FINAL
Site Inspection Report
Army Aviation Support Facility #2
Louisville, Tennessee

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

April 2023

Prepared for:

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

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
ANGB	Air National Guard Base
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DOT	Department of Transportation
DQO	data quality objective
DUA	data usability assessment
EDR™	Environmental Data Resources, Inc.™
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GPS	Global positioning system
GPRS	Ground Penetrating Radar Systems
HA	Health Advisory
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specification
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
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
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TDEC	Tennessee Department of Environment and Conservation
TNANG	Tennessee Air National Guard
TNARNG	Tennessee Army National Guard
TOC	total organic carbon
TPP	Technical Project Planning
UCMR 3	Third Unregulated Contaminant Monitoring Rule
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

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 two 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 Army Aviation Support Facility (AASF) #2 in Louisville, Tennessee and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1 and AOI 2 at this time. AASF #2 will also be referred to as the "facility" throughout this document.

AASF #2 is located at 2111 Army Drive Louisville, Tennessee; the facility is in northern Blount County, Tennessee, approximately 3 miles east of Louisville and approximately 10 miles south of Knoxville. The facility is situated at the northwest corner of McGhee Tyson Municipal Airport and encompasses 21.19 acres. AASF #2 property is owned by the City of Knoxville, leased to the US Air Force, and licensed for Tennessee ARNG use.

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

[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	Active Hangar	◐	●	●	Proceed to RI
2	Flight Line and Wash Rack	●	●	●	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 Army Aviation Support Facility (AASF) #2 in Louisville, Tennessee. AASF #2 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 AASF #2 (AECOM Technical Services, Inc. [AECOM], 2020) that identified two 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

AASF # 2 is located at 2111 Army Drive Louisville, Tennessee (35°49'14.01" N; 83°59' 33.06" W); the facility is in northern Blount County, Tennessee, approximately 3 miles east of Louisville and approximately 10 miles south of Knoxville. As shown on **Figure 2-1**, the facility, which encompasses 21.19 acres, is situated at the northwest corner of McGhee Tyson Municipal Airport (the airport). As a result, the property is owned by the City of Knoxville, leased to the US Air Force, and licensed for Tennessee ARNG (TNARNG) use (DA, 1997).

The facility is generally used for the operation and maintenance of rotary winged aircraft. The facility includes hangars, ground support structures and administration/training buildings. To the southwest of AASF #2 is the McGhee Tyson Air National Guard Base (ANGB). The airport terminal building, Airport Authority Aircraft Rescue and Firefighting Facility (Airport Fire and Rescue), and maintenance hangars, as well as the fixed base operator and other commercial facilities, are situated on the south side of the airport, southeast of AASF #2.

The airport opened with commercial airline service in 1937. From 1942 to 1945, the US Navy controlled airport operations. In 1952, the McGhee Tyson Air Force Base opened at the airport. The Air Force Base closed in 1960 and facilities turned over to the City of Knoxville. The Tennessee Air National Guard then leased the parcel from the City of Knoxville (TNANG) (Leidos, 2019).

2.2 Facility Environmental Setting

AASF #2 lies within the Valley and Ridge physiographic region of Tennessee. The Valley and Ridge is a low land that has alternating linear ridges and valleys oriented southwest to northeast and parallel to the Great Smoky Mountains (Elder, et al., 1959). The topography at AASF #2 is flat to gently rolling; elevation ranges from 992 to 1,015 feet mean sea level (**Figure 2-2**). The facility is located adjacent to the airport and most of the surrounding land is developed in support of airport operations. Outside the immediate airport area, land use is a mix of industrial, commercial, and residential.

2.2.1 Geology

AASF #2 is underlain primarily by Dewey silty clay and loam and Linside silt loam soils, which derived from the carbonate bedrock (US Department of Agriculture [USDA], 2019). The bedrock is Cambrian/Ordovician age Knox Group, which is primarily composed of limestone and dolomite (**Figure 2-3**). The Chepultepec dolomite, which is lower Ordovician in age and is derived from the larger Knox Group, is the primary bedrock type. The dolomite is characterized as light-gray to light olive-gray and mostly fine-grained; white, oolitic, chert nodules are present in some beds (Hardeman et al., 1966). The Ordovician Knox Group carbonates underneath the facility are weathered along bedding planes and joints. Weathering has produced an undulated and pinnacled (karst) bedrock surface (US Geological Survey [USGS], 2018).

The structural geology throughout the Valley and Ridge consists of folds, faults, and deformations associated with regional compressional forces from with Appalachian Orogeny which occurred in the late Paleozoic era. The airport is located in an area between two major regional thrust faults. This fault block is bounded to the northwest by the Chestuee fault and to the southeast by the Dumplin Valley fault (Hardeman et al., 1966).

During the SI, low to medium plasticity fines (clays and silts) were observed as the dominant lithology of the unconsolidated sediments below AASF #2. The borings were completed at depths between 50 and 70 feet below ground surface (bgs). Varying quantities of fine grained sand were mixed with the clay and silts; however, the fraction did not amount to a significant percentage. Some of the borings also contained varying percentages of gravel imbedded in the clay packages. Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

Groundwater recharge in the immediate vicinity of the facility likely occurs by infiltration of precipitation through the overlying soil. The majority of the area is overlain by impervious materials such as asphalt and concrete. Groundwater flow direction was assumed to flow to the southwest prior to the SI, as presented in the SI performed by Leidos at the adjacent McGhee Tyson Air Base. Groundwater was encountered between 25 and 55 feet bgs during the same investigation (Leidos, 2019). Potable water for the facility and surrounding area is supplied by City of Alcoa, which utilizes a surface water intake downstream of the facility on the Little River, approximately 4 miles northeast (Blount County Regional Planning Commission, 2003).

A query of Tennessee Department of Environment and Conservation (TDEC) water well database was performed by Environmental Data Resources, Inc.™ (EDR™). Using additional online resources, such as state and local Geographic Information System databases, approximately 210 water supply well locations are reported to fall within the 4-mile radius of the facility (TDEC, 2020). The water supply well uses include commercial, farm, heat pump, industrial, irrigation, and residential. The total depth of the wells range from 20 to 825 feet. Residential and commercial wells range in total depth from 75 to 825 feet. Refer to **Figure 2-3** for proximity of water supply wells to the facility.

Depths to water measured in March 2022 during the SI ranged from 44.21 to 56.20 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the groundwater flow direction at AASF #2 is primarily to the southeast.

2.2.3 Hydrology

As shown on **Figure 2-5**, surface water at AASF# 2 drains into two watersheds, the Roddy Branch-Little River Watershed, which drains the majority of AASF #2, and the Lackey Creek Watershed. The Middle Fort Loudoun Lake Watershed drains the area north of AASF #2. Little River is located approximately 3 miles to the east of AASF #2 and drains into the Tennessee River at Fort Loudoun Lake. The Lackey Creek Watershed drains the westernmost portion of AASF #2 and drains directly into the Tennessee River (Fort Loudoun Lake) (Blount County Regional Planning Commission, 2003).

In the vicinity of the flight line, storm water surface runoff at AASF #2, flows south and east toward the runway; however, on the northwest side of the hangar and office buildings, drainage flows north and west to the parking lot. Wastewater at AASF#2 (including both the hangar floor drains and wash rack) is conveyed through an oil water separator (OWS) and then to the airport wastewater collection system, which reportedly discharges to the Town of Maryville wastewater system.

2.2.4 Climate

AASF#2 is in a temperate climate zone, characterized by warm summers and mild winters. Data from the airport indicate that the mean annual temperature in the facility area is 59.2 degrees Fahrenheit (ºF) (National Oceanic and Atmospheric Administration, 2018). The warmest months are July and August, with normal daily mean temperatures of 78.4 ºF and 77.8 ºF, respectively.

January is the coldest month, with a mean temperature of 38.2 ºF. The average reported annual precipitation at the airport is 47.86 inches. Rainfall is heaviest during winter, with a seasonal average of 13.08 inches; September and October are the driest months. Average monthly precipitation ranges from 2.51 inches in October to 5.08 inches in July.

