar fire suppression system is connected to one 100-gallon tank and two 800-gallon tanks. Evidence of spillage on the sides of the larger tanks in both hangars was observed during a visual site inspection. No floor drains were observed in either storage room where bulk AFFF was stored.

3.4 AOI 4 Hazardous Materials Storage Building and Fuel Station

AOI 4 encompasses the Hazardous Materials Storage Building and the Fuel Station. The Hazardous Materials Storage Building historically contained 105 5-gallon sealed containers of AFFF, and the Fuel Station historically had AFFF-containing Tri-Max™ units stationed around the area. No known releases of any PFAS-containing materials occurred in either area.

3.5 Adjacent Sources

3.5.1 Former Bergstrom AFB

The former Bergstrom AFB is located directly north of the Austin Bergstrom AASF. A Site Investigation of potential release areas conducted in 2014 at the former AFB revealed that firefighting training activities at the base were conducted from 1942 to 1991 at FT023P, located approximately 1 mile north of the facility. FT023P consisted of one fire training pit, approximately 200 feet in diameter, with a circular berm and limestone lining (Amec Foster Wheeler, 2016).

Surface and subsurface soil samples were collected and analyzed for PFAS at FT023P. The six PFAS reported were detected above the limit of quantitation in all three soil locations and indicated that PFAS were present across the soil column in both shallow (0-2 feet bgs) and in deeper soil (greater than 2 feet to 35 feet bgs). No results were above the US Air Force (USAF) Project Action Limits (PALs) for PFOA (12,000 µg/kg) and PFAS (5,000 µg/kg). At the time of the Site Investigation, no USAF PALs had been developed for PFHxS, PFBS or PFNA (Amec Foster Wheeler, 2016).

In groundwater, PFOA and PFOS were detected above their USAF PALs of 400 ng/L and 200 ng/L, respectively, at each of the five locations tested, indicating that PFAS have migrated through FTA soils into underlying groundwater. FT023P is underlain by terrace deposits consisting of clay from the surface to approximately 26 feet bgs, then approximately 5.5 feet of silty to clayey gravel. Clay potentially associated with the Upper Taylor Marl bedrock unit was interpreted as being present underneath the gravel sediment. However, Cretaceous bedrock in Austin is highly faulted, and the bedrock unit underlying the FTA is uncertain. Local groundwater supply comes primarily from the regional groundwater aquifer (Edwards Aquifer – Balcones Fault Zone), which occurs at about 1,000 feet bgs at the FTA and is not likely to be impacted by the fire training activities. Shallow groundwater occurs in the fluviatile terrace deposits and is not used at the facility for water supply, but it has domestic uses 1 mile to the south and southeast of the FTA (Amec Foster Wheeler, 2016).

A PFAS PA was conducted by Amec Foster Wheeler in December 2015 to determine whether and where AFFF was stored, handled, used, or released at the former Bergstrom AFB, in areas other than FT023P (Amec Foster Wheeler, 2015). The locations identified in that report are shown on **Figure 3-1** and include the following:

1) Former Building 201 (Fire Station): Facility stored and potentially used AFFF; however, no AFFF releases were documented.

2) Former Building 203 (Fire Station Vehicle Wash Rack): Facility was used to wash emergency vehicles and included a 400-gallon OWS, with effluent drainage to the sanitary sewer system.

3) STOR-604 (Base Supply Open Storage Area/Solid Waste Management Unit [SWMU]-153) and Former Building 604 (Base Hazardous Storage Facility): Open storage area with a building that stored 55-gallon drums and five-gallon containers of AFFF, with a documented AFFF release inside the building in 1993.

4) Former Discharge Detention Basin (SWMU-223): Unlined basin designed to contain a full discharge of AFFF from the fire suppression systems in Hangars 1608 and former Hangar 1609, with three documented AFFF releases.

5) Hangar 1608 (Regional Corrosion Control Facility) and STOR-1608 (Storage of Hazardous Waste): Hangar 1608 maintained an AFFF fire suppression system with two documented releases. Storage facility STOR-1608 likely stored AFFF; however, no AFFF releases were documented.

6) Former Hangar 1609 (Small Aircraft Maintenance Dock): Hangar maintained an AFFF fire suppression system with two documented releases.

7) Building 4577 (Crash Fire Station/Vehicle Maintenance Building): Facility may have been used as a crash fire station; however, no documentation of AFFF storage or use was found.

3.5.2 ABIA Fire Station

In 1999, the City of Austin was conveyed a deed notice for 942 acres of the former AFB for the development of the ABIA. The ABIA Fire Station, approximately 1.4 miles north-northeast of the facility, stores AFFF and houses four firetrucks that all use AFFF. AFFF is tested at the Austin Fire Department training facility at 4800 Shaw Lane, approximately 2 miles west-northwest of the facility. Additionally, Federal Aviation Administration inspections include the use of AFFF at unspecified locations around the airport. The last inspection occurred in 2019 and included the use of AFFF, although efforts were made to mitigate the foam.

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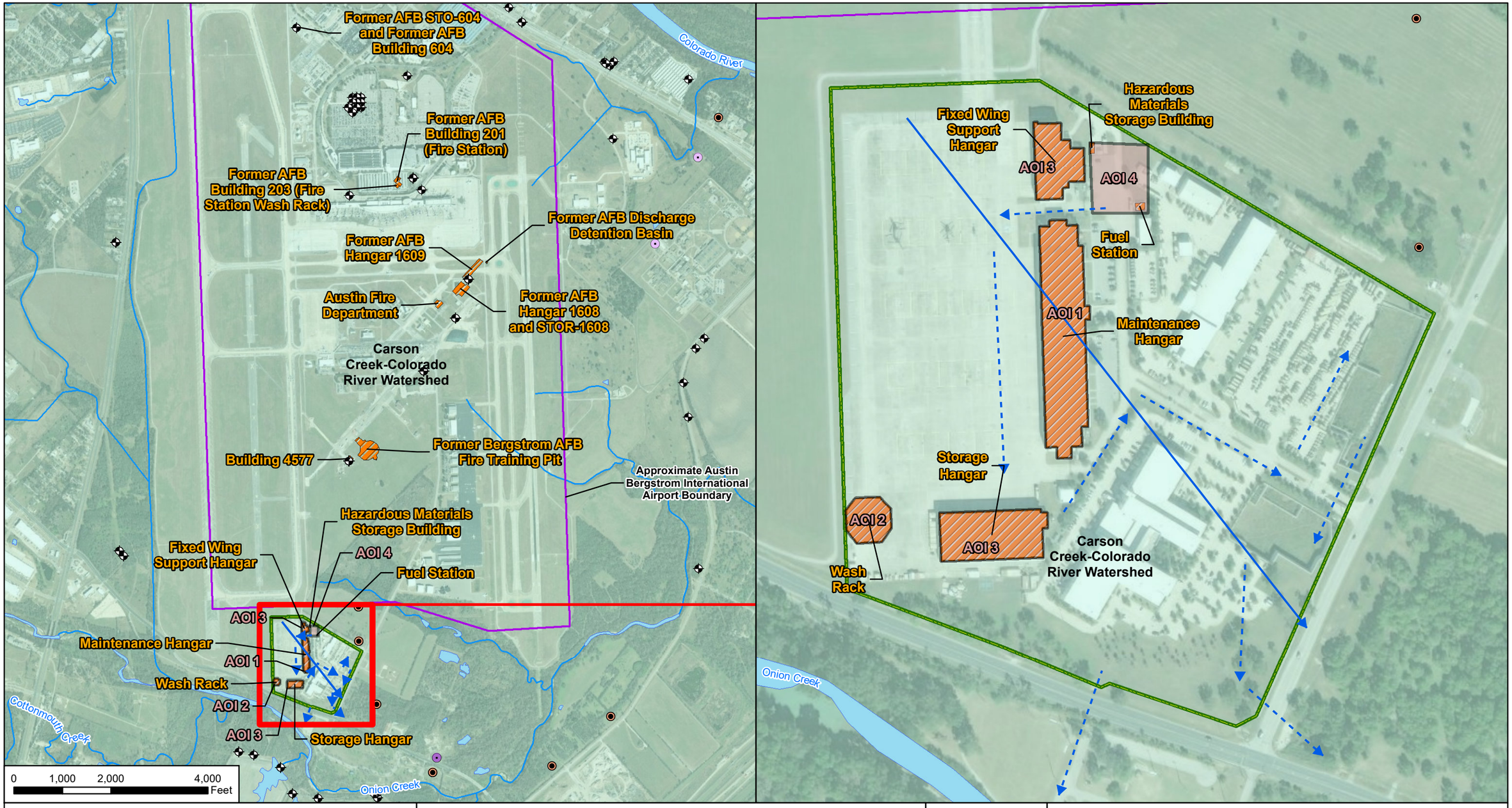

CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
REVISED	4/26/2023	GIS BY	MS	4/26/2023
SCALE	1:24,000	CHK BY	MB	4/26/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	4/26/2023

- Area of Interest
- Potential Release Area
- Approximate Airport Boundary
- Facility Boundary
- Water Body
- Stream/River
- Surface Water Flow Direction
- Groundwater Flow Direction
- Domestic
- Industrial
- Irrigation
- Monitoring Well

N

Areas 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, 2021a), 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/SI for the former Bergstrom AFB (Amec Foster Wheeler, 2015; Amec Foster Wheeler, 2016);
- The PA for Austin Bergstrom AASF (AECOM, 2020);
- 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, 2021a); 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). Temporal boundaries were limited to the spring season, which was the earliest available time field resources were available to complete the study.

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, 2021a).

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, 2021a).

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, Austin Bergstrom Army Aviation Support Facility, Austin, Texas* dated July 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Austin Bergstrom Army Aviation Support Facility, Austin, Texas* dated April 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan, Austin Bergstrom Army Aviation Support Facility, Austin, Texas* dated June 2021 (AECOM, 2021b).

The SI field activities were conducted from 7 to 10 June 2021 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as noted in **Section 5.8**.

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:

- Twenty-eight (28) soil samples from 15 boring locations;
- Six grab groundwater samples from six temporary well locations; and
- Fifteen (15) 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**, and a Nonconformance and Corrective Action Report is provided in **Appendix B4**. 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 5 January 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, TXARNG, USACE, Texas Commission on Environmental Quality (TCEQ), and representatives familiar with the facility, the regulations, and the community. 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, 2021a).

A TPP Meeting 3 was held after the field event to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** 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's drilling subcontractor, WEST Drilling placed a ticket with the Texas811 utility clearance provider to notify them of intrusive work on 16 April 2021. 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 3 June and 7 June 2021 with input from the AECOM field team and Austin Bergstrom 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

A potable water source at Austin Bergstrom AASF was sampled on 28 April 2021 to assess usability for decontamination of drilling equipment. Results of the sample collected (ABF-PW-01) confirmed this source to be acceptable for use in this investigation; 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 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, 2021a). 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 direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2021a). A GeoProbe® 4822T 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 5 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 5-1**.

