# FINAL
# Site Inspection Report
# Holman Field Army Aviation Support Facility
# St. Paul, Minnesota

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

September 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 |
| 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 |
| DPT | direct push technology |
| DQO | data quality objective |
| DUA | data usability assessment |
| ELAP | Environmental Laboratory Accreditation Program |
| EM | Engineer Manual |
| FedEx | Federal Express |
| GPS | Global positioning system |
| GPRS | Ground Penetrating Radar Systems |
| 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 |
| MAC | Metropolitan Airports Commission |
| MIL-SPEC | military specification |
| MNARNG | Minnesota Army National Guard |
| MNDNR | Minnesota Department of Natural Resources |
| MS/MSD | matrix spike/ matrix spike duplicate |
| ND | non-detect |
| NELAP | National Environmental Laboratory Accreditation Program |
| ng/L | nanograms per liter |
| OSD | Office of the Secretary of Defense |
| PA | Preliminary Assessment |
| PFAS | per- and polyfluoroalkyl substances |
| PFBS | perfluorobutanesulfonic acid |
| PFHxS | perfluorohexanesulfonic acid |

| | |
|---|---|
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PID | photoionization detector |
| PQAPP | Programmatic UFP-QAPP |
| 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 |
| TOC | total organic carbon |
| TPP | Technical Project Planning |
| UFP | Uniform Federal Policy |
| US | United States |
| USACE | United States Army Corps of Engineers |
| USCS | Unified Soil Classification System |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |

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

The Holman Field AASF is in southern Ramsey County, Minnesota, approximately 2 miles southeast of the City of St. Paul. The facility is accessible from State Highway 52 by Plato Boulevard or Eaton Street and Airport Road. The AASF is adjacent to the St. Paul Downtown Airport, which is bordered by the Mississippi River on the north, east, and south and on the west by a railroad and United States Army Corps of Engineers (USACE) flood control levy. The AASF was constructed in the 1920s on a 4.25-acre parcel of land owned by the Metropolitan Airports Commission (MAC) (MAC, 2010) and leased to the Minnesota ARNG (MNARNG). The current lease agreement expires on 30 September 2028. The AASF facilities include a hangar for the operation, maintenance, and repair of MNARNG rotary-winged and fixed-wing aircraft, administrative offices, and classrooms (AECOM, 2019).

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

[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** | South Hanger Ramp and Fire Truck Storage Area | ◐ | ● | ● | Proceed to RI |

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

# 1. Introduction

## 1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as “relevant compounds” throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the Holman Field Army Aviation Support Facility (AASF) in St. Paul, Minnesota. The Holman Field AASF is also referred to as the “facility” or the AASF 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 Holman Field AASF (AECOM Technical Services, Inc. [AECOM], 2019) that identified one Area of Interest (AOI) 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 AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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# 2. Facility Background

## 2.1 Facility Location and Description

The AASF is in southern Ramsey County, Minnesota, approximately 2 miles southeast of the City of St. Paul (**Figure 2-1**). The facility is accessible from State Highway 52 by Plato Boulevard or Eaton Street and Airport Road. The AASF is adjacent to the St. Paul Downtown Airport, which is bordered by the Mississippi River on the north and east, and it is bordered by commercial properties to the south, and a railroad and United States Army Corps of Engineers (USACE) flood control levy to the west.

The AASF was constructed in the 1920s, on a 4.25-acre parcel of land owned by the Metropolitan Airport Commission (MAC) and leased to the Minnesota ARNG (MNARNG). The AASF facilities include a hangar for the operation, maintenance, and repair of MNARNG rotary-winged and fixed-wing aircraft, administrative offices, and classrooms. The AASF also includes a separate parking area to the west, across State Highway 52.

## 2.2 Facility Environmental Setting

The AASF lies within the Twin Cities metropolitan area, which is characterized by rolling to hilly terrain with poorly drained depressions that form ponds and lakes. The Mississippi River forms ravines, surrounded bluffs, and steep slopes throughout the area, as well as relatively flat areas along the flood plain. The elevation of the facility is approximately 705 feet above mean sea level and approximately 20 feet above the Mississippi River. The facility is located on the 100-year floodplain.

### 2.2.1 Geology

The AASF is situated in the St. Paul Baldwin Plains and Moraines Subsection of the Eastern Broadleaf Forest Province as defined by the Minnesota Department of Natural Resources (MNDNR) Ecological Classification System. The St. Paul Baldwin Plains and Moraines are characterized by Quaternary deposits directly overlying Cambrian or Ordovician bedrock formations. The bedrock formations form part of a gently sloping structure centered under the Minneapolis-St. Paul metropolitan area, known as the Twin Cities basin (WSB & Associates Inc., 2011). Bedrock directly underlying the AASF is composed of Lower Ordovician-aged sedimentary deposits, namely dolostone, sandy to silty dolostone, and sandstone beds. Naturally occurring soils at the AASF generally consist of alluvium deposits approximately 100 feet deep from the retreating ice of the Wisconsin glaciation. Most of the facility [Holman Field area] was originally marsh land; however, several grading operations utilizing river dredge material, predominantly sand, and other common fill generally made up of sand, clay, silt, and broken limestone, have been completed (MAC, 2010).