2.2.5 Current and Future Land Use

Land use south and east of AASF #2 is commercial/ industrial (airport and associated services) and military (Air National Guard), with surrounding residential, agricultural, and commercial parcels to the north and west of AASF #2. At the facility, a large portion of the parcel is tarmac for flight operations. The infrastructure on-facility (hangar and other buildings) are used for storage and maintenance of ARNG property and operations. Reasonably anticipated future land use is not expected to change from the current land use described above.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

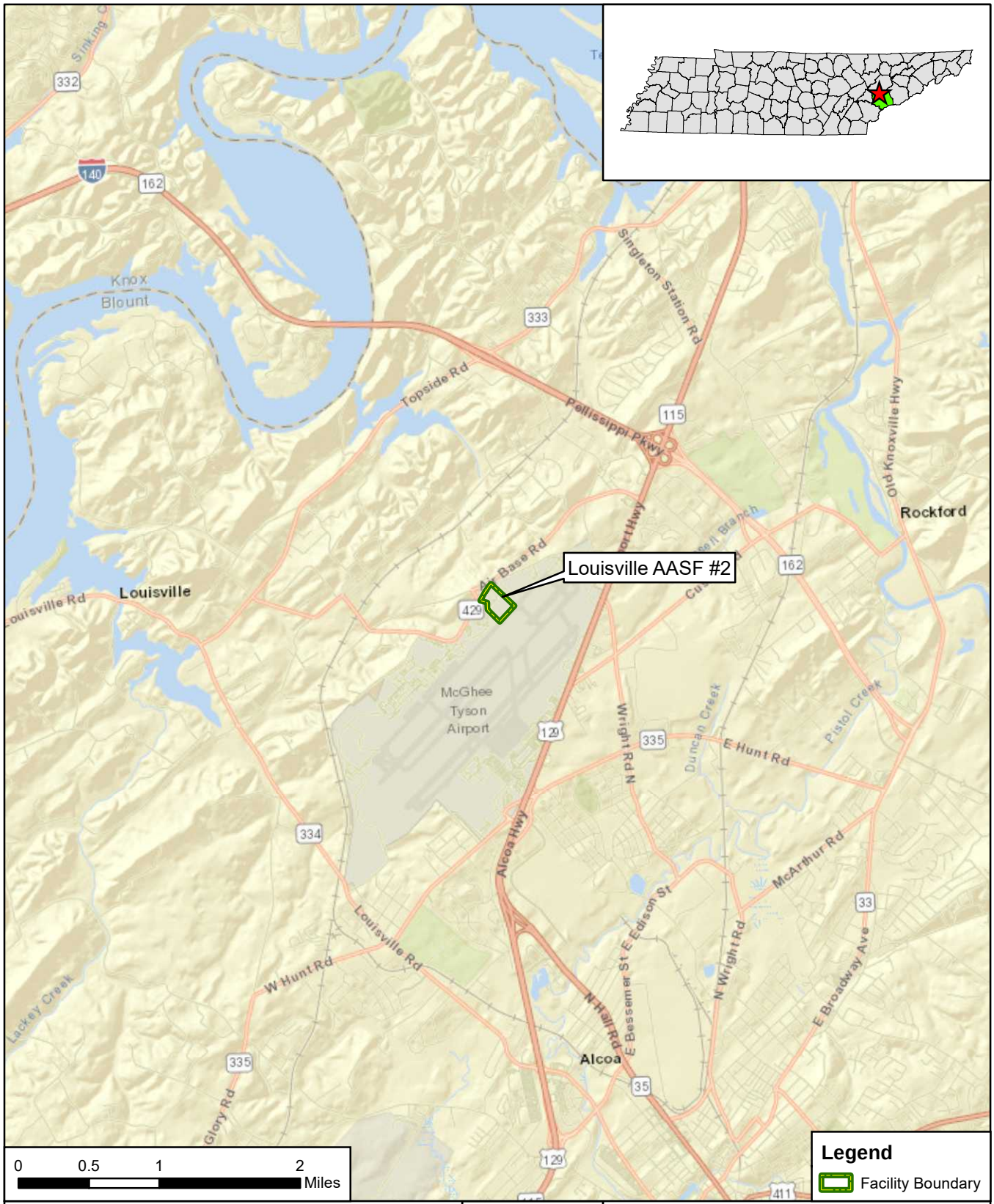
A wildlife survey has not occurred at the facility, and the facility does not have any significant areas of habitat. The species listed below have not been identified at the facility but may be present in the surrounding area.

The following arachnids, clams, fishes, flowering plants, insects, and snails are federally endangered, threatened, proposed, and/or are listed as candidate species in Blount County, Tennessee (US Fish and Wildlife Service [USFWS], 2022).

- **Arachnids:** Spruce-fir moss spider, *Microhexura montivaga* (endangered)
- **Clams:** Purple lilliput, *Toxolasma lividum* (resolved taxon); Oyster mussel, *Epioblasma capsaeformis* (endangered); Orangefoot pimpleback, *Plethobasus cooperianus* (endangered); Dromedary pearlymussel, *Dromus dromas* (endangered); Tubercled blossom, *Epioblasma torulosa* (endangered); Finerayed pigtoe *Fusconaia cuneolus* (endangered); Rough pigtoe, *Pleurobema plenum* (endangered); Rabbitsfoot, *Quadrula cylindrica* (threatened); Ring pink (mussel), *Obovaria retusa* (endangered); Fanshell, *Cyprogenia stegaria* (endangered); Sheepnose mussel, *Plethobasus cyphyus* (endangered); Pink mucket, *Lmapsilis abrupta* (endangered)
- **Fishes:** Spotfin Chub, *Erimonax monachus* (experimental population, non-essential); Smokey madtom, *Noturus baileyi* (endangered); Duskytail darter, *Etheostoma percnurum* (endangered); Snail darter, *Percina tanasi* (threatened); Yellowfin madtom, *Noturus flavipinnis* (threatened)
- **Flowering Plants:** Spreading avens, *Geum radiatum* (endangered); Virginia spiraea, *Spiraea virginiana* (threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Gray bat, *Myotis grisescens* (endangered); Tricolored bat, *Perimyotis subflavus* (under review); Little brown bat, *Myotis lucifugus* (under review); Carolina northern flying squirrel, *Glaucomys sabrinus coloratus* (endangered); Northern long-eared bat, *Myotis septentrionalis* (threatened); Indiana bat, *Myotis sodalis* (endangered)
- **Snails**: Anthony's riversnail, *Athearnia anthonyi* (endangered)

2.3 History of PFAS Use

Two AOIs where aqueous film-forming foam (AFFF) may have been used, stored, disposed, or released historically were identified in the PA for Louisville AASF #2 (AECOM, 2020). The hangar has an AFFF fire suppression system which has never been deployed during testing, training, or emergency situations. The flightline and wash rack have mobile AFFF carts staged for emergency situations; however, there are no documented spills or releases. The potential release areas were grouped into two AOIs based on preliminary data and presumed groundwater flow directions. A description of each AOI is presented in **Section 3**.