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 mid-point between the surface and the groundwater table.

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 boring logs (**Appendix E**) 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.

Soil borings completed during the SI found lean clay with sand and gravel as the dominant lithology of the unconsolidated sediments below the Austin Bergstrom AASF. The borings were completed at depths between 24 and 28 feet bgs. Layers of sand, gravel, and silt were also observed in the boring logs at thicknesses ranging from a few inches to several feet. These observations are consistent with the understood depositional environment of the region.

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, 2021a).

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 during shipment.

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) using bentonite chips at completion of sampling activities.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® 4822T DPT drilling rig equipped with hollow stem auger capabilities to accommodate the installation of 2-inch well casing. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-foot section of 2-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge period, groundwater samples were collected using a bladder pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were 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, 2021a).

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.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with bentonite chips. Upon completion of well abandonment, the ground surface at each location was patched to match existing surrounding conditions.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed between 7 June to 10 June 2021. Groundwater elevation measurements were collected from the six new temporary 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**.

5.5 Surveying

The northern side of each well casing was surveyed by Texas-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 10 June 2021 in the applicable Universal Transverse Mercator 14 zone projection with World Geodetic System 84 datum (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, 2021a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., drill cuttings) generated during SI activities were containerized in properly labeled 55-gallon drums and stored next to the Hazardous Materials Storage Containers at the facility. ARNG G-9 will manage disposal of the solid IDW and will coordinate with TXARNG to ensure proper disposal in accordance with Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Liquid IDW (i.e., purge water and decontamination fluids) generated during SI activities was containerized in properly-labeled 55-gallon drums and stored next to the Hazardous Materials Storage Containers at the facility. 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 until the analytical results for the associated groundwater samples are available. ARNG G-9 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 TCEQ to ensure proper disposal 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**):

- Upon review of field documentation, it was discovered that soil sample AO01-01-SB-28 collected for grain size analysis was inadvertently not logged in by the lab during sample check in and therefore, not analyzed. The SI QAPP Addendum states that grain size analysis would be performed in up to one soil sample per AOI where extensive horizontal and vertical clay units are identified by the field geologist, if these conditions are encountered in the field. As a result, AECOM will use information from the photo log and boring logs to understand geologic conditions at the facility. Additionally, this discrepancy does not affect the determination of whether further investigation of the AOI is needed in a Remedial Investigation. This action was documented in a nonconformance and corrective action report provided in **Appendix B4**.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Austin Bergstrom AASF, Austin, Texas

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)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-00-02	6/9/2021 12:50	0-2	x				
AOI01-01-SB-06-08	6/9/2021 13:30	6-8	x				
AOI01-01-SB-06-08-D	6/9/2021 13:30	6-8	x				Field Duplicate
AOI01-01-SB-13-15	6/9/2021 14:00	13-15	x	x	x		
AOI01-01-SB-13-15-D	6/9/2021 14:00	13-15	x	x	x		Field Duplicate
AOI01-01-SB-13-15-MS	6/9/2021 14:00	13-15	x	x	x		MS/MSD
AOI01-01-SB-13-15-MSD	6/9/2021 14:00	13-15	x	x	x		MS/MSD
AOI01-01-SB-28	6/9/2021 14:30	28				x	
AOI01-02-SB-00-02	6/7/2021 16:00	0-2	x				
AOI01-02-SB-00-02-D	6/7/2021 16:00	0-2	x				Field Duplicate
AOI01-02-SB-00-02-MS	6/7/2021 16:00	0-2	x				MS/MSD
AOI01-02-SB-00-02-MSD	6/7/2021 16:00	0-2	x				MS/MSD
AOI02-01-SB-00-02	6/7/2021 9:18	0-2	x	x	x		
AOI02-02-SB-00-02	6/7/2021 9:50	0-2	x				
AOI02-03-SB-00-02	6/7/2021 10:20	0-2	x				
AOI03-01-SB-00-01	6/8/2021 11:30	0-1	x				
AOI03-02-SB-00-01	6/8/2021 12:00	0-1	x	x	x		
AOI03-03-SB-00-02	6/7/2021 15:10	0-2	x				
AOI04-01-SB-00-02	6/8/2021 15:40	0-2	x	x	x		
AOI04-02-SB-00-02	6/8/2021 15:10	0-2	x				
ABF-01-SB-00-02	6/8/2021 11:55	0-2	x				
ABF-01-SB-07-09	6/8/2021 12:40	7-9	x				
ABF-01-SB-13-15	6/8/2021 12:35	13-15	x				
ABF-02-SB-00-02	6/8/2021 16:00	0-2	x				
ABF-02-SB-07-09	6/8/2021 16:30	7-9	x				
ABF-02-SB-13-15	6/8/2021 16:25	13-15	x				
ABF-03-SB-00-02	6/9/2021 8:45	0-2	x				
ABF-03-SB-07-09	6/9/2021 9:20	7-9	x				
ABF-03-SB-13-15	6/9/2021 9:15	13-15	x				
ABF-04-SB-00-02	6/7/2021 14:40	0-2	x				
ABF-04-SB-06-08	6/7/2021 16:05	6-8	x				
ABF-04-SB-12-14	6/7/2021 16:00	12-14	x				
ABF-05-SB-00-02	6/8/2021 8:08	0-2	x				
ABF-05-SB-06-08	6/8/2021 8:50	6-8	x				
ABF-05-SB-12-14	6/8/2021 8:45	12-14	x				
Groundwater Samples							
AOI01-01-GW	6/9/2021 17:40	26.5	x				
AOI01-01-GW-D	6/9/2021 17:40	26.5	x				Field Duplicate
AOI01-01-GW-MS	6/9/2021 17:40	26.5	x				MS/MSD
AOI01-01-GW-MSD	6/9/2021 17:40	26.5	x				MS/MSD
ABF-01-GW	6/8/2021 17:50	22.30	x				
ABF-02-GW	6/9/2021 10:25	23	x				
ABF-03-GW	6/10/2021 7:30	25	x				
ABF-04-GW	6/8/2021 9:45	24	x				
ABF-05-GW	6/8/2021 14:00	17.81	x				
Quality Control Samples							
ABF-PW-01	4/28/2021 9:30	NA	x				Decon Source
ABF-ERB-01	6/7/2021 14:35	NA	x				Hand Auger
ABF-ERB-02	6/8/2021 12:30	NA	x				Bladder Pump
ABF-ERB-03	6/9/2021 7:35	NA	x				Drill Shoe
ABF-FRB-01	6/8/2021 9:32	NA	x				Field Blank

Notes:
AOI = Area of Interest
AASF = Army Aviation Support Facility
ABF = Austin Bergstrom Facility
ASTM = American Society for Testing and Materials
bgs = below ground surface
D = duplicate
ERB = equipment rinsate blank
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
pH = potential for hydrogen
QSM = Quality Systems Manual
SB = soil boring
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

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Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Austin Bergstrom AASF, Austin Texas

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary 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	28	22.67-27.67	477.03	476.2	19.88	19.05	457.15
	AOI01-02	2	NA	NA	NA	NA	NA	NA
2	AOI02-01	2	NA	NA	NA	NA	NA	NA
	AOI02-02	2	NA	NA	NA	NA	NA	NA
	AOI02-03	2	NA	NA	NA	NA	NA	NA
3	AOI03-01	2	NA	NA	NA	NA	NA	NA
	AOI03-02	1	NA	NA	NA	NA	NA	NA
	AOI03-03	1	NA	NA	NA	NA	NA	NA
4	AOI04-01	2	NA	NA	NA	NA	NA	NA
	AOI04-02	2	NA	NA	NA	NA	NA	NA
Facility Boundary	ABF-01	24	18.26-23.26	476.64	475.6	17.17	16.13	459.47
	ABF-02	25	20.5-25.5	474.65	473.7	17.48	16.53	457.17
	ABF-03	25	20.18-25.18	473.47	473.4	17.65	17.58	455.82
	ABF-04	25	19.32-24.32	476.18	475.0	20.39	19.21	455.79
	ABF-05	24	12.0-17.0	472.61	470.8	16.17	14.36	456.44

Notes:
AOI = Area of Interest
AASF = Army Aviation Support Facility
ABF = Austin Bergstrom Facility
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

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CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
REVISED	8/1/2022	GIS BY	MS	8/1/2022
SCALE	1:3,600	CHK BY	MC	8/1/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/1/2022

N

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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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 6.7**. **Table 6-2** through **Table 6-4** 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 against 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: Maintenance Hangar. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-4**. 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 6-3** summarize the soil results.

Soil was sampled surface soil (0 to 2 feet bgs) from boring locations AOI01-01 and AOI01-02. Soil was also sampled from subsurface soil (6 to 8 feet bgs and 13 to 15 feet bgs) from boring location AOI01-01. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected at locations AOI01-01 and AOI01-02, with concentrations of 0.440 J micrograms per kilogram (µg/kg) and 0.888 J µg/kg, respectively. PFOS was detected at location AOI01-01, with a concentration of 1.13 J µg/kg. PFHxS was detected at location AOI01-01, with a concentration of 0.594 J µg/kg. PFNA was detected at locations AOI01-01 and AOI01-02, with concentrations of 0.311 J µg/kg and 0.748 J µg/kg, respectively. PFBS was detected at location AOI01-01, with a concentration of 0.051 J µg/kg. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil.

Soil was also sampled from surface soil (0 to 2 feet bgs) at the facility boundary locations ABF-01 through ABF-04. Soil sample ABF-01 was upgradient of AOI 1 and ABF-02 through ABF-04 were downgradient of AOI 1. Soil was also sampled from subsurface soil at all four locations with intervals of 7 to 9 feet bgs and 13 to 15 feet bgs at ABF-01 through ABF-03, and intervals of 6 to 8 feet bgs and 12 to 14 feet bgs at ABF-04. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected at all four locations, with concentrations ranging from 0.133 J µg/kg to 0.263 J µg/kg. PFOS was detected at all four locations, with concentrations ranging from 0.390 J µg/kg to 0.773 J µg/kg. PFHxS was detected at three locations (ABF-01, ABF-03, ABF-04), with concentrations ranging from 0.079 J µg/kg to 0.115 J µg/kg. PFNA was detected at all four locations, with concentrations ranging from 0.027 J µg/kg to 0.065 J µg/kg. PFBS was detected at locations ABF-03 and ABF-04, with concentrations of 0.029 J µg/kg and 0.062 J µg/kg, respectively. PFOS and PFHxS were detected in subsurface soil at concentrations below their respective SLs. PFOS was detected below the SL of 160 µg/kg at location ABF-01 (13 to 15 feet bgs), with a concentration of 2.55 µg/kg. PFHxS was detected below the SL of 1,600 µg/kg at location ABF-01 (13 to 15 feet bgs),

with a concentration of 0.045 J µg/kg. PFOA, PFNA, and PFBS were not detected in 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 6-4** summarizes the groundwater results.