Soils classifications fall under the Chaska and Udorthents associations. These soils are generally described as level to very gently sloping. The Chaska soils are present in the southern marshy portions of the facility and are poorly drained soils subject to frequent flooding from the Mississippi River consisting of silt loam for approximately the top 6 inches. The Udorthents soils are also present and consist of variable permeability fill soils comprised of Mississippi River dredging materials and various fill materials made up of sand, clay, silt, and broken limestone (MAC, 2010).

During the SI, poorly graded and well-graded sands were observed as the dominant lithology of the unconsolidated sediments below the Holman Field AASF. The borings were completed at depths between 10 and 15 feet below ground surface (bgs). Varying quantities of low to medium plasticity fines (silts and clay) were noted, specifically, isolated layers of silt with sand, silty lean clay, lean clay, clayey silt, sandy silt, and poorly graded sand with silt were also observed in the borings with thicknesses ranging from a few inches to 5 feet. Many of the logs also reported varying percentages of gravel included in the sand packages. A representative grain-size sample was collected at location AOI01-01 and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil sample is comprised primarily of fine sand (30.23 percent [%]) and silt (17.90%). These results and facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E**, and grain size results are presented in **Appendix F**.

### 2.2.2 Hydrogeology

The AASF is within the Metro Groundwater Province as defined by the MNDNR. Surficial sand and gravel aquifers are used for domestic and some irrigation purposes, while public water supply and municipal wells in the region draw from deeper bedrock aquifers composed of dolomite and sandstone (WSB & Associates Inc., 2011). Depth to groundwater in the area ranges from 0 to 25 feet bgs, with the shallowest wells closer to lakes, streams, and rivers. Surficial aquifers are recharged predominantly through infiltration of precipitation, although some recharge occurs from open water sources and during periods of high water levels (WSB & Associates Inc., 2011). Regional recharge of the five major bedrock aquifers occurs to the south in Freeborn and Mower Counties (WSB & Associates Inc., 2011).

No potable water wells are located within the boundary of the AASF (**Figure 2-3**). Several monitoring, commercial, and industrial wells are within 4 miles of the facility, and one domestic well is located less than 0.5 miles due north of the facility. Drinking water for the AASF is supplied by the City of St. Paul, which obtains its municipal water through the Saint Paul Regional Water Services. The Saint Paul Regional Water Services predominantly uses the Mississippi River as its drinking water source although some water is supplied by groundwater aquifers (WSB & Associates Inc., 2011). The Mississippi River surface water intakes are located upgradient of the facility, approximately 18 miles north near Fridley, Minnesota.

Depths to water measured in May 2022 during the SI ranged from 3.83 to 7.11 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the groundwater flow direction at the AASF is primarily to the southwest. However, due to a limited number, spatial arrangement, and differences in depth of wells installed during the SI, these contours and flow direction cannot capture the full complexity of groundwater conditions at the facility. Groundwater conditions at the AASF will be further characterized and evaluated during the RI.

### 2.2.3 Hydrology

The Mississippi River borders the AASF to the north and east and is a significant resource for the area. However, three reaches of the Mississippi River, including the segment directly adjacent to the AASF, and several lakes in the Harriet Island-Mississippi River Watershed are listed as impaired by the Minnesota Pollution Control Agency due to aluminum, fecal coliform, polychlorinated biphenyl, PFOS, and mercury contamination and high turbidity. The largest lake near the AASF is Pigs Eye Lake, along the Mississippi River.

The AASF lies within the 100-year floodplain of the Mississippi River. Freshwater wetlands are located to the southwest and northeast of the facility. In 2008, a floodwall was installed to protect against flooding (MAC, 2010). Surface water features are presented on **Figure 2-5**.

### 2.2.4 Climate

The climate of St. Paul consists of warm to hot, humid summers and cold winters, with moderate to heavy snowfall. Thunderstorms with heavy rainfall are common in the spring, summer, and fall. Seasonally, temperatures vary from summer highs of 85 degrees Fahrenheit (°F) to winter lows of 7 °F (World Climate, 2022). The average temperature is 42.85 °F. Average precipitation is 32.04 inches of rain and 54.4 inches of snow (World Climate, 2022). The prevailing wind varies from north to south, averaging 8 to 12 miles per hour, with arctic air masses throughout the winter.

### 2.2.5 Current and Future Land Use

The AASF is a controlled access facility, with public roads adjacent to the St. Paul Downtown Airport. The St. Paul Regional Airport is owned and operated by the MAC and provides corporate and military air service and a flight training school. The MNARNG uses the AASF for the tie-down and servicing of rotary-winged and fixed-wing aircraft. A large portion of the AASF's footprint is tarmac for flight operations. The infrastructure on-facility (hangar and other buildings) are used for storage and maintenance of ARNG property and operations, as well as administrative and training purposes. The AASF is bordered by the Mississippi River to the north and east, a combination of mixed-use commercial, office and industrial/utility land uses to the south, as well as a USACE flood control levy to the west (MAC, 2010). Residential areas are located northeast and southwest of the airport. Future land use developments are continually evaluated by the Joint Airport Zoning Board regarding safety zone dimensions and development restrictions. Future land use at the facility is not expected to change from the current land use.