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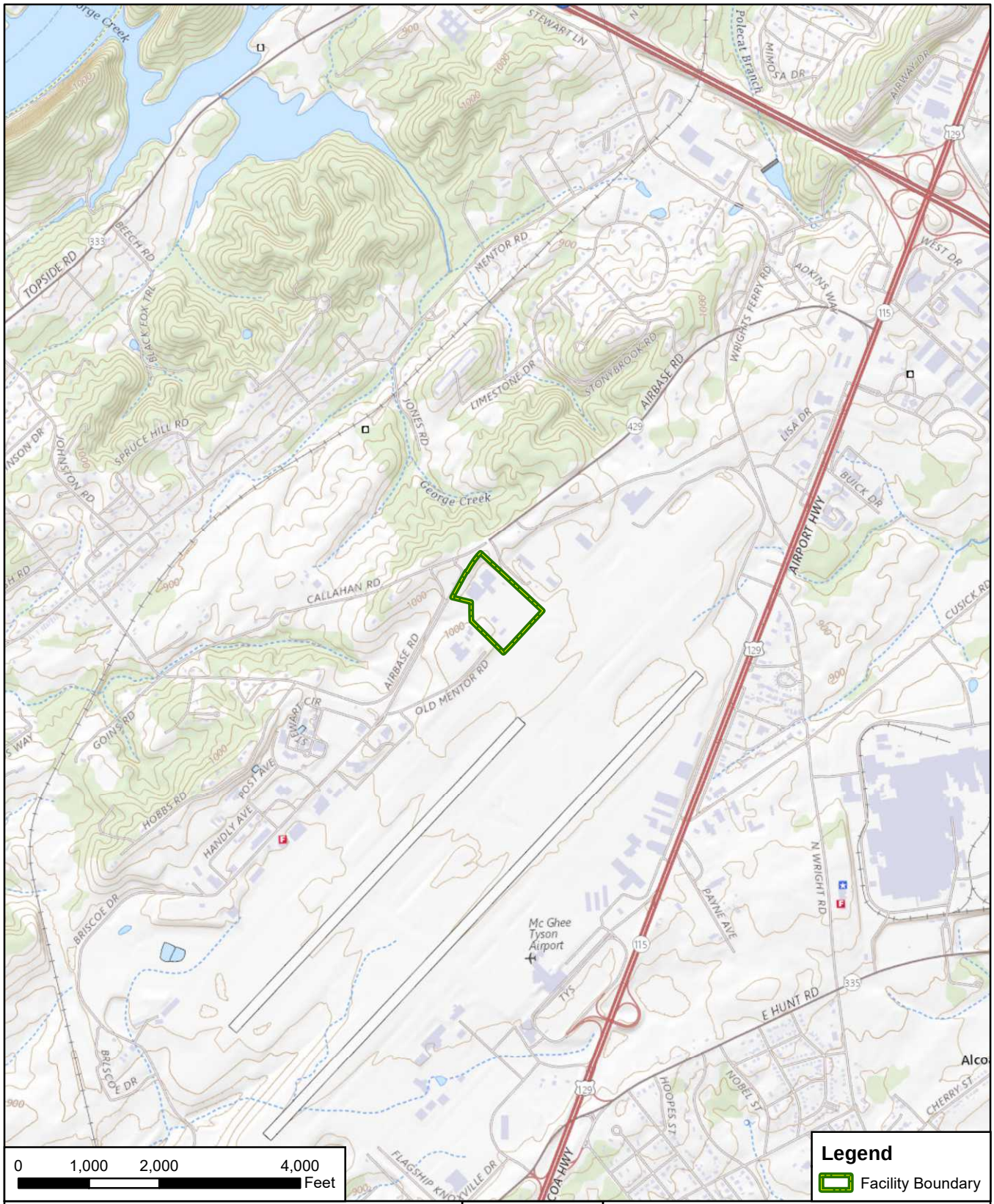
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	9/6/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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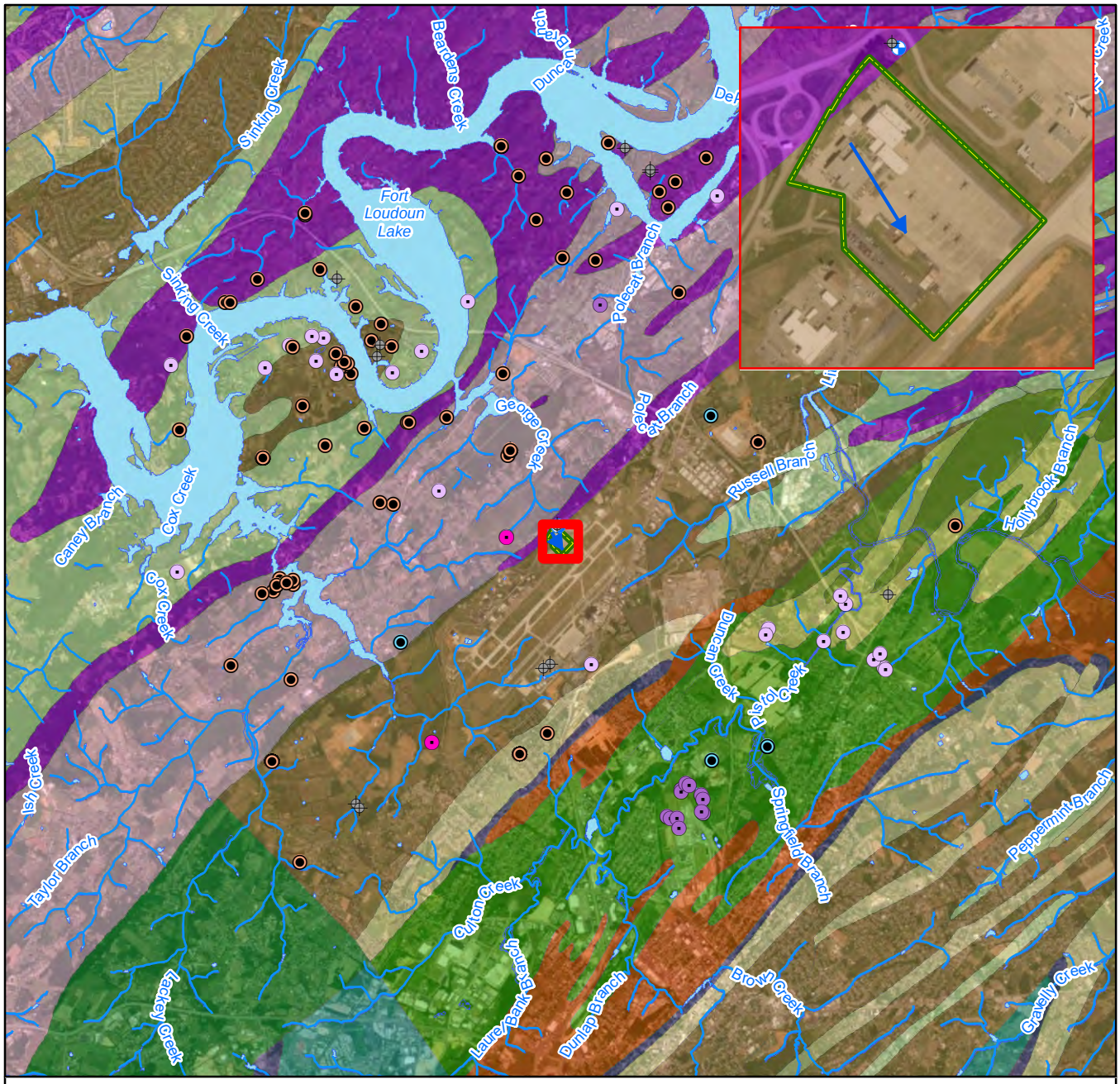
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	9/6/2022

Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	1/9/2023

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Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3

CLIENT	ARNG			
PROJECT	Site Inspection at Louisville AASF #2, TN			
REVISED	1/9/2023	GIS BY	MS	1/9/2023
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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	1/9/2023

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Groundwater Elevations, April 2022

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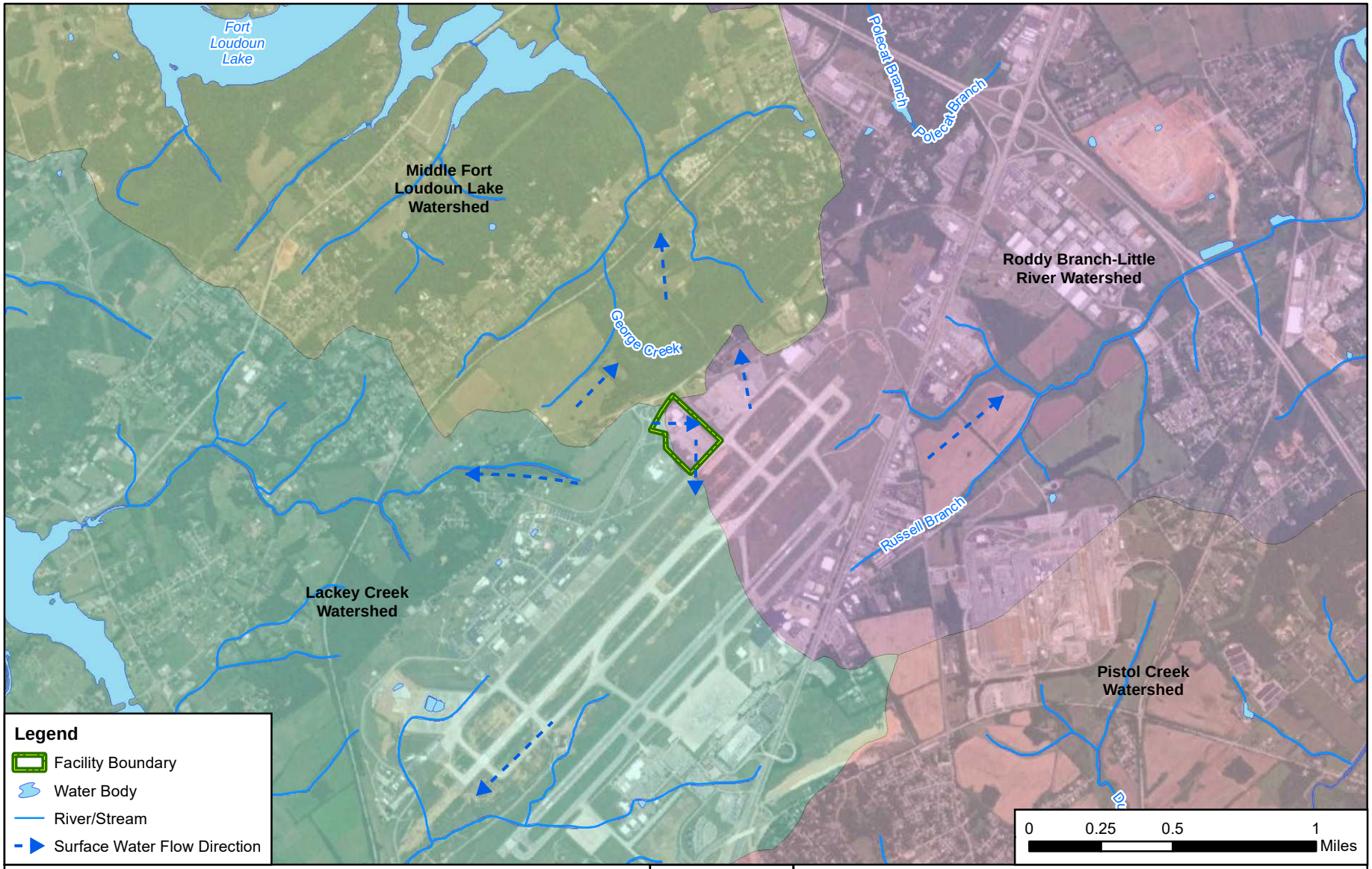
Germantown, MD 20876

Figure 2-4



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Base Map: National Agricultural Imagery Program, 2016		PM	CM	11/15/2022

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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, two potential release areas were identified at AASF #2 and grouped into two AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Active Hangar

AOI 1 is the Active Hangar, which was reported to have been constructed in 2008-2009. It contains an AFFF fire suppression system. The AFFF suppression system includes a 500-gallon above ground storage tank stored in the northern corner of the hangar. Although AFFF is stored in the hangar, no releases have been reported during training or emergency situations. If AFFF were to be released in the hangar, it is possible that the release could migrate outside the building and drain to adjacent grassy areas and then infiltrate to the subsurface from surface soil outside the building or through floor cracks/drains inside the building.

3.2 AOI 2 Flight Line and Wash Rack

AOI 2 is associated with mobile cart storage on the flight line and wash rack. The facility has eight mobile carts that contain AFFF; although mobile carts are occasionally staged in these areas, no releases have been reported. The Wash Rack is connected to an OWS that discharges to the airport wastewater collection system, which ultimately discharges to the Town of Maryville Wastewater System and to the Fort Loudoun Reservoir and the Little River.