Within AOI 1, groundwater was sampled from temporary monitoring well location AOI01-01. PFOA, PFOS, PFHxS, and PFNA were detected in groundwater at concentrations exceeding their respective SLs. PFOA was detected above the SL of 6 nanograms per liter (ng/L), with a maximum concentration of 44.8 J+ ng/L in the field duplicate sample (AOI01-01-GW-D). PFOS was detected above the SL of 4 ng/L, with a concentration of 578 ng/L. PFHxS was detected above the SL of 39 ng/L, with a concentration of 240 J+ ng/L. PFNA was detected above the SL of 6 ng/L, with a concentration of 9.30 J+ ng/L. PFBS was detected below the SL of 601 ng/L, with a concentration of 17.7 J+ ng/L.

Groundwater was also sampled at the facility boundary from four temporary monitoring well locations ABF-01 through ABF-04. Groundwater sample ABF-01 was upgradient of AOI 1 and ABF-02 through ABF-04 were downgradient of AOI 1. PFOA, PFOS, and PFHxS were detected in groundwater at concentrations exceeding their respective SLs. PFOA was detected above the SL of 6 ng/L at all four locations, with concentrations ranging from 7.53 ng/L to 24.8 ng/L. PFOS was detected above the SL of 4 ng/L at all four locations, with concentrations ranging from 59.2 ng/L to 273 ng/L. PFHxS was detected above the SL of 39 ng/L at locations ABF-01 and ABF-02, with concentrations of 77.4 ng/L to 176 ng/L, respectively. Additionally, PFHxS was detected below the SL at locations ABF-03 and ABF-04, with concentrations of 16.2 ng/L and 38.2 ng/L, respectively. PFNA was detected below the SL of 6 ng/L at all four locations, with concentrations ranging from 2.25 J ng/L to 5.98 ng/L. PFBS was detected below the SL of 601 ng/L at all four locations, with concentrations ranging from 1.59 J ng/L to 13.9 ng/L.

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 respective SLs. PFOA, PFOS, PFHxS, and PFNA were detected in groundwater at concentrations above their respective 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: Wash Rack. The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. 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 6-3** summarize the soil results.

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI02-01, AOI02-02, and AOI02-03. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected at location AOI02-01, with a concentration of 0.207 J µg/kg. PFOS was detected at all three locations, with concentrations ranging from 0.114 J µg/kg to 3.02 µg/kg. PFHxS was detected at all three locations, with concentrations ranging from 0.063 J µg/kg to 1.43 µg/kg. PFNA was detected at locations

AOI02-01 and AOI02-03, with concentrations of 0.040 J µg/kg and 0.027 J µg/kg, respectively. PFBS was not detected in surface soil.

Soil was also sampled from surface soil (0 to 2 feet bgs) at facility boundary location ABF-05, which was downgradient of AOI 2. Soil was also sampled from subsurface soil at the location with intervals of 6 to 8 feet bgs and 12 to 14 feet bgs. PFOS, PFHxS, and PFBS were detected in surface soil below their respective SLs. PFOS was detected with a concentration of 0.090 J µg/kg. PFHxS was detected with a concentration of 0.038 J µg/kg. PFBS was detected with a concentration of 0.025 J µg/kg. PFOA and PFNA were not detected in surface soil. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil.

6.4.2 AOI 2 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled at the facility boundary from temporary monitoring well location ABF-05, which was downgradient of AOI 2. PFOA, PFOS, and PFNA were detected in groundwater, at concentrations exceeding their respective SLs. PFOA was detected above the SL of 6 ng/L, with a concentration of 11.9 ng/L. PFOS was detected above the SL of 4 ng/L, with a concentration of 591 ng/L. PFNA was detected above the SL of 6 ng/L, with a concentration of 6.16 ng/L. PFHxS was detected below the SL of 39 ng/L, with a concentration of 35.8 ng/L. PFBS was detected below the SL of 601 ng/L, with a concentration of 1.78 J ng/L.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil at concentrations below their respective SLs. PFOA, PFOS, and PFNA were detected in groundwater downgradient of AOI 2 at concentrations above their respective 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: Fixed Wing Support Hangar and the Storage Hangar. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-4**. 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 6-3** summarize the soil results.

At the Fixed Wing Support Hangar, soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI03-01 and AOI03-02. PFOA, PFOS, and PFNA were detected in surface soil at concentrations below their respective SLs. PFOA was detected at locations AOI03-01 and AOI03-02, with concentrations of 0.186 J µg/kg and 0.321 J µg/kg, respectively. PFOS was detected at both locations AOI03-01 and AOI03-02, with concentrations of 0.264 J µg/kg and 0.132 J µg/kg, respectively. PFNA was detected at locations AOI03-01 and AOI03-02, with concentrations of 0.096 J µg/kg and 0.232 J µg/kg, respectively. PFHxS and PFBS were not detected at either location.

At the Storage Hangar, soil was sampled from surface soil (0 to 2 feet bgs) from boring location AOI03-03. PFOA, PFOS, and PFNA were detected in surface soil at concentrations below their

respective SLs. PFOA was detected with a concentration of 0.336 J µg/kg. PFOS was detected with a concentration of 0.324 J µg/kg. PFNA was detected with a concentration of 0.646 J µg/kg. PFHxS and PFBS were not detected at AOI03-03.

Soil was sampled from surface soil (0 to 2 feet bgs) at the facility boundary location ABF-04, which was downgradient of AOI 3. Soil was also sampled from subsurface soil at the location with intervals of 6 to 8 feet bgs and 12 to 14 feet bgs. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected with a concentration of 0.133 J µg/kg. PFOS was detected with a concentration of 0.390 J µg/kg. PFHxS was detected with a concentration of 0.079 J µg/kg. PFNA was detected with a concentration of 0.027 J µg/kg. PFBS was detected with a concentration of 0.062 J µg/kg. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil at ABF-04.

6.5.2 AOI 3 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled at the facility boundary from temporary monitoring well location ABF-04, which was downgradient of AOI 3. PFOA and PFOS were detected in groundwater at concentrations exceeding their respective SLs. PFOA was detected above the SL of 6 ng/L, with a concentration of 7.53 ng/L. PFOS was detected above the SL of 4 ng/L, with a concentration of 130 ng/L. PFHxS was detected below the SL of 39 ng/L, with a concentration of 38.2 ng/L. PFNA was detected below the SL of 6 ng/L, with a concentration of 2.25 J ng/L. PFBS was detected below the SL of 601 ng/L, with a concentration of 5.42 ng/L.

6.5.3 AOI 3 Conclusions

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

6.6 AOI 4

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 4: Hazardous Materials Storage Building and Fuel Station. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.6.1 AOI 4 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-3** summarize the soil results.

At the Hazardous Materials Storage Building, soil was sampled from surface soil (0 to 2 feet bgs) from boring location AOI04-01. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected with a concentration of 0.611 J µg/kg. PFOS was detected with a concentration of 1.00 J µg/kg. PFHxS was detected with a concentration of 0.093 J µg/kg. PFNA was detected with a concentration of 0.042 J µg/kg. PFBS was detected with a concentration of 0.038 J µg/kg.

At the Fuel Station, soil was sampled from surface soil (0 to 2 feet bgs) from boring location AOI04-02. PFOA, PFOS, PFHxS, and PFNA were detected in surface soil at concentrations below

their respective SLs. PFOA was detected with a concentration of 0.189 J µg/kg. PFOS was detected with a concentration of 0.597 J µg/kg. PFHxS was detected with a concentration of 0.118 J µg/kg. PFNA was detected with a concentration of 0.054 J µg/kg. PFBS was not detected at AOI04-02.

Soil was sampled from surface soil (0 to 2 feet bgs) at the facility boundary locations ABF-01 through ABF-03. Soil sample ABF-01 was upgradient of AOI 4, and ABF-02 through ABF-03 were downgradient of AOI 4. Soil was also sampled from subsurface soil at all three locations, with intervals of 7 to 9 feet bgs and 13 to 15 feet bgs. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at concentrations below their respective SLs. PFOA was detected at all three locations, with concentrations ranging from 0.156 J µg/kg to 0.263 J µg/kg. PFOS was detected at all three locations, with concentrations ranging from 0.420 J µg/kg to 0.773 J µg/kg. PFHxS was detected at locations ABF-01 and ABF-03, with concentrations of 0.115 J µg/kg and 0.087 J µg/kg, respectively. PFNA was detected at all three locations, with concentrations ranging from 0.028 J µg/kg to 0.065 J µg/kg. PFBS was detected at location ABF-03 with a concentration of 0.029 J µg/kg. PFOS and PFHxS were detected in subsurface soil at concentrations below their respective SLs. PFOS was detected below the SL of 160 µg/kg at location ABF-01 (13 to 15 feet bgs), with a concentration of 2.55 µg/kg. PFHxS was detected below the SL of 1,600 µg/kg at location ABF-01 (13 to 15 feet bgs), with a concentration of 0.045 J µg/kg. PFOA, PFNA, and PFBS were not detected in subsurface soil.

6.6.2 AOI 4 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled at the facility boundary from three temporary monitoring well locations, ABF-01 through ABF-03. Groundwater sample ABF-01 was upgradient of AOI 4 and ABF-02 through ABF-03 were downgradient of AOI 4. PFOA, PFOS, and PFHxS were detected in groundwater at concentrations exceeding their respective SLs. PFOA was detected above the SL of 6 ng/L at all three locations, with concentrations ranging from 7.89 ng/L to 24.8 ng/L. PFOS was detected above the SL of 4 ng/L at all three locations, with concentrations ranging from 59.2 ng/L to 273 ng/L. PFHxS was detected above the SL of 39 ng/L at locations ABF-01 and ABF-02, with concentrations of 77.4 ng/L and 176 ng/L, respectively. Additionally, PFHxS was detected below the SL at location ABF-03, with a concentration of 16.2 ng/L. PFNA was detected below the SL of 6 ng/L at all three locations, with concentrations ranging from 3.31 J ng/L to 5.98 ng/L. PFBS was detected below the SL of 601 ng/L at all three locations, with concentrations ranging from 1.59 J ng/L to 13.9 ng/L.