### 2.2.6 Sensitive Habitat and Threatened/ Endangered Species

A wildlife survey has not occurred at the facility prior to the SI, but a habitat assessment and ecological risk evaluation will be performed as a part of the RI. While there are no significant areas of habitat on the facility, freshwater wetland areas exist near the facility, with the closest areas being approximately 800 feet southwest of the southwestern facility boundary, as well as approximately 1,700 feet to the northeast of the facility abutting the Mississippi River (US Fish and Wildlife Service [USFWS], 2023a). The following species have not been identified at the facility but may be present in the surrounding area.

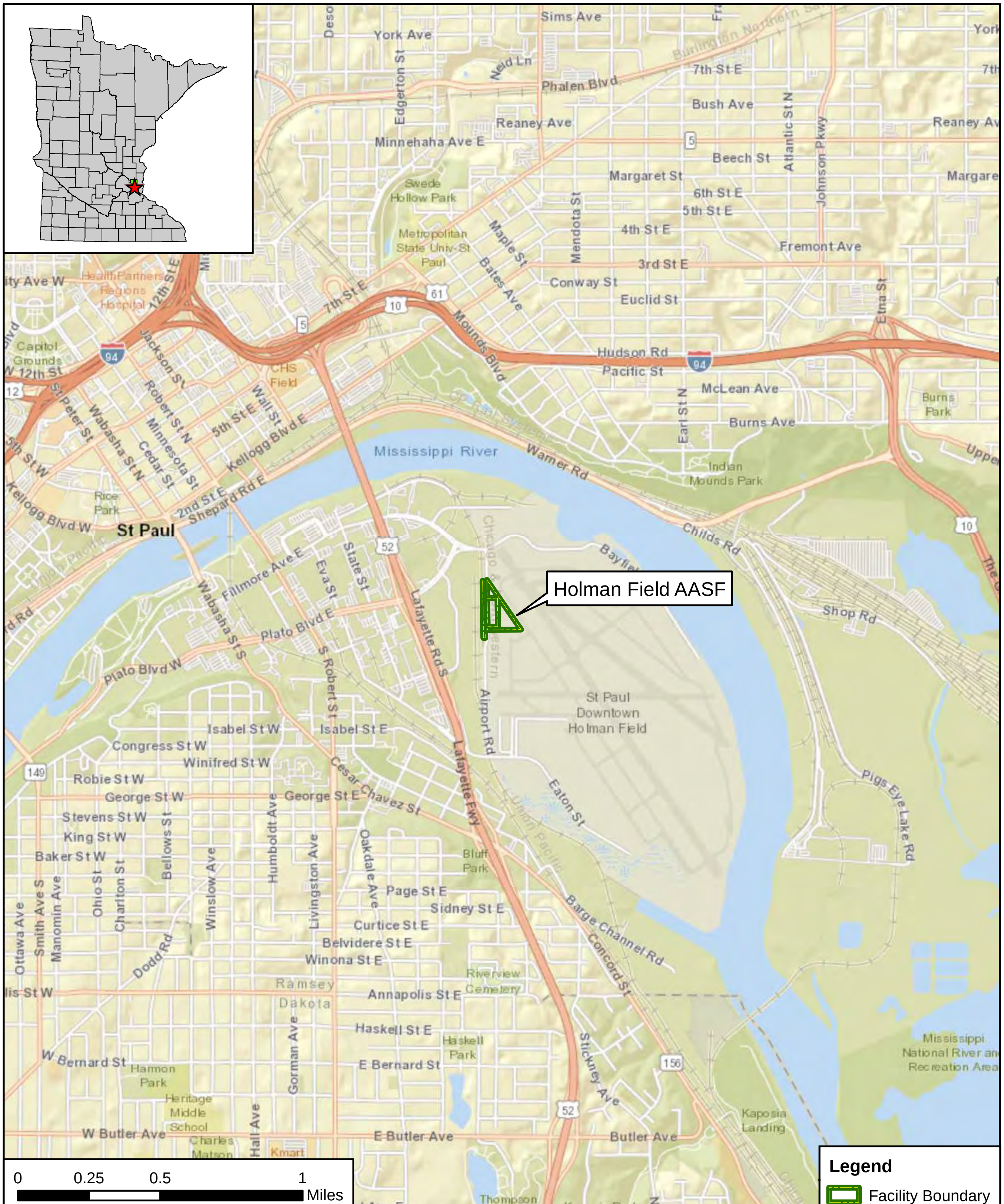
The following mollusks, insects, and mammals are federally endangered, threatened, proposed, and/ or are listed as candidate species in Ramsey County, Minnesota (USFWS, 2023b).

- **Mollusks:** Spectaclecase (mussel), *Cumberlandia monodonta* (endangered); Winged Mapleleaf, *Quadrula fragosa* (endangered); Higgins eye (pearlymussel), *Lampsilis higginsii* (endangered); Snuffbox mussel, *Epioblasma triquetra* (endangered)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate); Regal fritillary, *Speyeria idalia* (under review); Rusty patched bumble bee, *Bombus affinis* (endangered)
- **Mammals**: Tricolored bat, *Perimyotis subflavus* (proposed endangered); Little brown bat, *Myotis lucifugus* (under review); Northern Long-Eared Bat, *Myotis septentrionalis* (endangered)