3.3 Adjacent Sources

Multiple potential adjacent sources were identified during the PA associated with the McGhee Tyson Municipal Airport. The majority of these are related to the handling and transport of AFFF from the Metropolitan Knoxville Airport Authority Fire and Rescue Facility and the McGhee Tyson ANGB which are located southwest of the facility and downgradient. There are two additional potential adjacent sources, the United Parcel Service and Federal Express Facility, which are located up-gradient/cross-gradient of the facility, but no information was obtained on the history of use and storage at either location. These adjacent sources are shown on **Figure 3-1** for informational purposes only, but were not investigated as part of the SI.

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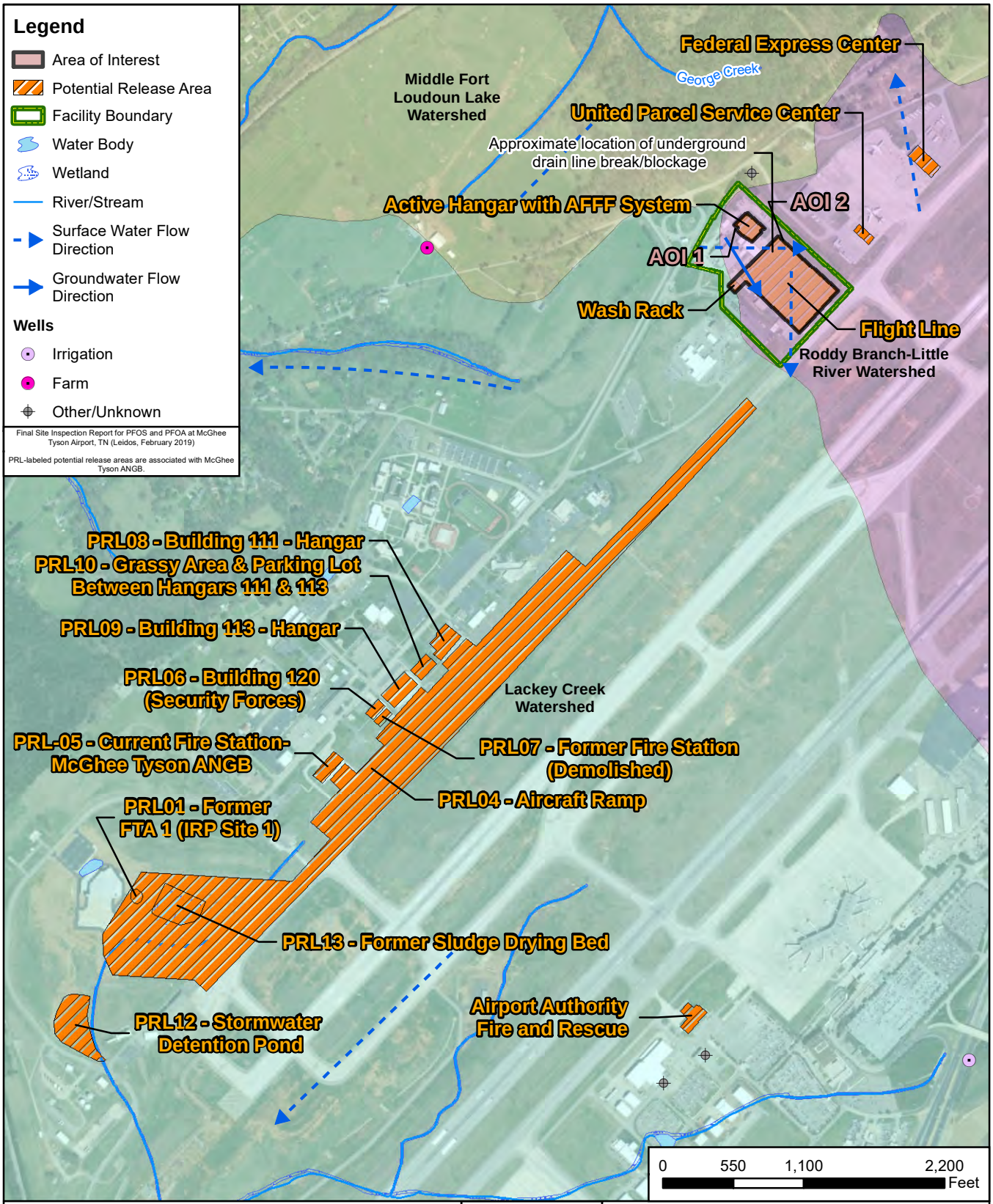

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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	1/9/2023

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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, 2022a), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

- The PA for Louisville AASF #2 (AECOM, 2020);
- The PA/SI for McGhee-Tyson ANG Base (URS, 2016) and the SI Report for McGhee-Tyson Airport (Leidos, 2019);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2022a); 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 is horizontally bounded by the property limits of AASF #2. Off-facility sampling is not included in the scope of this SI; however, if future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with the property owner(s). The scope of the SI is vertically bounded as follows: groundwater (25-55 feet bgs), subsurface soil from rotosonic borings (25-65 feet bgs), and surface soil (0 to 2 feet bgs). The temporal boundaries of the study are limited by seasonal conditions present when the field work was performed in Spring 2022.

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2022a).

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

455 in the context of the overall project decisions or objectives. Using both quantitative and qualitative
456 methods, the assessment determines whether project execution and the resulting data have met
457 installation-specific DQOs. Both sampling and analytical activities are considered to assess
458 whether the collected data are of the right type, quality, and quantity to support the decision-
459 making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

460 Based on the DUA, the environmental data collected during the SI were found to be acceptable
461 and usable for this SI evaluation with the qualifications documented in the DUA and its associated
462 data validation reports. These data are of sufficient quality to meet the objectives and
463 requirements of the SI QAPP Addendum (AECOM, 2022a).

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, Louisville Army Aviation Support Facility #2, Louisville* dated October 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Army Aviation Support Facility #2, Louisville, Tennessee* dated March 2022 (AECOM, 2022a); and
- *Final Site Safety and Health Plan, Army Aviation Support Facility #2, Louisville, Tennessee* dated March 2022 (AECOM, 2022b).

The SI field activities were conducted from 28 March to 2 April 2022 and consisted of utility clearance, rotosonic drilling, 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, 2022a).

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:

- Eighteen (18) soil samples from six boring locations;
- Four grab groundwater samples from six temporary well locations;
- Thirteen (13) 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**, field change request in **Appendix B3,** land survey data are provided in **Appendix B4**, and a nonconformance and corrective action Report is provided in **Appendix B5**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 11 February 2022, 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, TNARNG, USACE, TDEC, and AECOM. 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, 2022a).

A TPP Meeting 3 was held (TBD) 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, Cascade Technical Services, LLC. placed a ticket with the Tennessee 811 utility clearance provider to notify them of intrusive work on 14 March 2022. Responding utility companies (gas, electric, communication) marked their respective underground lines in the field. 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 8 March 2022 with input from the AECOM field team and AASF #2 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

One potable water source at AASF #2 was sampled on 27 January 2022 to assess usability for decontamination of drilling equipment. The samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. Results confirmed that the source was acceptable for use in this investigation. 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, 2022a). 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 rotosonic drilling technology in accordance with the SI QAPP Addendum (AECOM, 2022a). A GeoProbe® 8140LC 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**. Several boring locations were adjusted within a 50-feet offset for reasons including drill rig access, utility avoidance, and bias toward sampling within observed drainage features.

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 (all mid-point samples were collected from either the 10 to 12 or 13 to 15 feet bgs interval).

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

Low to medium plasticity fines (clays and silts) were observed as the dominant lithology of the unconsolidated sediments below the facility. The borings were completed at depths between 50 and 70 feet below ground surface (bgs). Varying quantities of fine grained sand were mixed with the clay and silts; however, the fraction did not amount to a significant percentage. Some of the borings also contained varying percentages of gravel imbedded in the clay packages. Bedrock was encountered in two borings (AOI01-02 and AOI02-02) at 46.5 and 65 feet bgs.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2022a).

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

Sonic borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2022a) using bentonite chips at completion of sampling activities. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a rotosonic GeoProbe® 8140LC dual-tube sampling system. 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. Groundwater samples were not collected from two locations (AOI01-02 and AOI02-02) as water was not encountered in the unconsolidated material in either boring (see **Appendix B3**). Additionally due to poor recharge and drawdown, it was necessary to collect samples from temporary wells AOI01-01, AOI01-02 and AOI02-03 before field parameters stabilized and standard purging completed.

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, 2022a).

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, 2022a) by removing the PVC and backfilling the hole with bentonite chips to approximately 6 inches bgs. 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 on 1 April 2022. 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. Measured depths to water ranged from 44.21 feet bgs to 56.20 feet bgs. 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 Tennessee-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2022a). The top of casing and ground surface elevation were surveyed for each newly installed well. Survey data from the newly installed wells on the facility were collected on 1 April 2022 in the applicable Universal Transverse Mercator zone projection with North American Datum 1983 State Plane (horizontal) and North American Vertical Datum 1988. The surveyed well data are provided in **Appendix B4.**

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of 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, 2022b) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were contained in labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and left onsite in a designated waste

storage area. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were contained in labeled, 55-gallon DOT-approved steel drums, and left temporarily onsite in an area designated by TNARNG. The liquid IDW was not sampled and assumes the PFAS characteristics of the associated groundwater samples collected from that source location.