6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil below their respective SLs. PFOA, PFOS, PFHxS and PFNA were detected in groundwater upgradient and downgradient of AOI 4 at concentrations above their respective SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 4 is warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Austin Bergstrom Army Aviation Support Facility

Area of Interest		AOI01						AOI02						AOI03						AOI04	
Sample ID		AOI01-01-SB-00-02		AOI01-02-SB-00-02		AOI01-02-SB-00-02-D		AOI02-01-SB-00-02		AOI02-02-SB-00-02		AOI02-03-SB-00-02		AOI03-01-SB-00-01		AOI03-02-SB-00-01		AOI03-03-SB-00-02		AOI04-01-SB-00-02	
Sample Date		06/09/2021		06/07/2021		06/07/2021		06/07/2021		06/07/2021		06/07/2021		06/08/2021		06/08/2021		06/07/2021		06/08/2021	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-1 ft		0-1 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	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	1900	0.051	J	ND	UJ	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.038	J
PFHxS	130	0.594	J	ND	UJ	ND	U	1.43		0.063	J	0.090	J	ND	U	ND	U	ND	U	0.093	J
PFNA	19	0.311	J	0.055	J	0.748	J	0.040	J	ND	U	0.027	J	0.096	J	0.232	J	0.646	J	0.042	J
PFOA	19	0.440	J	0.128	J	0.888	J	0.207	J	ND	U	ND	U	0.186	J	0.321	J	0.336	J	0.611	J
PFOS	13	1.13	J	ND	U	ND	U	3.02		0.114	J	0.306	J	0.264	J	0.132	J	0.324	J	1.00	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

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.

Notes

Full analytical results for all compounds detected by QSM 5.3 Table B-15, including detection limits, are included in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

ABF	Austin Bergstrom 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, Austin Bergstrom Army Aviation Support Facility

Area of Interest		AOI04		Sitewide									
Sample ID		AOI04-02-SB-00-02		ABF-01-SB-00-02		ABF-02-SB-00-02		ABF-03-SB-00-02		ABF-04-SB-00-02		ABF-05-SB-00-02	
Sample Date		06/08/2021		06/08/2021		06/08/2021		06/09/2021		06/07/2021		06/08/2021	
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	U	ND	U	ND	U	0.029	J	0.062	J	0.025	J
PFHxS	130	0.118	J	0.115	J	ND	U	0.087	J	0.079	J	0.038	J
PFNA	19	0.054	J	0.065	J	0.028	J	0.051	J	0.027	J	ND	U
PFOA	19	0.189	J	0.184	J	0.263	J	0.156	J	0.133	J	ND	U
PFOS	13	0.597	J	0.585	J	0.773	J	0.420	J	0.390	J	0.090	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

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.

Notes

Full analytical results for all compounds detected by QSM 5.3 Table B-15, including detection limits, are included in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

ABF	Austin Bergstrom 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, Austin Bergstrom Army Aviation Support Facility

Area of Interest		AOI01								Sitewide											
Sample ID		AOI01-01-SB-06-08		AOI01-01-SB-06-08-D		AOI01-01-SB-13-15		AOI01-01-SB-13-15-D		ABF-01-SB-07-09		ABF-01-SB-13-15		ABF-02-SB-07-09		ABF-02-SB-13-15		ABF-03-SB-07-09		ABF-03-SB-13-15	
Sample Date		06/09/2021		06/09/2021		06/09/2021		06/09/2021		06/08/2021		06/08/2021		06/08/2021		06/08/2021		06/09/2021		06/09/2021	
Depth		6-8 ft		6-8 ft		13-15 ft		13-15 ft		7-9 ft		13-15 ft		7-9 ft		13-15 ft		7-9 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	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U	0.045	J	ND	U	ND	U	ND	U	ND	U
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	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U	ND	U	2.55		ND	U	ND	U	ND	U	ND	U

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

Notes

Full analytical results for all compounds detected by QSM 5.3 Table B-15, including detection limits, are included in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

ABF	Austin Bergstrom 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, Austin Bergstrom Army Aviation Support Facility

Area of Interest		Sitewide							
Sample ID		ABF-04-SB-06-08		ABF-04-SB-12-14		ABF-05-SB-06-08		ABF-05-SB-12-14	
Sample Date		06/07/2021		06/07/2021		06/08/2021		06/08/2021	
Depth		6-8 ft		12-14 ft		6-8 ft		12-14 ft	
Analyte	OSD Screening Level [a]	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
PFHxS	1600	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U

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

Notes

Full analytical results for all compounds detected by QSM 5.3 Table B-15, including detection limits, are included in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

ABF	Austin Bergstrom 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 Groundwater
Site Inspection Report, Austin Bergstrom Army Aviation Support Facility

Area of Interest		AOI01				Sitewide									
Sample ID		AOI01-01-GW		AOI01-01-GW-D		ABF-01-GW		ABF-02-GW		ABF-03-GW		ABF-04-GW		ABF-05-GW	
Sample Date		06/09/2021		06/09/2021		06/08/2021		06/08/2021		06/10/2021		06/08/2021		06/08/2021	
Analyte	OSD Screening Level [a]	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	16.2	J+	17.7	J+	7.51		13.9		1.59	J	5.42		1.78	J
PFHxS	39	209	J+	240	J+	77.4		176		16.2		38.2		35.8	
PFNA	6	8.27	J+	9.30	J+	3.31	J	5.98		3.35	J	2.25	J	6.16	
PFOA	6	37.6	J+	44.8	J+	16.7		24.8		7.89		7.53		11.9	
PFOS	4	501	J	578		111		273		59.2		130		591	

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

J+ = Estimated concentration, biased high

Notes

Full analytical results for all compounds detected by QSM 5.3 Table B-15, including detection limits, are included in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

ABF	Austin Bergstrom Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
GW	groundwater
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
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

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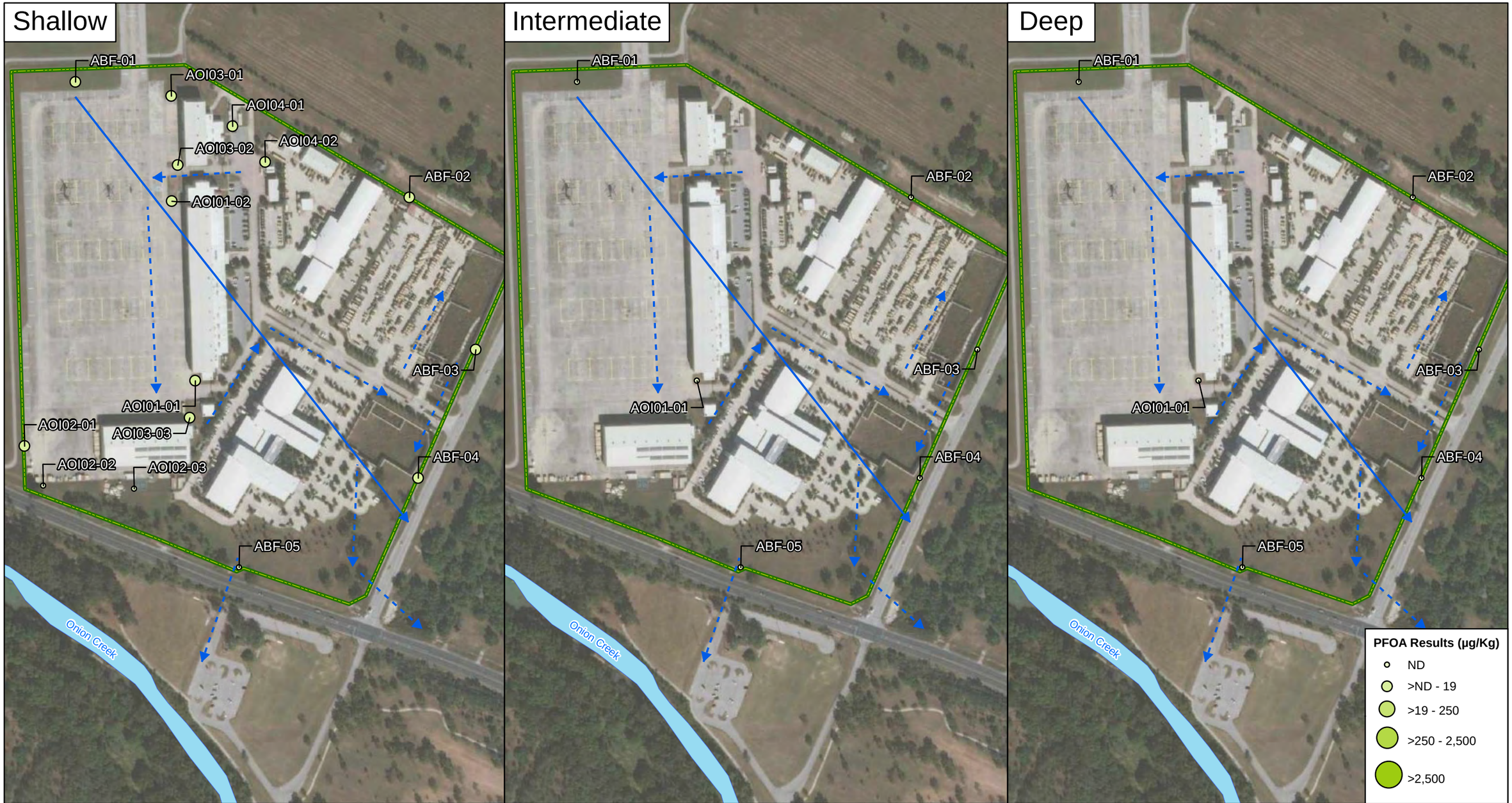

CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:4,320	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 180 360 720 Feet