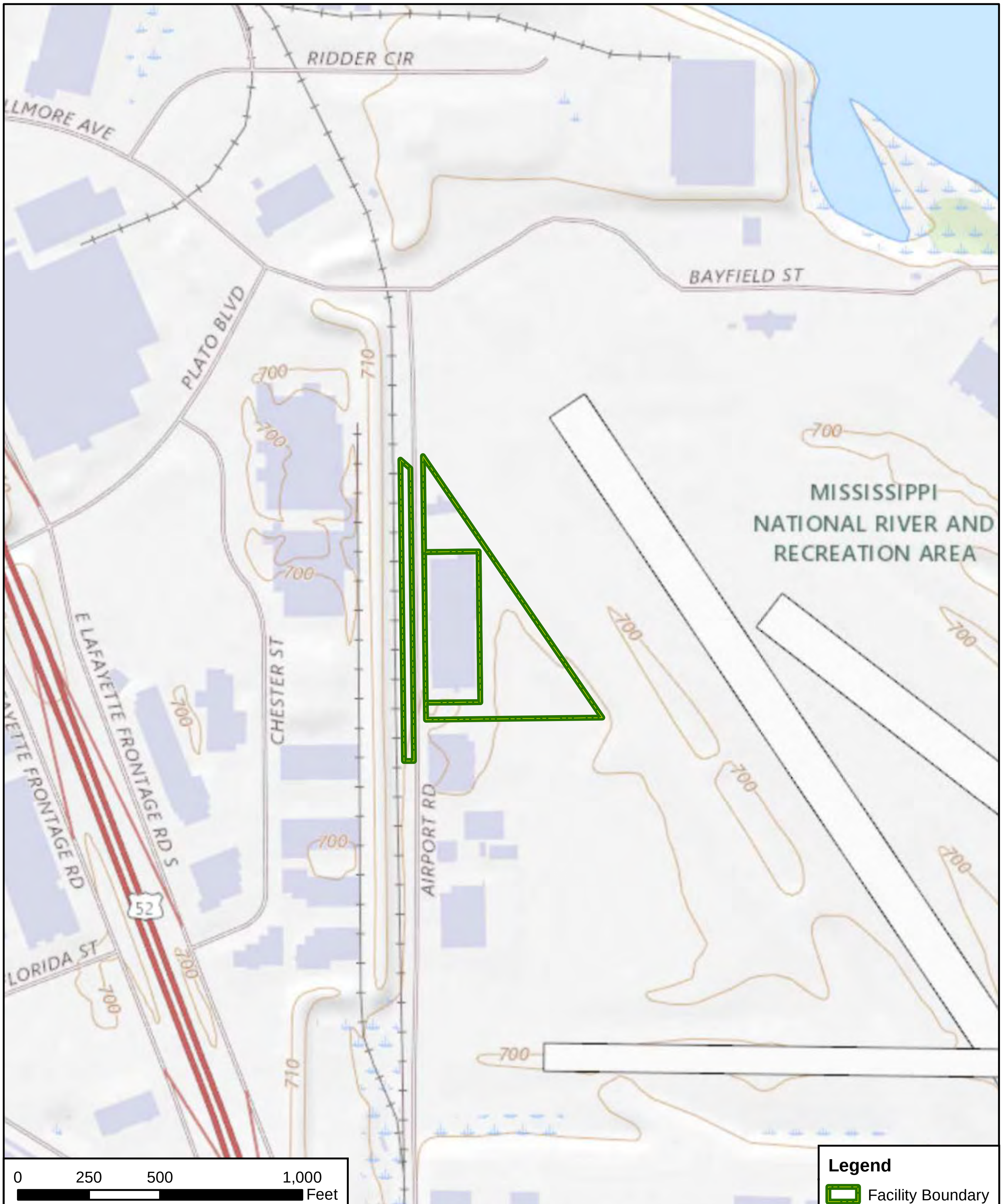
## 2.3 History of PFAS Use

One AOI was identified in the PA where AFFF may have been used, stored, disposed, or released historically at the Holman Field AASF (AECOM, 2019).

PFAS-containing materials were potentially released to soil and groundwater within the boundary of Holman Field AASF through fire training exercises and storm water conveyance. The potential release area was grouped into one AOI based on preliminary data and presumed groundwater flow directions. A description of the AOI is presented in **Section 3**.




| | | | | | | |
|---|---|---|---|---|---|---|
| CLIENT | ARNG | | | | | **Facility Location** |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | | |
| REVISED | 10/6/2022 | GIS BY | MS | 10/6/2022 | N | AECOM 12420 Milestone Center Drive Germantown, MD 20876 — **Figure 2-1** |
| SCALE | 1:31,680 | CHK BY | GR | 10/6/2022 | | |
| Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, | | PM | CM | 10/6/2022 | | |