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 the 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 Field Change Request Forms (**Appendix B3**) and Nonconformance Reports (**Appendix B5**):

- Water was not encountered in the unconsolidated material at borings AOI01-02 and AOI02-02. The borings were advanced to the top of bedrock and allowed to recharge overnight, but water did not enter from any water bearing units. The team agreed that a good faith effort had been made at both boring locations and further agreed to use all available analytical results at the two AOIs to determine presence/absence of PFAS at the facility. This action was documented in a field change request provided in **Appendix B3**.
- Due to a laboratory error, the grain size sample collected at location AOI01-02-12-13 and AOI02-02-10-12 could not be analyzed. This deviation was documented in a nonconformance and corrective action reported provided in **Appendix B5**.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Louisville AASF #2, Tennessee

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	3/28/2022 15:15	0-2	x				
AOI01-01-SB-13-15	3/30/2022 15:35	13-15	x				
AOI01-01-SB-54-56	3/31/2022 8:30	54-56	x				
AOI01-02-SB-00-02	3/29/2022 8:45	0-2	x	x	x		TOC/pH
AOI01-02-SB-00-02-D	3/29/2022 8:45	0-2	x				Duplicate
AOI01-02-SB-00-02-MS	3/29/2022 8:45	0-2	x				MS
AOI01-02-SB-00-02-MSD	3/29/2022 8:45	0-2	x				MSD
AOI01-02-SB-12-13	3/31/2022 12:58	12-13				x	Grain Size
AOI01-02-SB-13-15	3/31/2022 12:58	13-15	x				
AOI01-02-SB-40-42	3/31/2022 14:06	40-42	x				
AOI02-01-SB-00-02	3/28/2022 15:00	0-2	x				
AOI02-01-SB-13-15	4/1/2022 7:45	13-15	x				
AOI02-01-SB-42-44	4/1/2022 8:30	42-44	x				
AOI02-02-SB-00-02	3/28/2022 14:30	0-2	x				
AOI02-02-SB-10-12	3/30/2022 10:40	10-12				x	Grain Size
AOI02-02-SB-13-15	3/30/2022 10:25	13-15	x				
AOI02-02-SB-58-60	3/30/2022 13:40	58-60	x	x	x		
AOI02-02-SB-58-60-D	3/30/2022 13:40	58-60		x	x		Duplicate (TOC/pH)
AOI02-02-SB-58-60-MS	3/30/2022 13:40	58-60		x	x		MS (TOC/pH)
AOI02-02-SB-58-60-MSD	3/30/2022 13:40	58-60		x	x		MSD (TOC/pH)
AOI02-03-SB-00-02	3/28/2022 14:15	0-2	x				
AOI02-03-SB-13-15	3/29/2022 15:40	13-15	x				
AOI02-03-SB-13-15-D	3/29/2022 15:40	13-15	x				Duplicate
AOI02-03-SB-55-57	3/30/2022 9:00	55-57	x				
AOI02-04-SB-00-02	3/28/2022 10:30	0-2	x				
AOI02-04-SB-13-15	3/28/2022 12:05	13-15	x				
AOI02-04-SB-55-57	3/29/2022 12:00	55-57	x				
Groundwater Samples							
AOI01-01-GW	3/31/2022 12:40	N/A	x				
AOI02-01-GW	4/1/2022 11:55	N/A	x				
AOI02-03-GW	3/30/2022 15:21	N/A	x				
AOI02-04-GW	3/30/2022 11:38	N/A	x				
AOI02-04-GW-D	3/30/2022 11:38	N/A	x				Duplicate
AOI02-04-GW-MS	3/30/2022 11:38	N/A	x				MS
AOI02-04-GW-MSD	3/30/2022 11:38	N/A	x				MSD

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Louisville AASF #2, Tennessee

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
Quality Control Samples							
LV-ERB-01	3/29/2022 13:15	N/A	x				taken off of hand auger
LV-ERB-02	3/31/2022 13:40	N/A	x				taken off of cutting shoe
LV-ERB-03	4/1/2022 12:00	N/A	x				taken off of bladder pump
LV-FRB-01	3/29/2022 16:30	N/A	x				FRB
LAASF-DECON	1/27/2022 11:25	N/A	x				DECON water
LV-DECON-02	4/1/2022 8:30	N/A	x				DECON water (through hose)

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Louisville AASF #2, Tennessee

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	56	51 - 56	1012.23	1010.40	55.21	53.38	957.02
	AOI01-02	50	42 - 47	999.61	998.24	DRY		
2	AOI02-01	55	50 - 55	995.60	995.12	44.69	44.21	950.91
	AOI02-02	65	60 - 65	994.32	993.76	DRY		
	AOI02-03	70	60 - 65	995.41	995.17	56.44	56.20	938.97
	AOI02-04	65	60 - 65	997.63	997.96	53.81	54.14	943.82

Notes:
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

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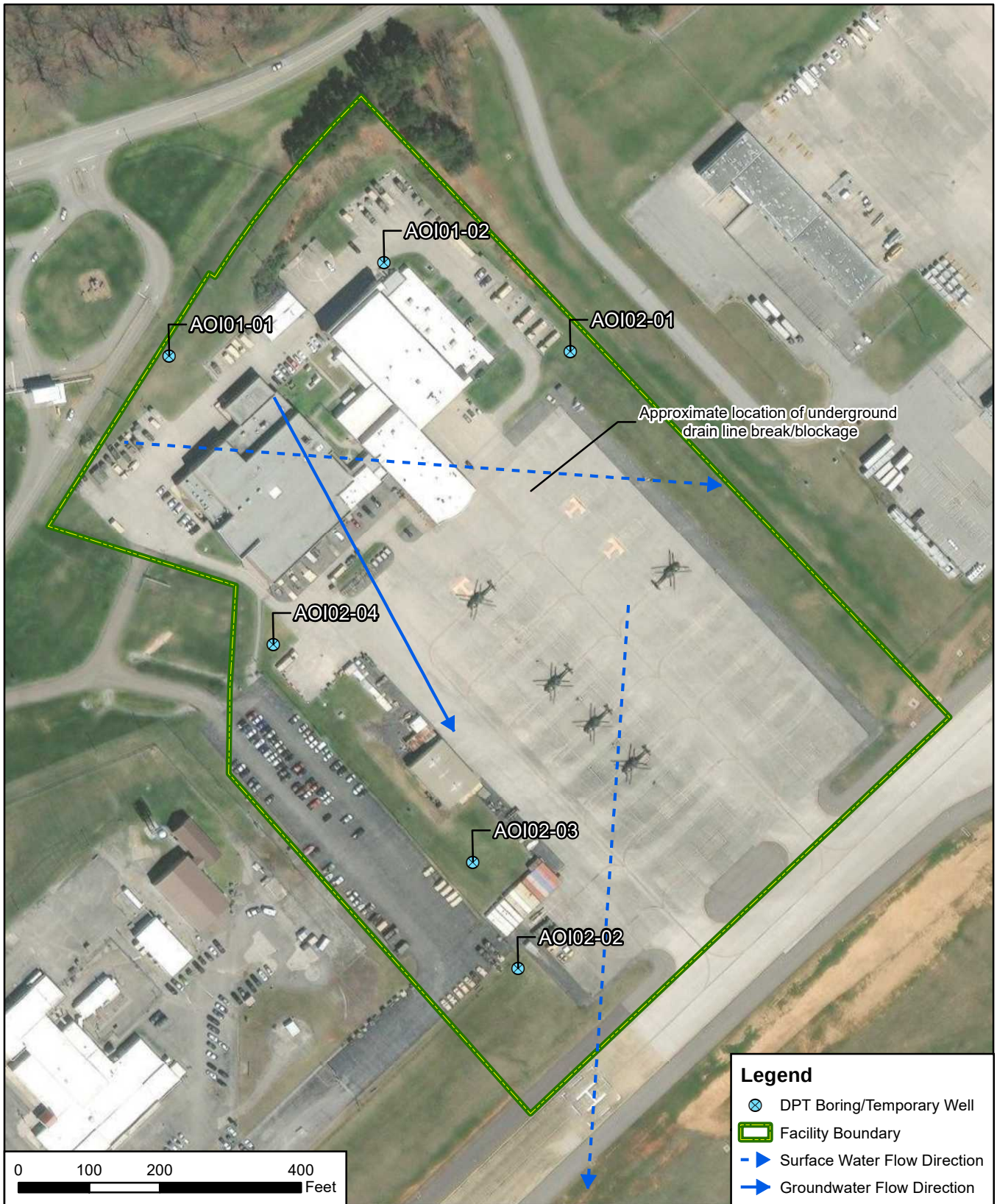

CLIENT	ARNG			
PROJECT	Site Inspection at Louisville AASF #2, TN			
REVISED	11/15/2022	GIS BY	MS	11/15/2022
SCALE	1:2,400	CHK BY	JD	11/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	11/15/2022

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 6.5**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

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

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

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

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

6.2 Soil Physicochemical Analyses

To provide basic soil parameter information, soil samples were analyzed for TOC and pH , which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC and pH sampling. TOC results ranged from 379 to 1330 micrograms per liter and pH ranged from 5.88 to 7.80.

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: Active Hangar. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil intervals (40 to 56 feet bgs) from boring locations AOI01-01 and AOI01-02. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, PFHxS, and PFNA were detected in surface soil at concentrations below their SLs. PFOA, PFOS, and PFNA were detected at both AOI01-01 and AOI01-02, at maximum concentrations of 1.28 J micrograms per kilogram (µg/kg), 1.66 µg/kg, and 4.43 J+ µg/kg, respectively. PFHxS was detected at AOI01-02, with a maximum concentration of 0.074 J µg/kg. PFBS was not detected in surface soil at AOI 1.