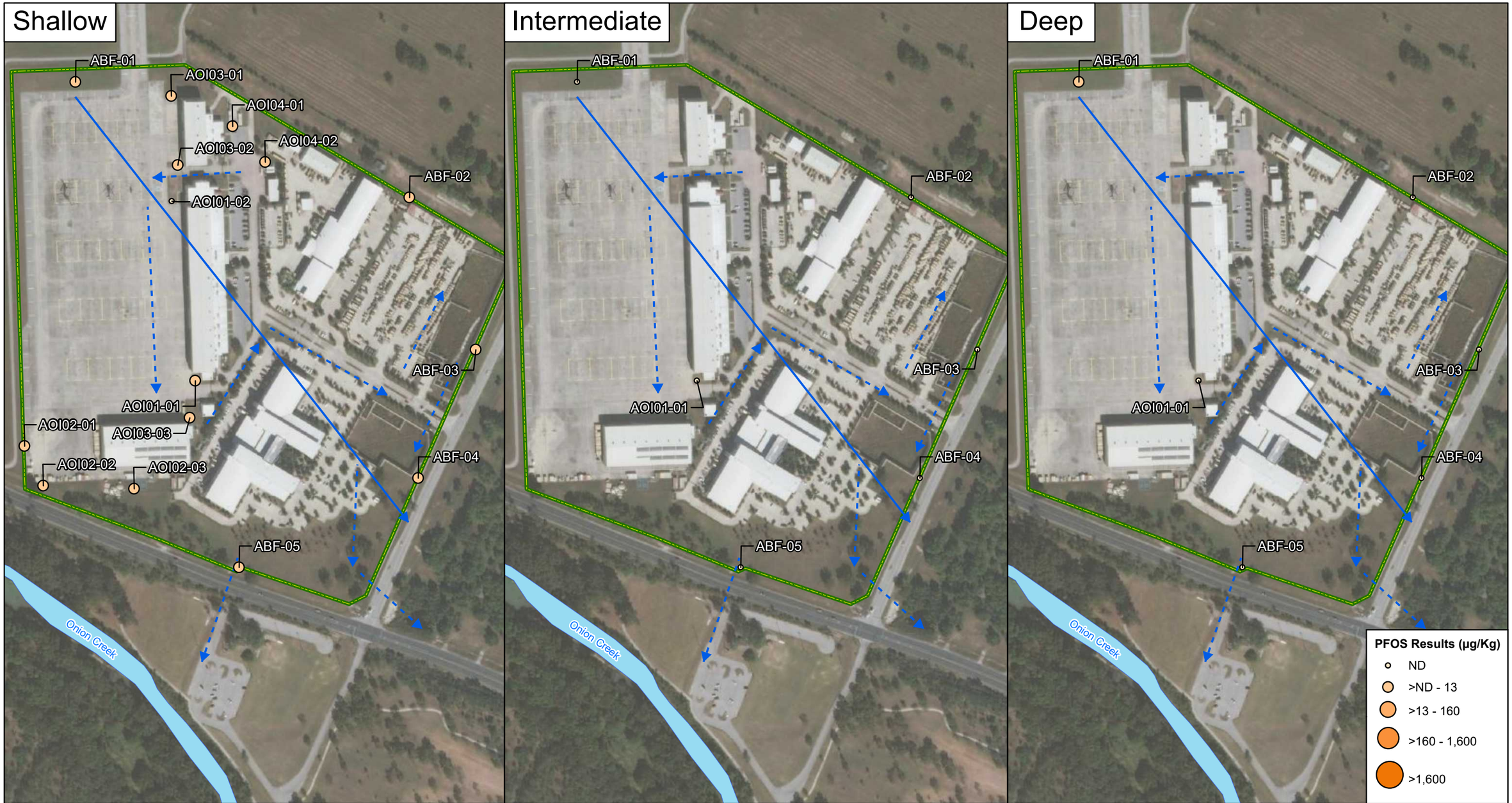
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:4,320	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 180 360 720 Feet

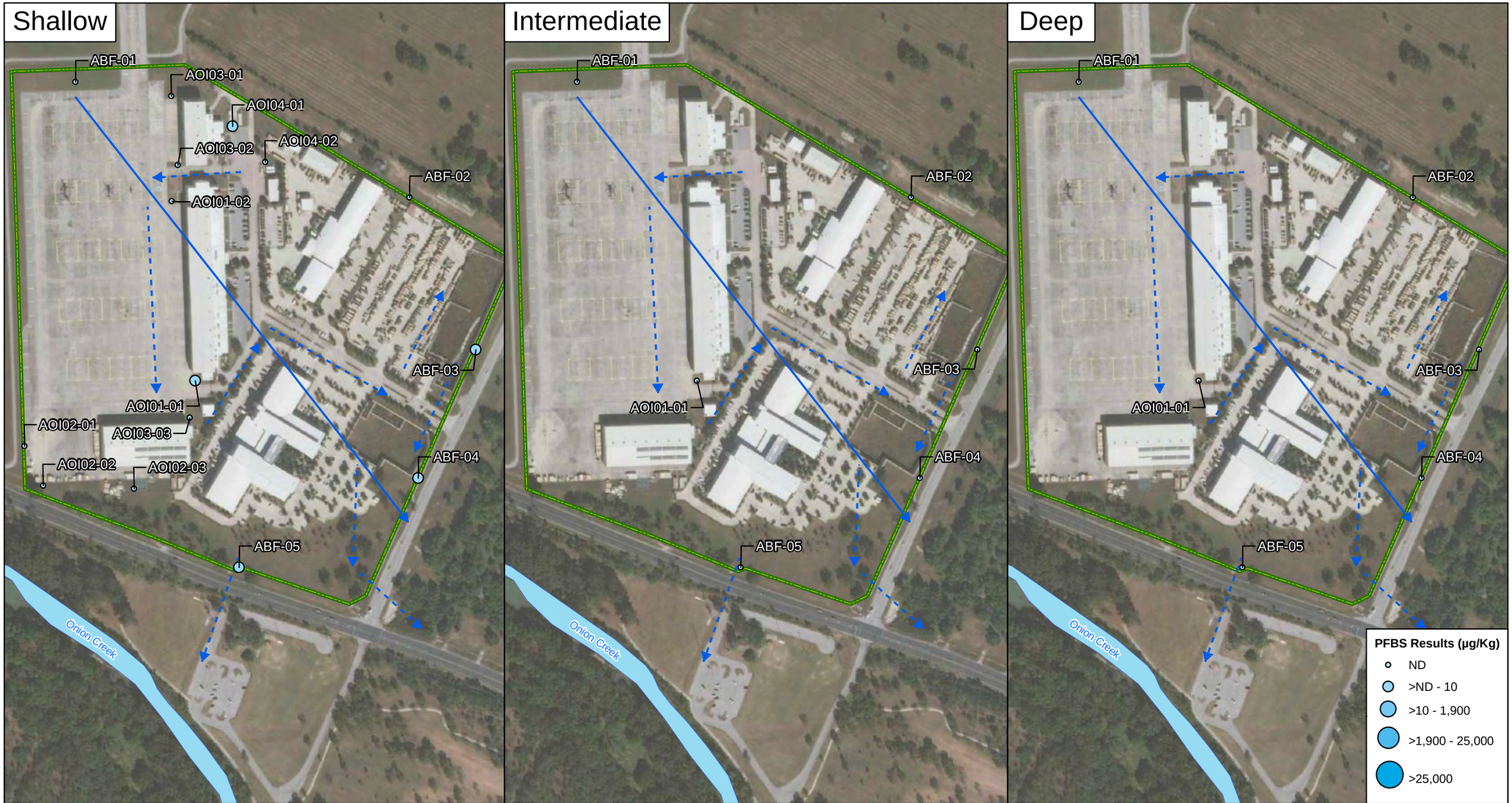
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:4,320	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 180 360 720 Feet

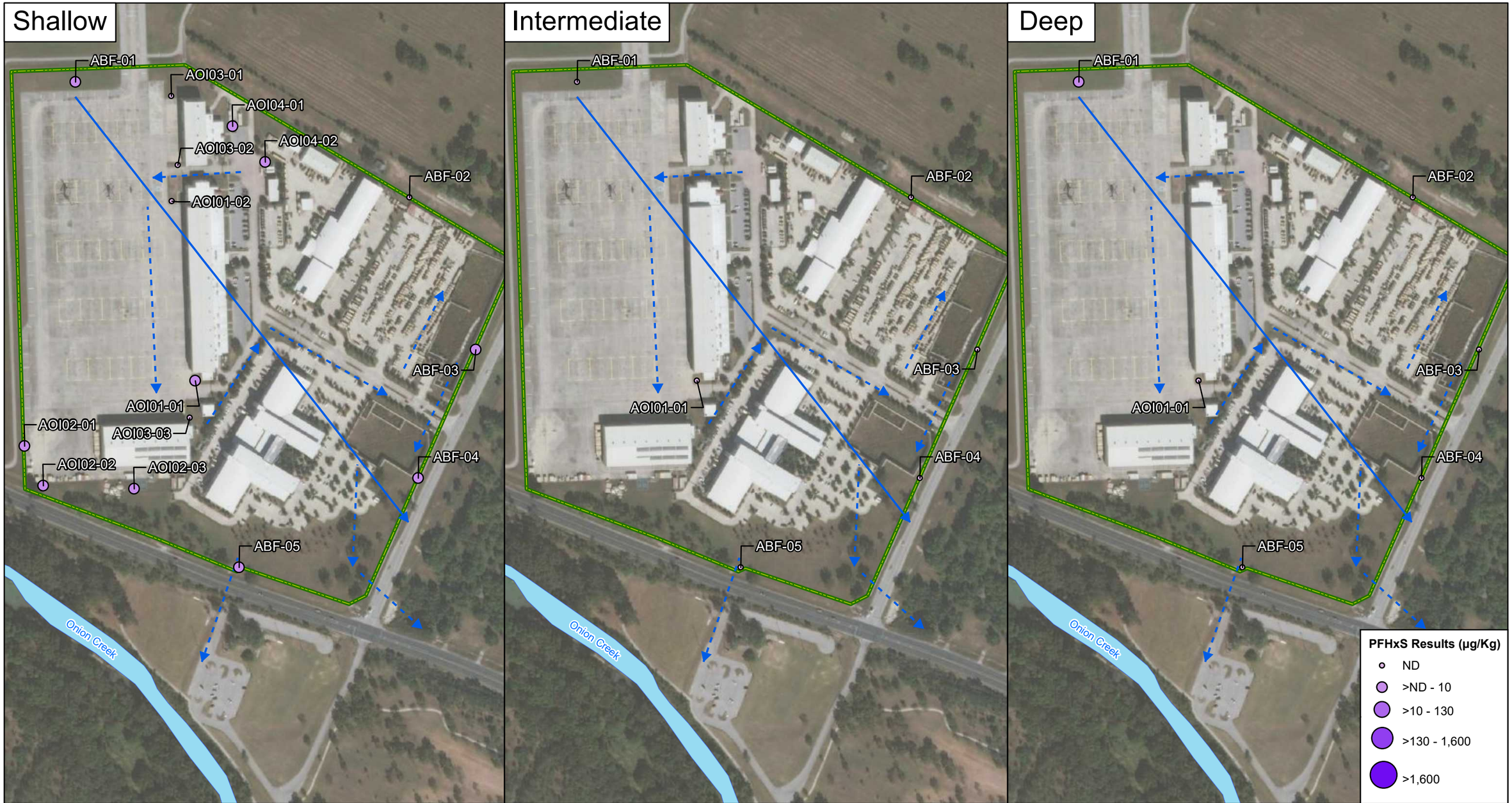
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFBS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-3



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:4,320	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 180 360 720 Feet