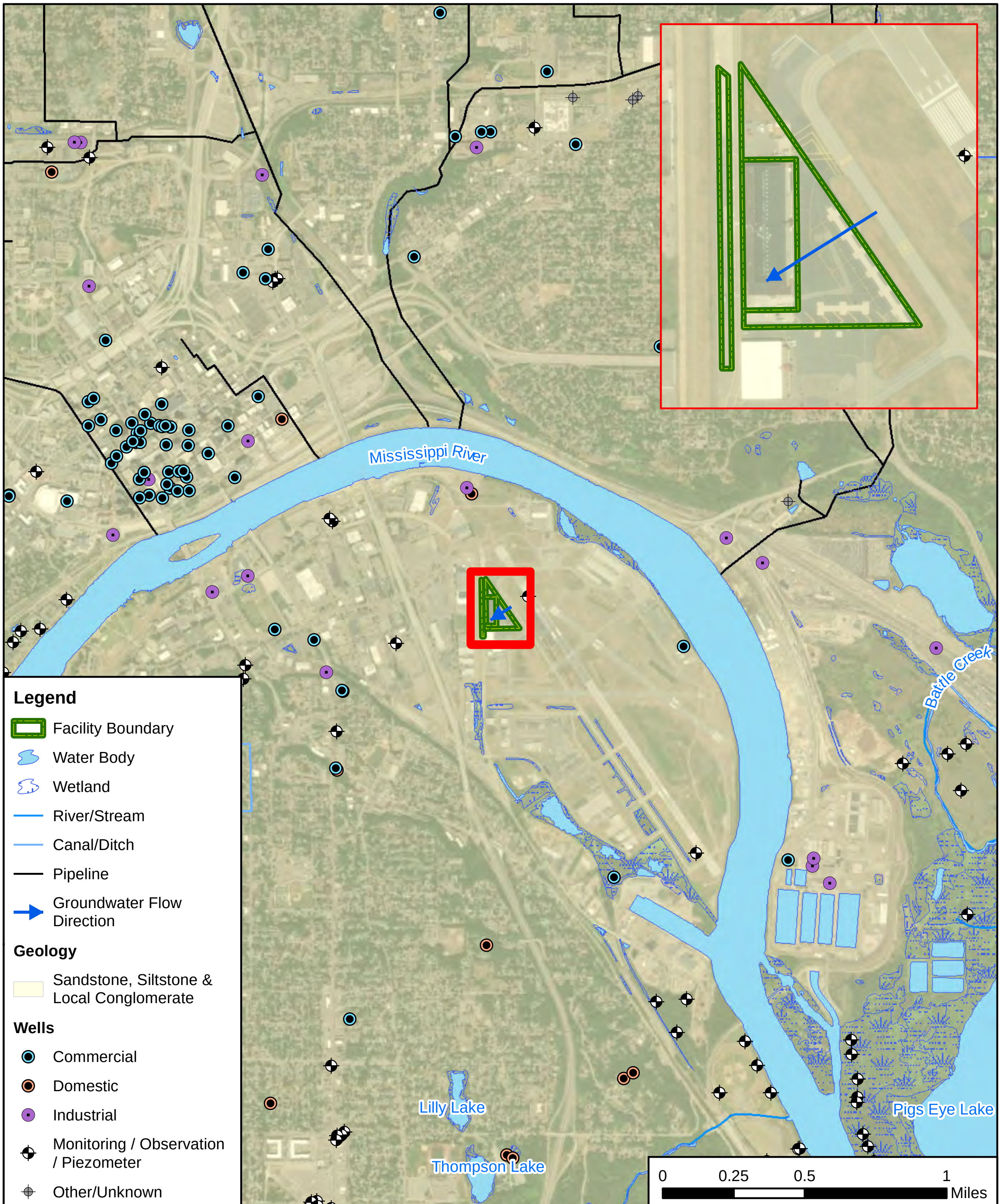

| CLIENT | ARNG | | | |
|---|---|---|---|---|
| PROJECT | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 10/6/2022 | GIS BY | MS | 10/6/2022 |
| SCALE | 1:6,000 | CHK BY | GR | 10/6/2022 |
| Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, | | PM | CM | 10/6/2022 |