PFOA, PFOS, PFHxS, and PFNA were detected in shallow subsurface soil at concentrations below their SLs. All four compounds were detected below 1 µg/kg. PFBS was not detected in shallow subsurface soil. There were no detections of PFAS in the deep subsurface soil.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater was sampled from temporary monitoring well AOI01-01. **Figure 6-6** and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

PFOA was detected above the SL of 6 nanograms per liter (ng/L) in AOI01, with a concentration of 6.40 ng/L. PFOS, PFBS, and PFHxS were all detected below their respective SLs at concentrations of 3.32 ng/L, 1.22 ng/L, and 7.79 ng/L, respectively. PFNA was not detected in AOI01-01.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA was detected in groundwater at concentrations above its SL. PFOS, PFBS, and PFHxS were detected in soil below their SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

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

6.4.1 AOI 2 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bs), and deep subsurface soil (42 to 60 feet bgs) from boring locations AOI02-01 through AOI02-04. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFNA, PFHxS, and PFBS were detected in soil at concentrations below their SLs in surface soil. Maximum concentrations detected for these compounds were 0.552 J µg/kg, 0.813 J µg/kg, 0.990 J µg/kg, and 0.023 J µg/kg, respectively. PFOS was detected in soil at a concentration above its SL in surface soil at AOI02-04 at a concentration of 38.6 µg/kg.

PFOA, PFOS, PFNA, and PFHxS were detected in shallow subsurface soil at concentrations below their SLs. Maximum concentrations detected for these compounds were 0.624 J µg/kg, 81.8 µg/kg, 0.591 J µg/kg, and 0.825 J µg/kg, respectively. PFBS was not detected.

PFOA, PFOS, PFHxS, and PFBS were all detected in the deep subsurface soil. Maximum concentrations detected for these compounds were 0.102 J µg/kg, 3.01 µg/kg, 0.429 J µg/kg, and 0.044 J µg/kg, respectively. PFNA was not detected.

6.4.2 AOI 2 Groundwater Analytical Results

Groundwater was sampled from temporary monitoring wells AOI02-01, AOI2-03, and AOI2-04. **Figure 6-6** and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

PFOA, PFOS, PFNA, and PFHxS were all detected above their respective SLs. Maximum concentrations detected for these compounds were 93.6 ng/L, 955 ng/L, 7.51 ng/L, and 696 ng/L respectively. PFBS was detected below its SL with a maximum concentration of 61.6 ng/L.

6.4.3 AOI 2 Conclusions

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

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

Area of Interest		AOI01						AOI02							
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		AOI02-04-SB-00-02	
Sample Date		03/28/2022		03/29/2022		03/29/2022		03/28/2022		03/28/2022		03/28/2022		03/28/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	1900	ND	U	ND	UJ	ND	U	ND	U	ND	U	ND	U	0.023	J
PFHxS	130	ND	U	ND	UJ	0.074	J	ND	U	0.273	J	ND	U	0.990	J
PFNA	19	0.341	J	0.528	J	1.66		0.587	J	0.064	J	0.118	J	0.813	J
PFOA	19	0.691	J	0.450	J	1.28	J	0.552	J	0.500	J	0.220	J	0.527	J
PFOS	13	0.389	J	1.56	J+	4.43	J+	1.13	J	0.870	J	1.75		38.6	

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

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted DL

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

Chemical Abbreviations

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

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
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, AASF #2 Louisville

Area of Interest		AOI01				AOI02									
Sample ID		AOI01-01-SB-13-15		AOI01-02-SB-13-15		AOI02-01-SB-13-15		AOI02-02-SB-13-15		AOI02-03-SB-13-15		AOI02-03-SB-13-15-D		AOI02-04-SB-13-15	
Sample Date		03/30/2022		03/31/2022		04/01/2022		03/30/2022		03/29/2022		03/29/2022		03/28/2022	
Depth		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
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
PFHxS	1600	ND	U	0.091	J	ND	U	0.186	J	ND	U	ND	U	0.825	J
PFNA	250	ND	U	0.097	J	0.103	J	ND	U	ND	U	ND	U	0.594	J
PFOA	250	0.170	J	0.823	J	0.245	J	ND	U	ND	U	ND	U	0.624	J
PFOS	160	ND	U	0.181	J	0.075	J	0.633	J	0.101	J	0.126	J	81.8	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, AASF #2 Louisville

Area of Interest	AOI01				AOI02							
Sample ID	AOI01-01-SB-54-56		AOI01-02-SB-40-42		AOI02-01-SB-42-44		AOI02-02-SB-58-60		AOI02-03-SB-55-57		AOI02-04-SB-55-57	
Sample Date	03/31/2022		03/31/2022		04/01/2022		03/30/2022		03/30/2022		03/29/2022	
Depth	54-56 ft		40-42 ft		42-44 ft		58-60 ft		55-57 ft		55-57 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)												
PFBS	ND	U	ND	U	ND	U	ND	U	ND	U	0.044	J
PFHxS	ND	U	ND	U	ND	U	ND	U	ND	U	0.429	J
PFNA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U	ND	U	0.102	J
PFOS	ND	U	ND	U	ND	U	ND	U	ND	U	3.01	

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, AASF #2 Louisville

	Area of Interest	AOI01		AOI02							
	Sample ID	AOI01-01-GW		AOI02-01-GW		AOI02-03-GW		AOI02-04-GW		AOI02-04-GW-D	
	Sample Date	03/31/2022		04/01/2022		03/30/2022		03/30/2022		03/30/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)											
PFBS	601	1.22	J	1.22	J	ND	U	55.6		61.6	
PFHxS	39	7.79		8.50		2.19	J	664	J	696	
PFNA	6	ND	U	4.31		ND	U	7.51		7.20	
PFOA	6	6.40		17.8		1.24	J	89.1		93.6	
PFOS	4	3.32	J	4.12		4.93		955	J	916	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Chemical Abbreviations

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

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
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

CLIENT	ARNG			
PROJECT	Site Inspection at Louisville AASF #2, TN			
REVISED	9/8/2022	GIS BY	MS	9/8/2022
SCALE	1:3,246	CHK BY	JD	9/8/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/8/2022

Legend

Facility Boundary

0 135 270 540 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 Louisville AASF #2, TN			
REVISED	9/8/2022	GIS BY	MS	9/8/2022
SCALE	1:3,246	CHK BY	JD	9/8/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/8/2022

Legend

Facility Boundary

0 135 270 540 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 Louisville AASF #2, TN			
REVISED	9/8/2022	GIS BY	MS	9/8/2022
SCALE	1:3,246	CHK BY	JD	9/8/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/8/2022

Legend

Facility Boundary

0 135 270 540 Feet

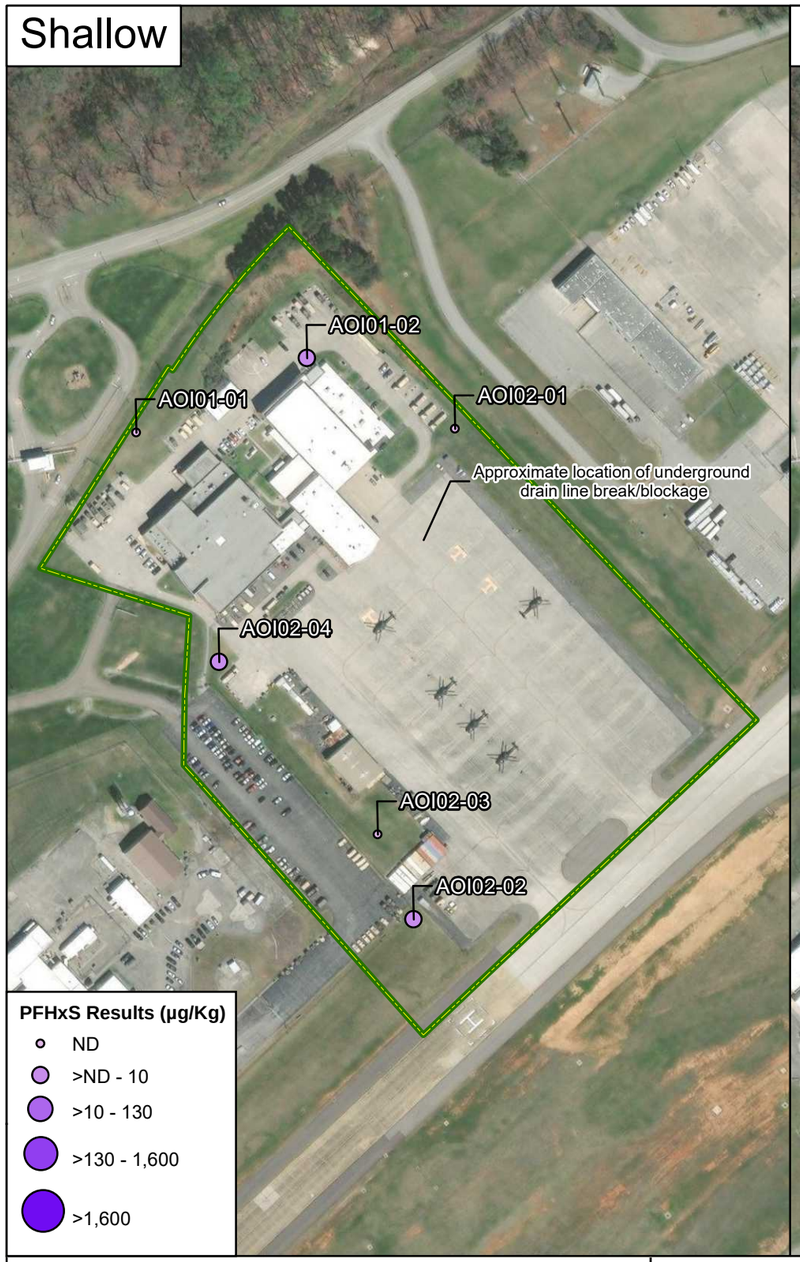
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFBS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-3