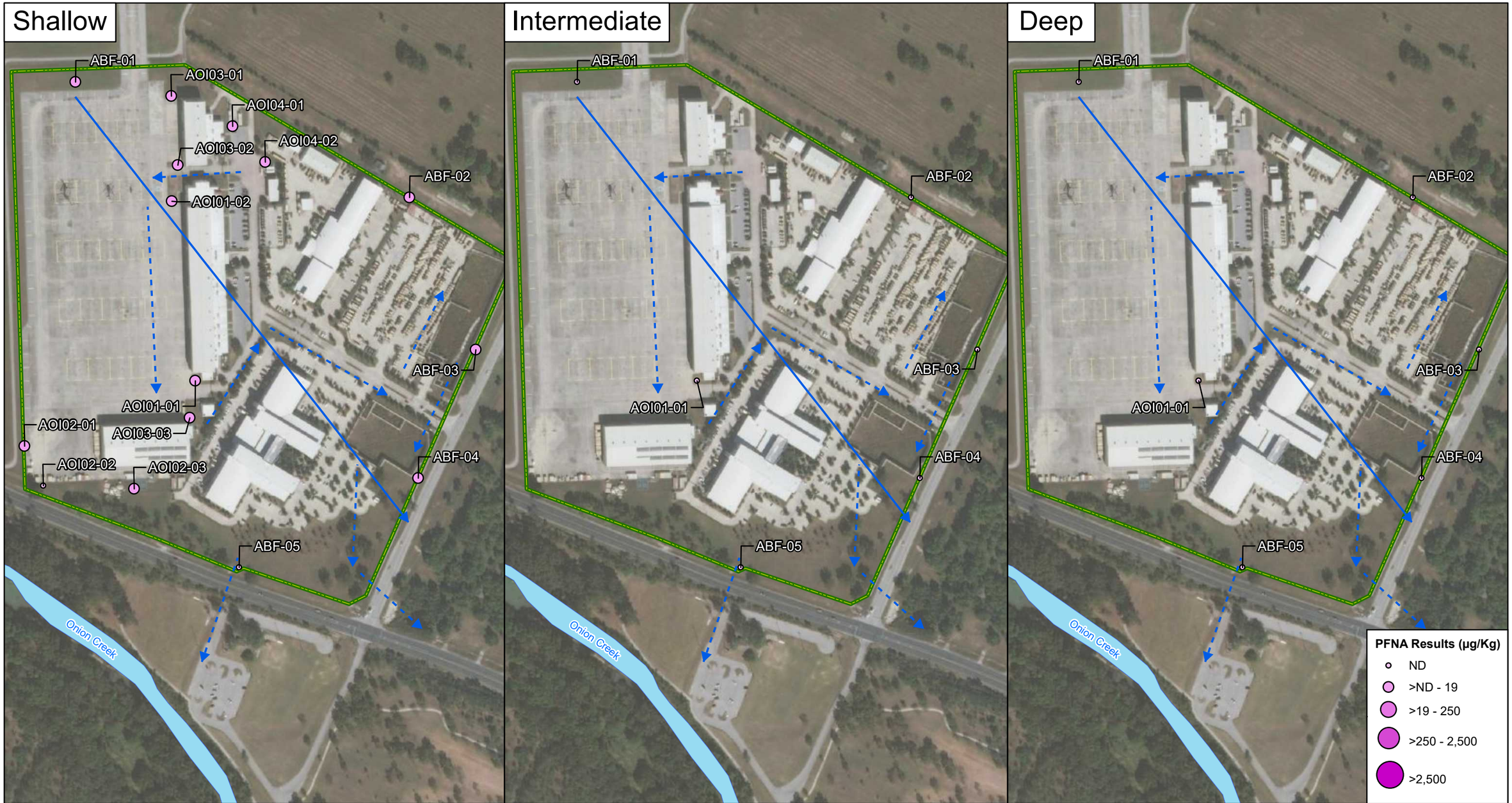
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFHxS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
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SCALE	1:4,320	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 180 360 720 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.

N

PFNA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-5

PFOA

PFOS

PFBS

ABF-01

ABF-02

ABF-03

ABF-04

ABF-05

AOI01-01

PFOA Results (ng/L)

- ND
- >ND - 6
- >6 - 40
- >40 - 70
- >70

PFOS Results (ng/L)

- ND
- >ND - 4
- >4 - 40
- >40 - 70
- >70

PFBS Results (ng/L)

- ND
- >ND - 100
- >100 - 601
- >601 - 2,000
- >2,000

CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
REVISED	10/13/2022	GIS BY	MS	10/13/2022
SCALE	1:3,840	CHK BY	MB	10/13/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/13/2022

- Facility Boundary
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction

0 160 320 640 Feet

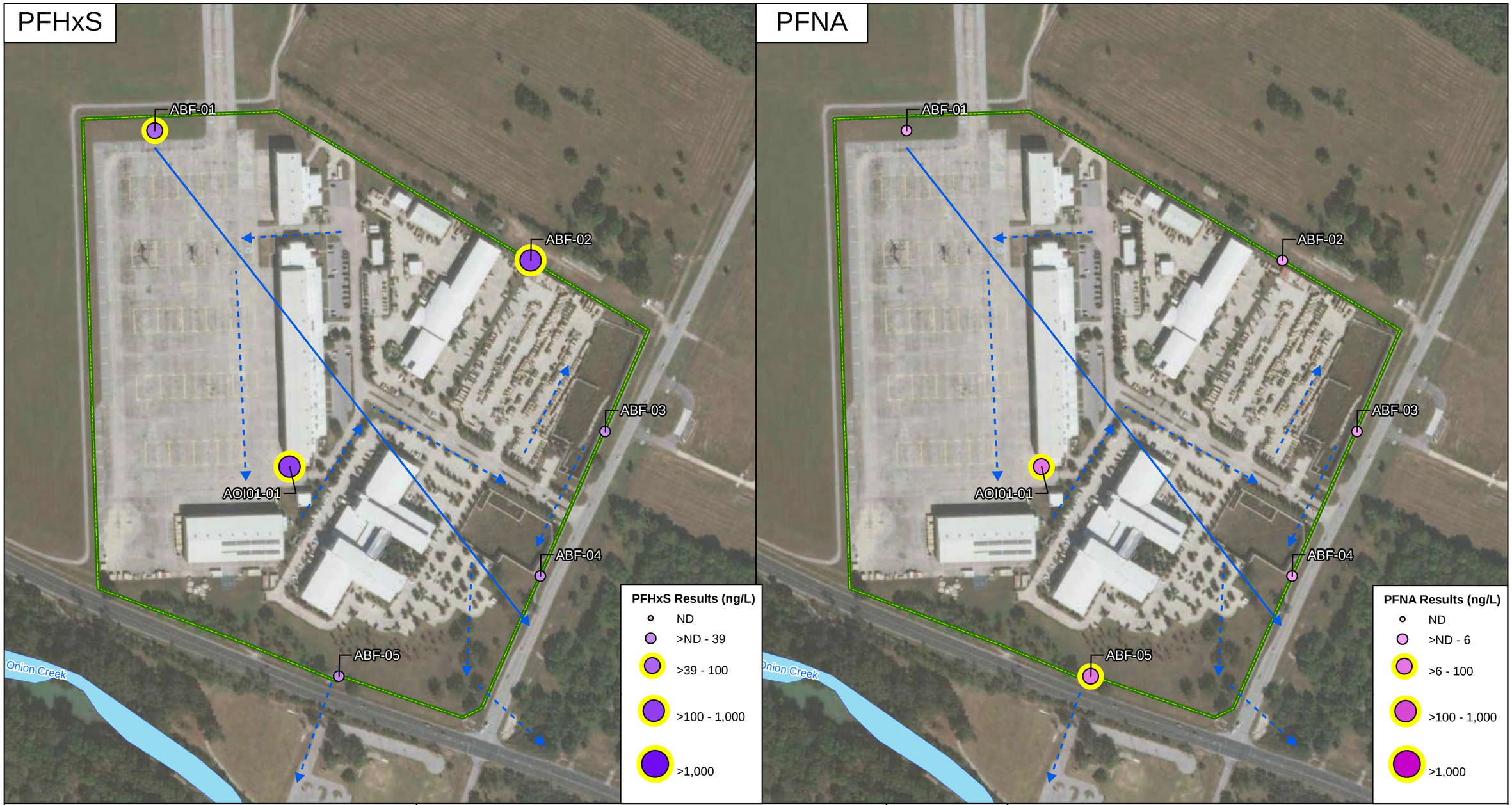
Exceedances of the OSD SL are depicted with a yellow halo.

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-6



CLIENT	ARNG			
PROJECT	Site Inspection at Austin Bergstrom AASF, TX			
REVISED	8/10/2022	GIS BY	MS	8/10/2022
SCALE	1:3,840	CHK BY	MB	8/10/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/10/2022

Facility Boundary
Water Body
Surface Water Flow Direction
Groundwater Flow Direction

0 160 320 640 Feet

N

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

PFHxS and PFNA Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

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** and **Figure 7-2**. 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 a 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, 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 through AOI 4 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Maintenance Hangar, where, in 2005, AFFF was released during testing of a newly installed fire suppression system and again in 2006 when a faulty sensor triggered the fire suppression system.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at AOI 1. Site workers, construction workers, or trespassers could contact constituents in soil via incidental ingestion, and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. PFOS and PFHxS were detected in shallow subsurface soil at location ABF-01 associated with AOI 1. Construction workers could contact constituents in subsurface soil via incidental ingestion and therefore, the subsurface exposure pathway for future construction workers is potentially complete. No current construction is known to be occurring at AOI 1. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is the Wash Rack, where, between 2005 and 2010, mobile fire extinguishers containing AFFF were stored. In 2009, AFFF was released at the Wash Rack during fire training activities.

PFOA, PFOS, PFHxS, and PFNA were detected in surface soil at AOI 2. Site workers, construction workers, or trespassers could contact constituents in surface soil via incidental ingestion, and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. No current construction is known to be occurring at AOI 2. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil at AOI 2; therefore, all exposure pathways are considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.1.3 AOI 3

AOI 3 consists of the Fixed Wing Support Hangar and the Storage Hangar. Although there are no recorded releases of AFFF at the Fixed Wing Support Hangar or the Storage Hangar, it is possible both fire suppression systems were tested in 2005 when the systems were installed and led to a release of AFFF.

PFOA, PFOS, and PFNA were detected in surface soil at AOI 3. Site workers, construction workers, or trespassers could contact constituents in surface soil via incidental ingestion, and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. No current construction is known to be occurring at AOI 3. PFOA, PFOS, PFHxS, PFNA, and PFBS were not detected in subsurface soil at AOI 3; therefore, all exposure pathways are considered incomplete. The CSM for AOI 3 is presented on **Figure 7-3**.