N

**Facility Topography**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-2**

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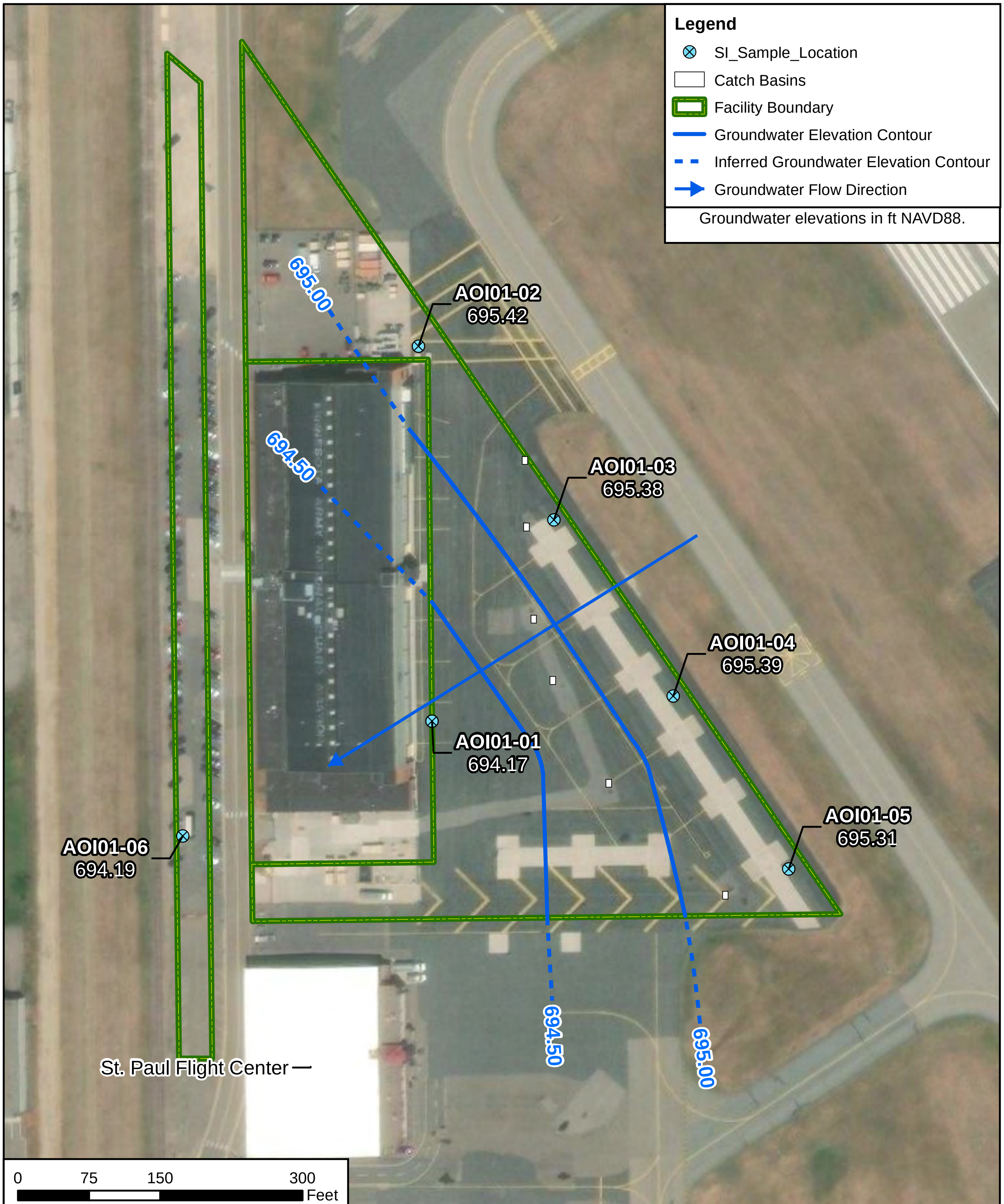
|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 |
| SCALE | 1:31,680 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

**Groundwater Features**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-3**

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|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | |
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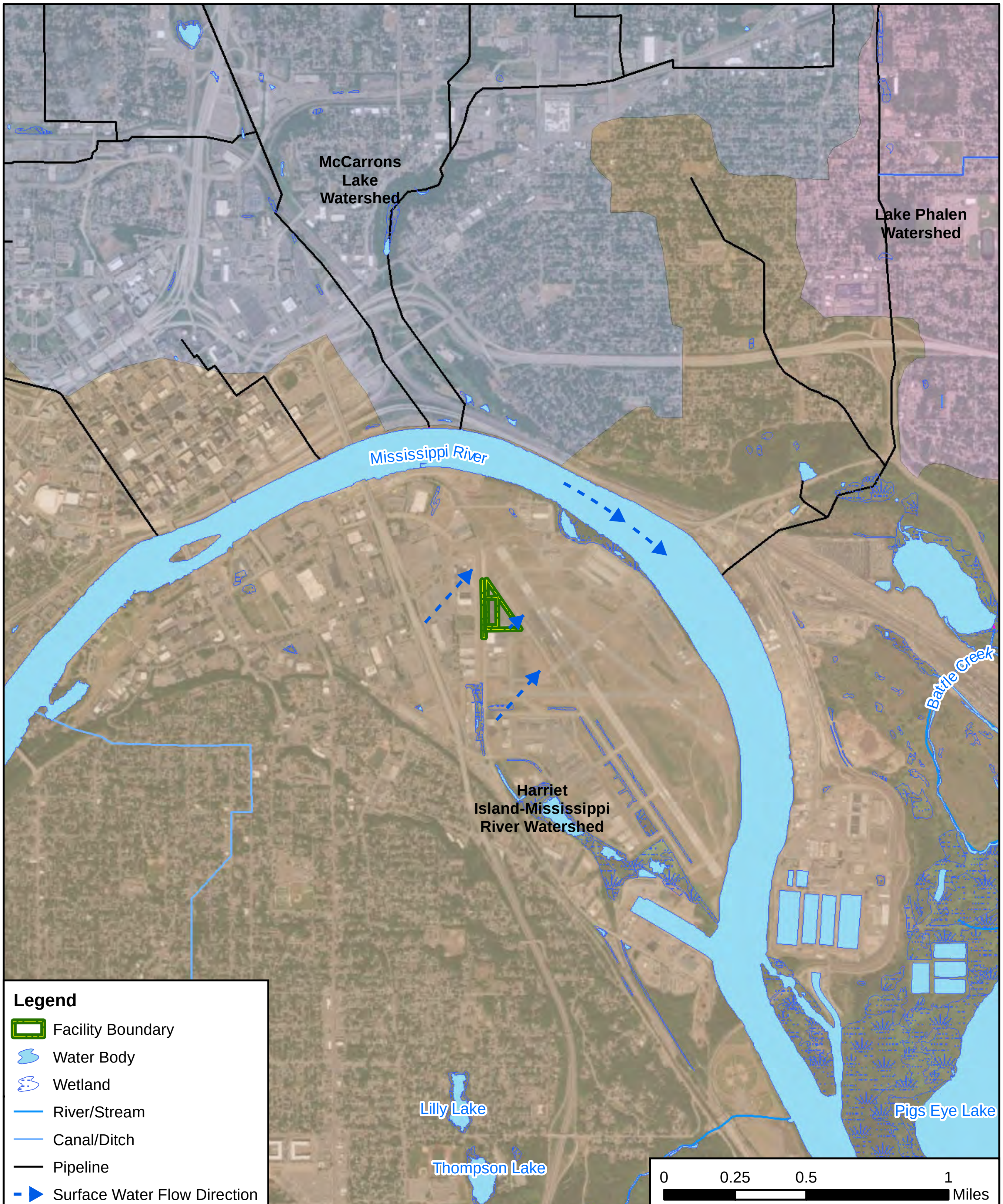
| SCALE | 1:1,800 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