CLIENT	ARNG			
PROJECT	Site Inspection at Louisville AASF #2, TN			
REVISED	9/8/2022	GIS BY	MS	9/8/2022
SCALE	1:3,246	CHK BY	JD	9/8/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/8/2022

Legend

Facility Boundary

0 135 270 540 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 Louisville AASF #2, TN			
REVISED	9/8/2022	GIS BY	MS	9/8/2022
SCALE	1:3,246	CHK BY	JD	9/8/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/8/2022

Facility Boundary

0 135 270 540 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

AOI01-01

AOI02-01

Approximate location of underground drain line break/blockage

AOI02-04

AOI02-03

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 Louisville AASF #2, TN			
REVISED	10/6/2022	GIS BY	MS	10/6/2022
SCALE	1:3,246	CHK BY	JD	10/6/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/6/2022

Legend

- Facility Boundary
- Groundwater Flow Direction

0 135 270 540 Feet

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

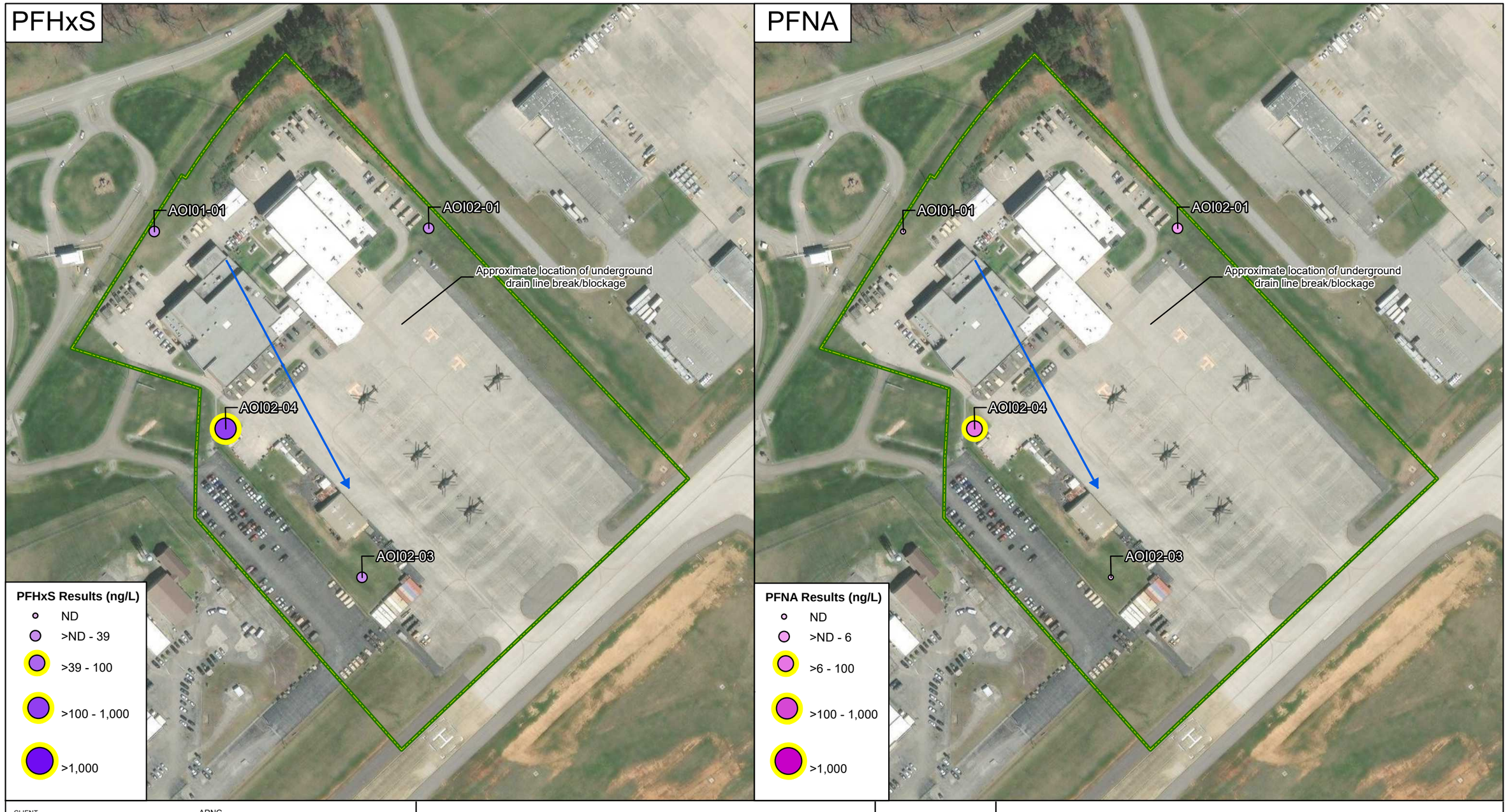
N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-6



CLIENT	ARNG			
PROJECT	Site Inspection at Louisville AASF #2, TN			
REVISED	9/14/2022	GIS BY	MS	9/14/2022
SCALE	1:2,400	CHK BY	JD	9/14/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/14/2022

Legend

Facility Boundary

Groundwater Flow Direction

0 100 200 400 Feet

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

N

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 conceptual site models (CSMs) for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **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 solely based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers, 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 and AOI 2 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Active Hangar, built in 2008, which contains an AFFF fire suppression system, including a 500-gallon above ground storage tank stored in the northern corner of the hangar.

PFOA, PFOS, PFHxS, and PFNA were detected in surface soil at AOI 1. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and

inhalation of dust. Therefore, the surface soil exposure pathways for site workers and construction workers are potentially complete. PFHxS, PFNA, PFOA, and PFOS were detected in subsurface soil at AOI 1. Construction workers could contact constituents in subsurface soil via incidental ingestion; therefore, the subsurface soil exposure pathway for construction workers is potentially complete. Given that the facility is secure and no off-facility residential properties are adjacent, the trespasser/recreational user and off-facility resident soil exposure pathways are incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is the Flight Line and Wash Rack area, which has eight mobile carts that contain AFFF. While mobile carts are occasionally staged in these areas, no releases have been reported. In the event of PFAS releases on the paved areas within AOI 2, it is possible that the release could migrate to surface soil at adjacent unpaved areas. AFFF may have also infiltrated directly to subsurface soil or via cracks in pavement or piping or joints between areas that are paved with different materials.

PFOA, PFOS, PFHxS, PFBS, and PFNA were detected in surface soil and the PFOS SL was exceeded in surface soil at AOI 2. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and construction workers are potentially complete. PFOA, PFOS, PFHxS, and PFNA were detected in subsurface soil at AOI 2. Construction workers could contact constituents in subsurface soil via incidental ingestion; therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. Given that the facility is secure and no off-facility residential properties are adjacent, the trespasser/recreational user and off-facility resident soil exposure pathways are incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

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 was detected in the groundwater sample collected at AOI 1 at a concentration above the SL. Wells located downgradient of the facility are classified as residential, agricultural, and other/unknown based on information in the TDEC water well database. Based on this, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete with exceedances of SLs. At the facility, potable drinking water is provided by the City of Alcoa from a surface water source located approximately 4 miles away. Based on this, the exposure pathway for site workers is incomplete. The onsite depth to water measured at AOI 1 in April 2022 during the SI was 53.38 feet bgs. Therefore, the ingestion exposure pathway for construction workers and trespassers/ recreational users is incomplete. CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA, PFOS, PFHxS, and PFNA were detected in groundwater samples collected at AOI 2 at concentrations above SLs. Wells located downgradient of the facility are classified as residential, agricultural, and other/unknown based on information in the TDEC water well database. Based on this, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete with exceedances of SLs. At the facility, potable drinking water is provided by the City of Alcoa from a surface water source located approximately 4 miles away.

Based on this, the exposure pathway for site workers is incomplete. The onsite depth to water measured at AOI 2 in April 2022 during the SI ranged from 44.21 to 56.20 feet bgs. Therefore, the ingestion exposure pathway for construction workers and trespassers/ recreational users is incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.

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

7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and groundwater at AOI 1; therefore, it is possible that those compounds may have migrated from soil and groundwater to the creek in the northwest of the facility via runoff or groundwater discharge. Furthermore, releases inside the building could also enter floor drains, which connect to the facility wastewater system through OWSs and subsequently discharge to the Town of Maryville Wastewater System. This eventually discharges to Fort Loudon Reservoir and the Little River. Therefore, the surface water and sediment ingestion exposure pathway for site and construction workers is potentially complete. The surrounding surface water features located off-facility could be accessible to residents and recreational users; therefore, those pathways are also potentially complete.

7.3.2 AOI 2

The Wash Rack is connected to an OWS that discharges to the airport wastewater collection system which ultimately discharges to the Town of Maryville Wastewater System and to Fort Loudon Reservoir and the Little River. As a result, the pathway for site and construction works, off-facility residents, and recreational users are the same at AOI 1.