7.1.4 AOI 4

AOI 4 consists of the Hazardous Materials Storage Building and the Fuel Station. Although no known releases of PFAS-containing material have been recorded at either area, AFFF has historically been stored at the Hazardous Materials Storage Building and the Fuel Station.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at AOI 4. Site workers, construction workers, or trespassers could contact constituents in surface soil via incidental ingestion, and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. PFOS and PFHxS were detected in shallow subsurface soil at location ABF-01 associated with AOI 4. Construction workers could contact constituents in subsurface soil via incidental ingestion and therefore, the subsurface exposure pathway for future construction workers is potentially complete. No current construction is known to be occurring at AOI 4. The CSM for AOI 4 is presented on **Figure 7-1**.

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

PFOA, PFOS, PFHxS, and PFNA were detected above their respective SLs in groundwater samples collected at AOI 1. Additionally, PFOA, PFOS, and PFHxS were detected above their respective SLs in groundwater samples collected upgradient and downgradient of AOI 1. Due to the presence of downgradient domestic wells within a 4-mile radius of the facility, the ingestion exposure pathway is considered potentially complete for off-facility residents. Further, due to the depth of groundwater at the AOI (greater than 15 feet bgs), the exposure pathway for future construction workers to groundwater is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA, PFOS, and PFNA were detected above their respective SLs in a groundwater sample collected downgradient of AOI 2. Due to the presence of downgradient domestic wells within a 4-mile radius of the facility, the ingestion exposure pathway is considered potentially complete for off-facility residents. Due to the presence of shallow groundwater (less than 15 feet bgs), future construction workers may be exposed to contaminated groundwater under trenching scenarios. The CSM is presented on **Figure 7-2**.

7.2.3 AOI 3

PFOA and PFOS were detected above their respective SLs in a groundwater sample collected downgradient of AOI 3. Due to the presence of downgradient domestic wells within a 4-mile radius of the facility, the ingestion exposure pathway is considered potentially complete for off-facility residents. Further, due to the depth of groundwater at the AOI (greater than 15 feet bgs), the exposure pathway for future construction workers to groundwater is considered incomplete. The CSM for AOI 3 is presented on **Figure 7-1**.

7.2.4 AOI 4

PFOA, PFOS, and PFHxS were detected above their respective SLs in groundwater samples collected upgradient and downgradient of AOI 4. Due to the presence of downgradient domestic wells within a 4-mile radius of the facility, the ingestion exposure pathway is considered potentially complete for off-facility residents. Further, due to the depth of groundwater at the AOI (greater than 15 feet bgs), the exposure pathway for future construction workers to groundwater is considered incomplete. The CSM for AOI 4 is presented on **Figure 7-1**.

7.3 Surface Water and Sediment Exposure Pathway

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

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Surface water runoff at AOI 1 flows to the south towards Outfall #1 and discharges to Onion

Creek, a tributary to the Colorado River. Additionally, surface water flows to the northeast near the Storage Hangar before being routed to the southeast and eventually discharging to the AFRC Pond. Overflow from the AFRC pond historically discharged to Outfall #2. Outfall #2 discharged to a ditch running along the north side of Burleson Road and north of Onion Creek. Outfall #2 was capped, and no water from the AFRC Pond discharges to Outfall #1. Because PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and groundwater at AOI 1, it is possible that those compounds may have migrated from soil and groundwater to the south, towards Outfall #1 on the southern edge of the property via groundwater discharge or surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The Onion Creek ultimately discharges to the Colorado River. Due to potential recreational use, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

Surface water runoff at AOI 2 flows to the south towards Outfall #1 and discharges to Onion Creek, a tributary to the Colorado River. Because PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and groundwater at AOI 2, it is possible that those compounds may have migrated from soil and groundwater to the south, towards Outfall #1 on the southern edge of the property via groundwater discharge or surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The Onion Creek ultimately discharges to the Colorado River. Due to potential recreational use, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3.3 AOI 3

Surface water runoff at AOI 3 flows west towards AOI 1 and then south towards Outfall #1 and discharges to Onion Creek. Additionally, surface water flows to the northeast near the Storage Hangar before being routed to the southeast and discharging to the AFRC Pond and ultimately to Onion Creek. Because PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and were detected above SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the south, towards Outfall #1 on the southern edge of the property via groundwater discharge or surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The Onion Creek ultimately discharges to the Colorado River. Due to potential recreational use, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The CSM for AOI 3 is presented on **Figure 7-3**.

7.3.4 AOI 4

Similar to AOI 3, surface water runoff at AOI 4 flows west towards AOI 1 and then south towards Outfall #1 and discharges to Onion Creek. Additionally, surface water flows to the northeast near the Storage Hangar before being routed to the southeast and discharging to the AFRC Pond and ultimately to Onion Creek. Because PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and were detected above SLs in groundwater, it is possible that those compounds may have migrated from soil and groundwater to the south, towards Outfall #1 on the southern edge of the property via groundwater discharge or surface water runoff. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The Onion Creek ultimately discharges to the Colorado River.

Due to potential recreational use, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The CSM for AOI 4 is presented on **Figure 7-1**.

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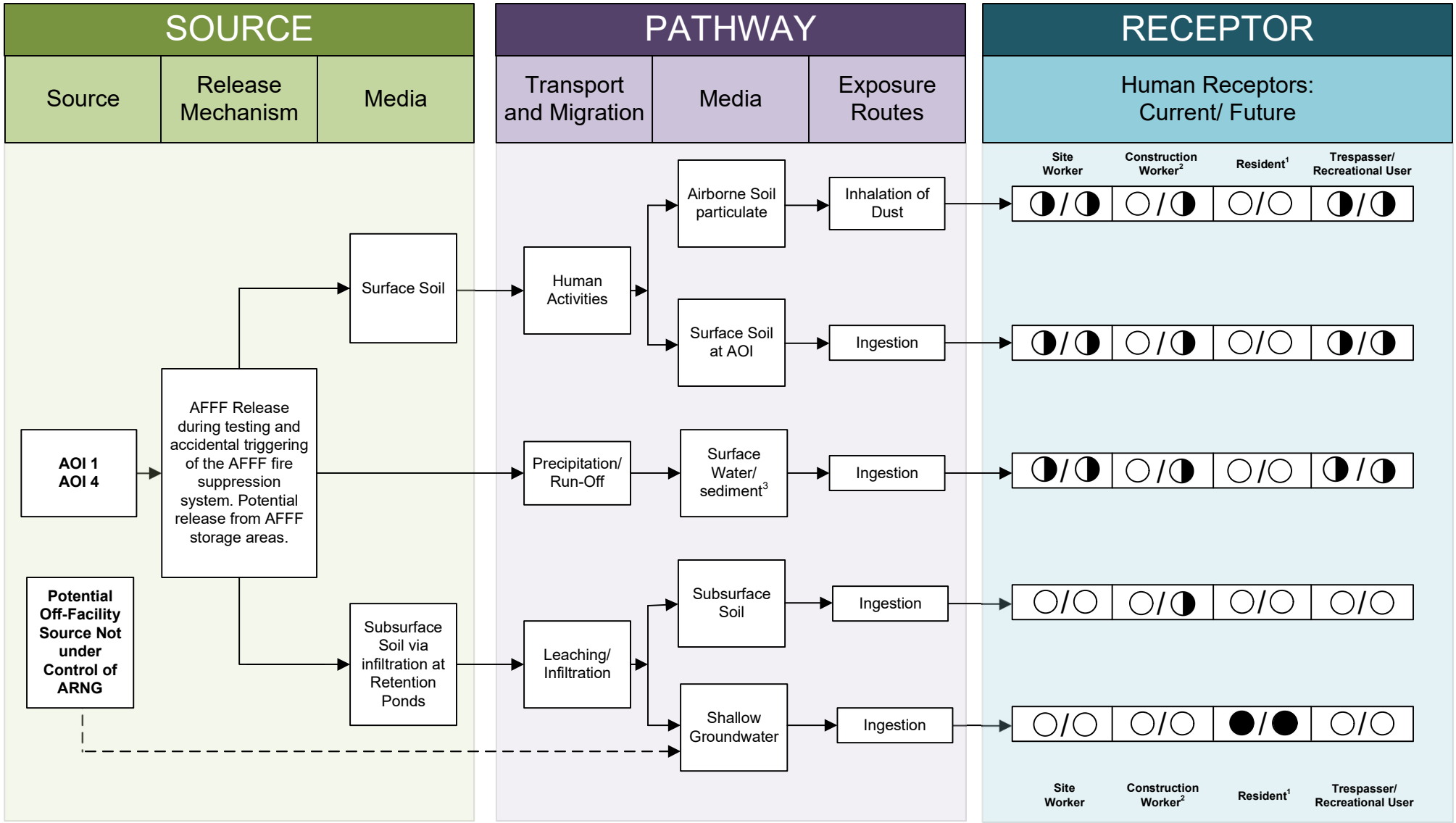