N

**Groundwater Elevations, May 2022**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 2-4**

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| CLIENT | ARNG | | | |
| NOTES | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 |
| SCALE | 1:31,680 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

## 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, one potential release area was identified at the facility [Holman Field AASF] and grouped into one AOI (AECOM, 2019). The potential release areas are shown on **Figure 3-1**.

## 3.1 AOI 1 South Hanger Ramp and Fire Truck Storage Area

AOI 1 is the South Hangar Ramp and Fire Truck Storage Area. One potential release of AFFF occurred in October 2013, when the Tri-Max$^{TM}$ fire extinguishers were emptied on the east side of the South Hangar Ramp by the MNARNG prior to being returned to Camp Ripley for demilitarization. In total, approximately 12 gallons of AFFF concentrate were released during this event. Additionally, an AFFF-capable firetruck was stored in the northeast corner of the facility building from 1987 to 1989. Site personnel indicated AFFF concentrate was transferred to the fire truck by pouring AFFF from 5-gallon containers into the tanks. No spills were noted. In addition, the former Fire Marshall indicated the firetruck did not have maintenance issues and was never used for emergency response or training. The nozzles on the firetruck were tested using water only; the proportioning valve was never tested. Periodically, the firetruck was washed in the hangar at the indoor wash rack. Water from the indoor wash rack drains to the oil water separator and then to the sanitary sewage.

## 3.2 Adjacent Sources

One off-facility, potential source was identified adjacent to the AASF during the PA and are not associated with ARNG activities. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and will not be investigated as part of this SI.

### 3.2.1 St. Paul Downtown Airport

The St. Paul Downtown Airport was constructed in 1926 and is owned and operated by the MAC. The AASF is southwest and adjacent to the St. Paul Downtown Airport. The St. Paul Downtown Airport is one of several reliever airports in the Twin Cities and consists of several private hangars, including hangars for the 3M Company, and the St. Paul Flight Center. The City of St. Paul Fire Department provides fire emergency services for the St. Paul Downtown Airport. Based on the interview with the City of St. Paul Fire Chief's, none of the hangars at the St. Paul Downtown Airport contain AFFF fire suppression systems, and AFFF has not been dispensed at the Holman Field Complex, including the AASF.

### 3.2.2 Upgradient Sources

Several additional sources of PFAS in the St. Paul area, not adjacent to the AASF facility, were identified in a report by Delta Consultants titled *Perfluorocarbon (PFC)-Containing Firefighting Foams And Their Use In Minnesota*. These sources include a 3M Company plant, the Minneapolis-St. Paul International Airport / Minneapolis–Saint Paul Joint Air Reserve Station, refineries, marina fire locations, and landfills. The AASF is downgradient of these additional sources of PFAS; therefore, PFAS use at these locations could potentially impact the AASF.