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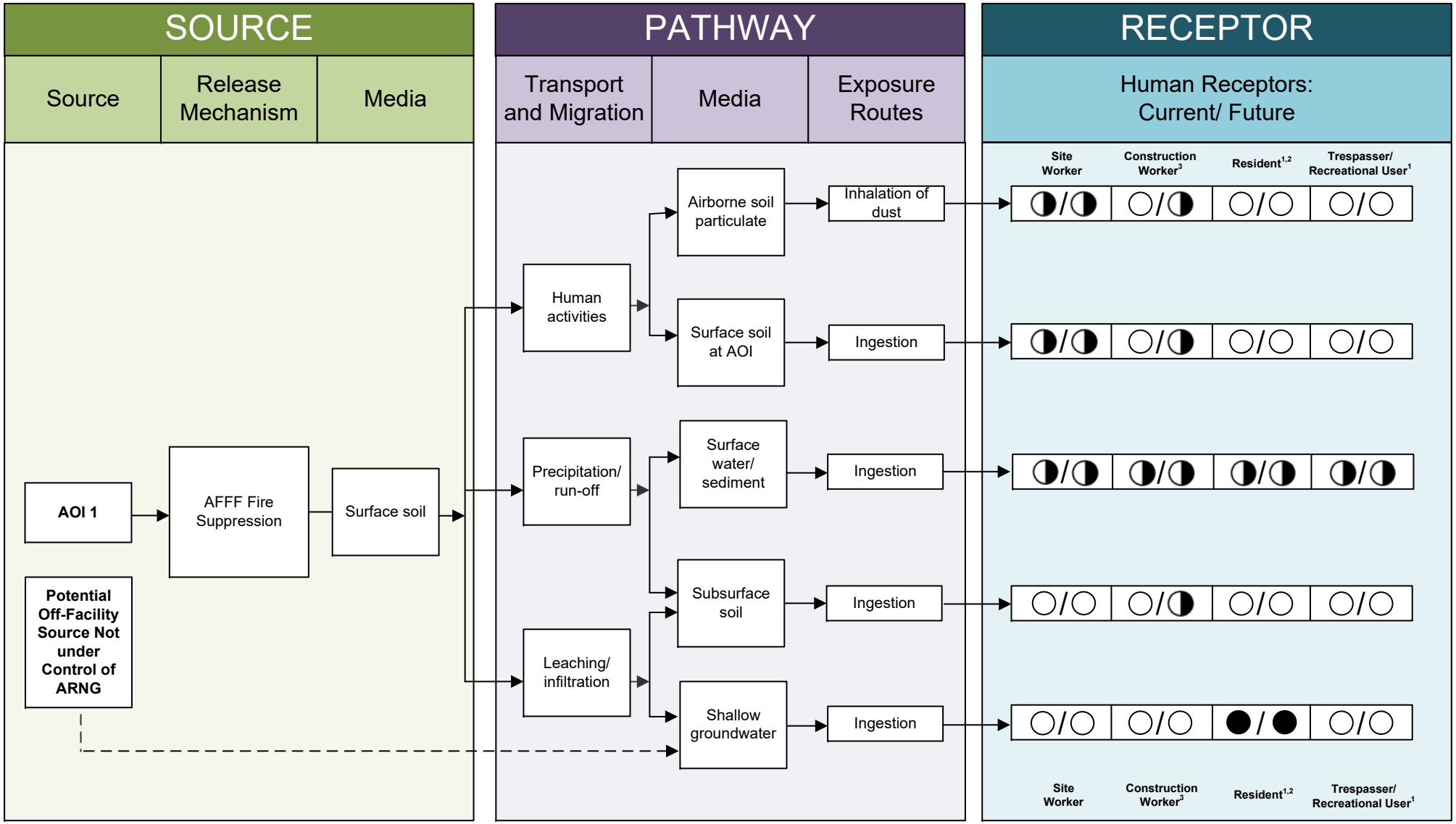


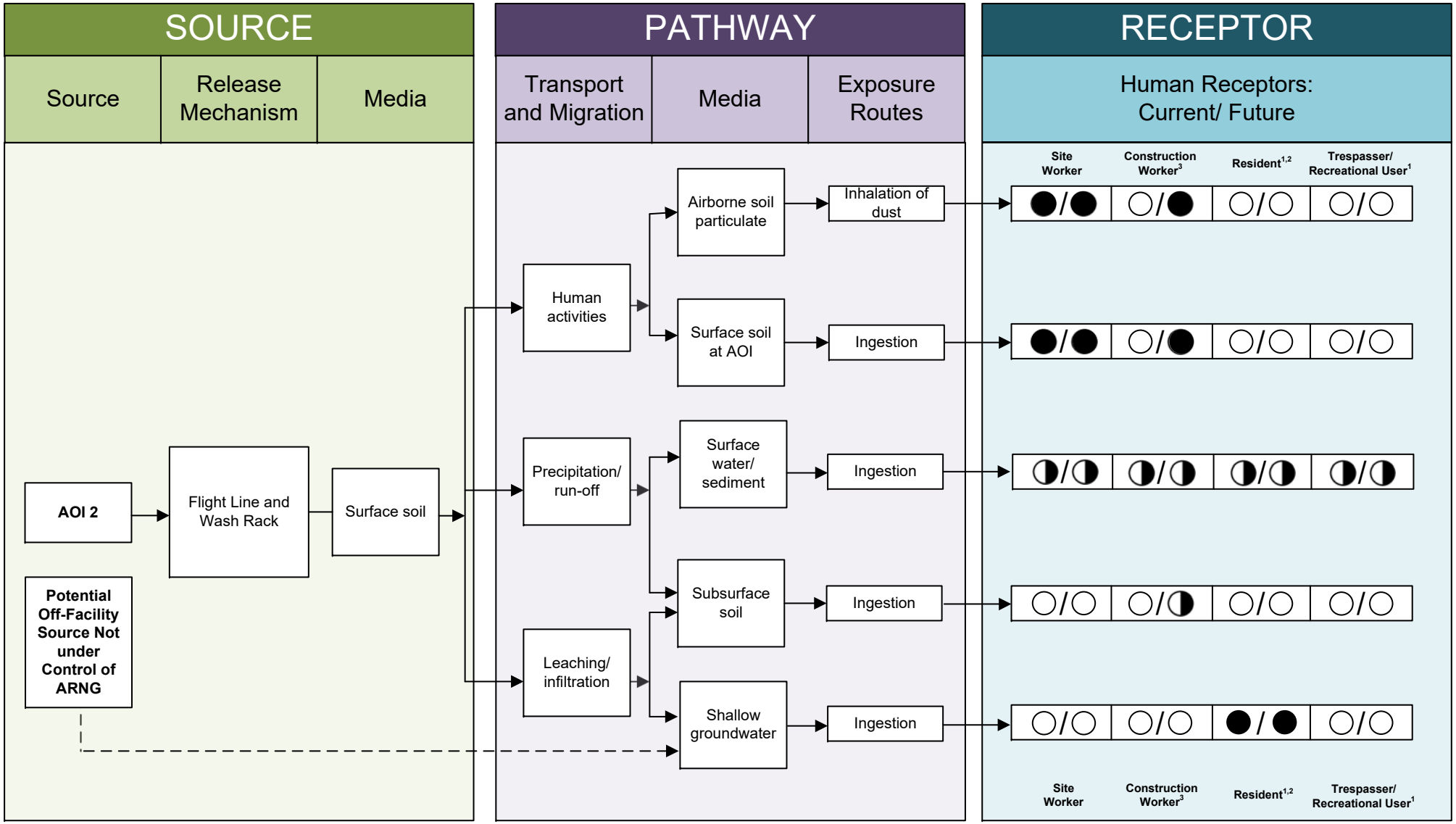
LEGEND

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

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1
Louisville AASF#2



LEGEND

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

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.

Figure 7-2
Conceptual Site Model, AOI 2
Louisville AASF#2

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 28 March to 2 April 2022 and consisted of utility clearance, sonic 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, 2022a).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2022a), 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.

- Eighteen (18) soil samples from six boring locations;
- Four grab groundwater samples from six temporary well locations;
- Thirteen (13) quality assurance (QA)/quality control (QC) samples.

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

8.2 Outcome

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

- At AOI 1:
  - The detected concentrations of PFOA, PFOS, PFHxS, and PFNA in soil at AOI 1 were below their SLs.
  - PFOA in groundwater exceeded the SL of 6 ng/L with a maximum concentration of 6.40 ng/L at location AOI01-01. Based on the results of the SI, further evaluation of AOI 1 is warranted in an RI.
- At AOI 2:
  - PFOS in surface soil exceeded its SL of 13 µg/kg, with a maximum concentration of 38.6 µg/kg at location AOI02-04. Based on the results of the SI, further evaluation of AOI 2 is warranted in an RI.

- PFOA, PFOS, PFNA, and PFHxS in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 93.6 ng/L at AOI02-04 (duplicate). PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 955 ng/L at AOI02-04. PFNA exceeded the SL of 6 ng/L, with a maximum concentration of 7.51 ng/L at AOI02-04. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 696 ng/L at AOI02-04 (duplicate). Based on the results of the SI, further evaluation of AOI 2 is warranted in an RI.

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

Table 8-1 summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Active Hangar	◐	●	●	Proceed to RI
2	Flight Line and Wash Rack	●	●	●	Proceed to RI

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

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