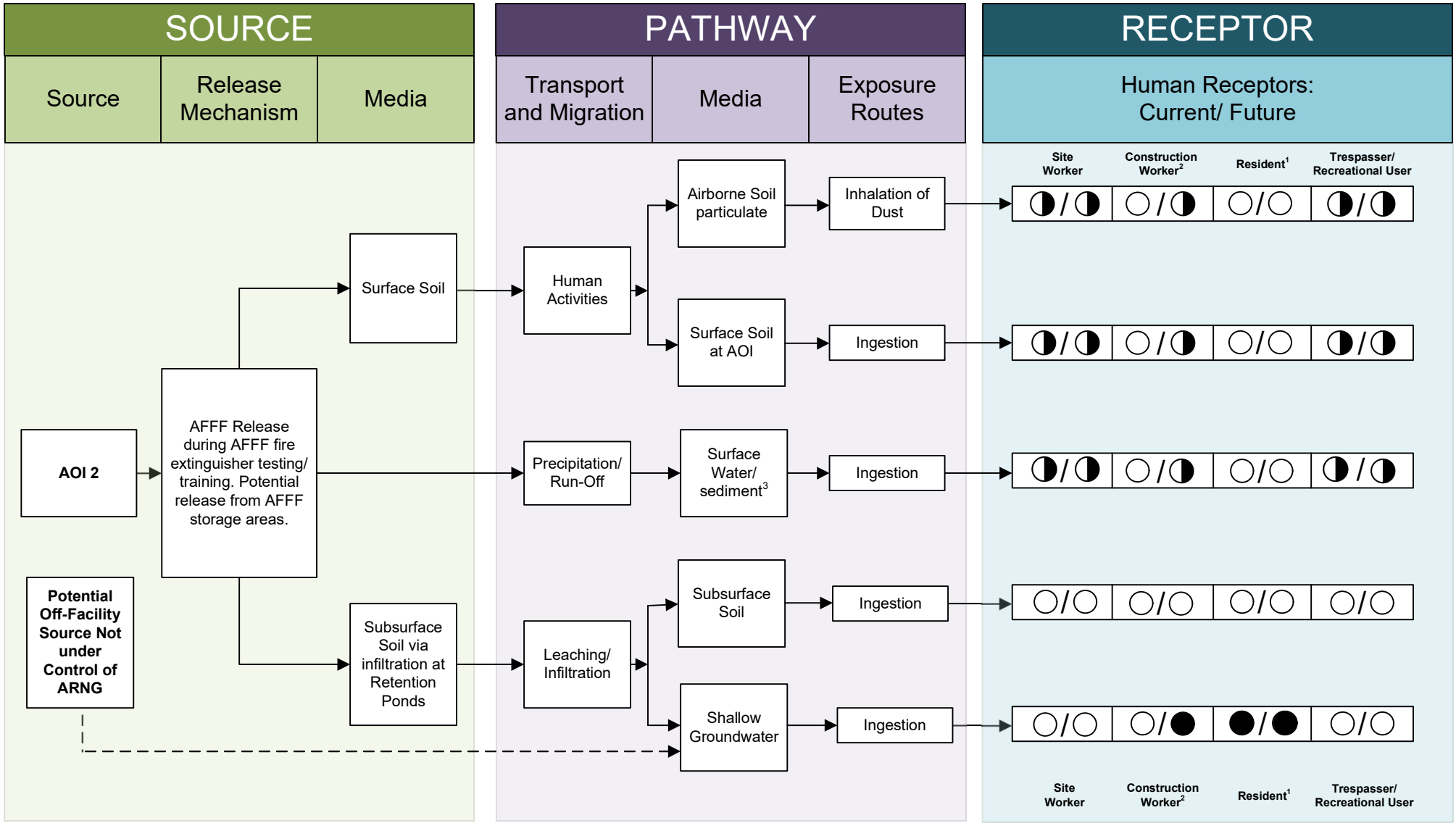
LEGEND

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

Note:

1. The residential receptor refers to an off-facility receptor.
2. No current active construction at the facility.
3. Precipitation/run-off flows through the facility's stormwater system and retention ponds before discharging to Onion Creek, a tributary of the Colorado River..

Figure 7-1
Conceptual Site Model
AOI 1 Maintenance Hangar and AOI 4 Hazardous Materials Storage Building and Fuel Station



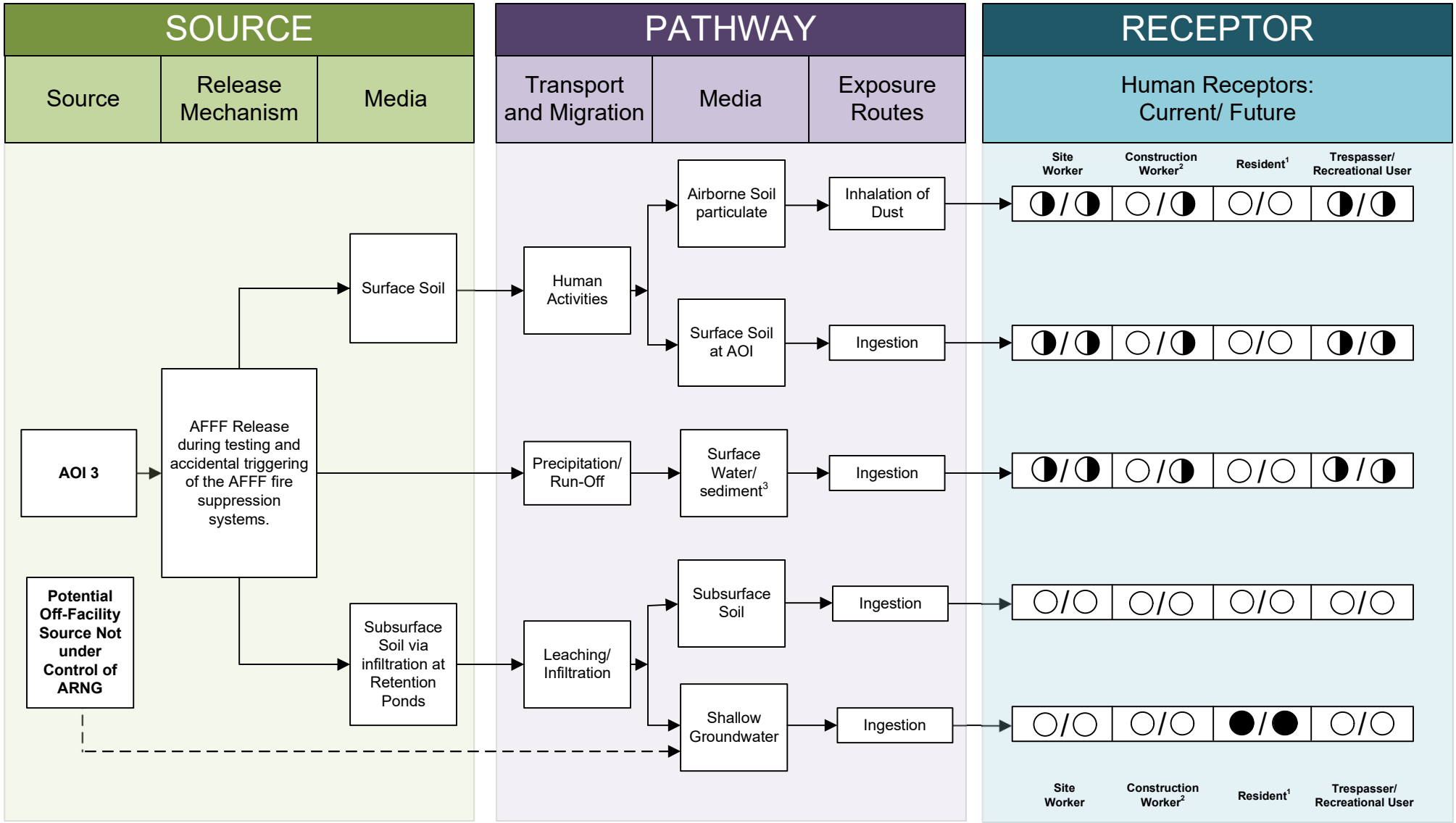
LEGEND

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

Note:

1. The residential receptor refers to an off-facility receptor.
2. No current active construction at the facility.
3. Precipitation/run-off flows through the facility's stormwater system and retention ponds before discharging to Onion Creek, a tributary of the Colorado River.

Figure 7-2
Conceptual Site Model
AOI 2 Wash Rack



LEGEND

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

Note:

1. The residential receptor refers to an off-facility receptor.
2. No current active construction at the facility.
3. Precipitation/run-off flows through the facility's stormwater system and retention ponds before discharging to Onion Creek, a tributary of the Colorado River.

Figure 7-3
Conceptual Site Model
AOI 3 Fixed Wing Support Hangar and Storage Hangar

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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 10 June 2021 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as noted in **Section 5.8**.

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.

- Twenty-seven (27) soil samples from 15 boring locations;
- Six grab groundwater samples from six temporary well locations;
- Fifteen (15) 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 is warranted in an RI for each of the four AOIs. 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 through AOI 4 from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared against 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:
    - PFOA, PFOS, PFHxS, and PFNA in groundwater exceeded their respective SLs at location AOI01-01. PFOA exceed the SL of 6 ng/L, with a maximum concentration of 44.8 J+ ng/L. PFOS exceed the SL of 4 ng/L, with a maximum concentration of 578 ng/L. PFHxS exceed the SL of 39 ng/L, with a maximum concentration of 240 J+ ng/L. PFNA exceeded the SL of 6 ng/L, with a maximum concentration of 9.30 J+ ng/L. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.
    - Additionally, PFOA, PFOS, and PFHxS in groundwater exceeded their respective SLs at facility boundary locations upgradient and downgradient of AOI 1. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 24.8 ng/L at location ABF-02. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 273

ng/L at location ABF-02. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 176 at location ABF-02.

- The detected concentrations of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil at AOI 1, as well as facility boundary locations upgradient and downgradient of AOI 1, were below their respective SLs.

- At AOI 2:
  - PFOA, PFOS, and PFNA in groundwater exceeded their respective SLs downgradient of AOI 2 at facility boundary location ABF-05. PFOA exceed the SL of 6 ng/L, with a concentration of 11.9 ng/L. PFOS exceed the SL of 4 ng/L, with a concentration of 591 ng/L. PFNA exceeded the SL of 6 ng/L, with a concentration of 6.16 ng/L. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.
  - The detected concentrations of PFOA, PFOS, PFHxS, and PFNA in soil at AOI 2 were below their respective SLs.
  - The detected concentrations of PFOS, PFHxS, and PFBS in soil at facility boundary location ABF-05, downgradient of AOI 2, were below their respective SLs.
- At AOI 3:
  - PFOA and PFOS in groundwater exceeded their respective SLs downgradient of AOI 3 at facility boundary location ABF-04. PFOA exceed the SL of 6 ng/L, with a concentration of 7.53 ng/L. PFOS exceed the SL of 4 ng/L, with a concentration of 130 ng/L. Based on the results of the SI, further evaluation of AOI 3 is warranted in the RI.
  - The detected concentrations of PFOA, PFOS, and PFNA in soil at AOI 3 were below their respective SLs.
  - The detected concentrations of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil at facility boundary location ABF-04, downgradient of AOI 3, were below their respective SLs.
- At AOI 4:
  - PFOA, PFOS, and PFHxS in groundwater exceeded their respective SLs at facility boundary locations upgradient (ABF-01) and downgradient (ABF-02, ABF-03) of AOI 4. PFOA exceed the SL of 6 ng/L, with a maximum concentration of 24.8 ng/L at location ABF-02. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 273 ng/L at ABF-02. PFHxS exceed the SL of 39 ng/L, with a maximum concentration of 176 ng/L at location ABF-02. Based on the results of the SI, further evaluation of AOI 4 is warranted in an RI.
  - The detected concentrations of PFOA, PFOS, PFHxS, PFNA, and PFBS in soil at AOI 4, as well as facility boundary locations upgradient and downgradient of AOI 4, were below their respective SLs.

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	Groundwater – Facility Boundary	Future Action
1	Maintenance Hangar	◐	●	●	Proceed to RI
2	Wash Rack	◐	●	●	Proceed to RI
3	Fixed Wing Support Hangar	◐	●	●	Proceed to RI
	Storage Hangar	◐	●	●	Proceed to RI
4	Hazardous Materials Storage Building	◐	●	●	Proceed to RI
	Fuel Station	◐	●	●	Proceed to RI

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

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