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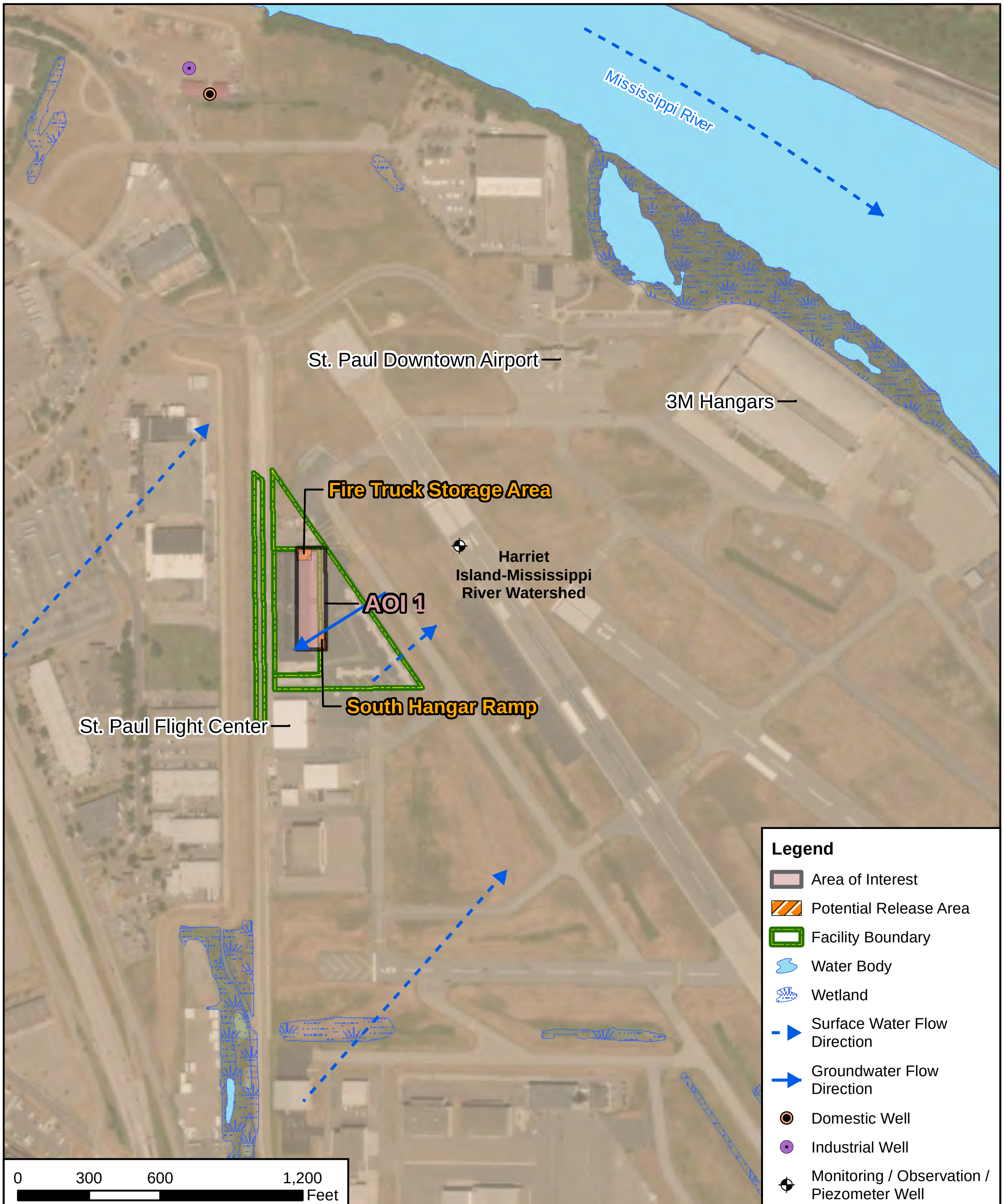


| CLIENT | ARNG | | | |
|---|---|---|---|---|
| NOTES | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 |
| SCALE | 1:7,200 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

**Area of Interest**

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

**Figure 3-1**

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# 4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 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 Holman Field AASF (AECOM, 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 was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The scope of the SI was vertically bounded by depth to groundwater, with a maximum drilled depth of 15 feet bgs. Temporal boundaries were limited to the summer season due to climate and field resource availability.

## 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 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, 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, Holman Field Army Aviation Support Facility, St. Paul, Minnesota* dated November 2019 (AECOM, 2019);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Holman Field Army Aviation Support Facility, St. Paul, Minnesota* dated March 2022 (AECOM, 2022a); and
- *Final Site Safety and Health Plan, Holman Field Army Aviation Support Facility, St. Paul, Minnesota* dated May 2022 (AECOM, 2022b).

The SI field activities were conducted from 23 to 25 May 2022 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, 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:

- Fifteen (15) soil samples from six boring locations;
- Six grab groundwater samples from six temporary wells;
- Fourteen (14) 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**, and land survey data are provided in **Appendix B3**. 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 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 8 September 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, MNARNG, USACE, MAC, Minnesota Pollution Control Agency, and Stantec. 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, 202a). A TPP Meeting 3 was held on (date 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 USA north 811 "Call Before You Dig" utility clearance provider to notify them of intrusive work on 17 May 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 23 May 2022 with input from the AECOM field team and Holman Field 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

One potable water source at Holman Field AASF was sampled on 12 January 2022 to assess usability for decontamination of drilling equipment. Results of the sample collected at the North Hanger Bay spigot (HF-DECON-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 associated with the wash rack spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 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 direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2022a). A GeoProbe® 7822DT 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. The boring logs are provided in **Appendix E**.

During the SI, poorly graded and well-graded sands were observed as the dominant lithology of the unconsolidated sediments in soil borings drilled at the facility. The borings were completed at depths between 10 and 15 feet bgs. Varying quantities of low to medium plasticity fines (silts and clay) were noted, specifically, isolated layers of silt with sand, silty lean clay, lean clay, clayey silt, sandy silt, and poorly graded sand with silt. These layers ranged in thickness from a few inches to 5 feet. Many of the logs also reported varying percentages of gravel included in the sand packages. 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), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) 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.

DPT 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.

## 5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed using either 5-foot or 10-foot sections of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. The temporary wells were installed in direct contact with the native material; filter sand or other well construction material was not used in the construction of the temporary wells. 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 peristaltic 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, DO, and ORP) 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, 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 neat cement grout. 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 25 May 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. 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 Minnesota-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2022a). Survey data from the newly installed wells on the facility were collected on 25 May 2022 in the applicable Universal Transverse Mercator zone projection with Minnesota Coordinate System of 1983 (CCS83) 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 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, 2022a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018). However, due to the proximity to facility operations, ARNG and MNARNG agreed to containerize all soil and liquid IDW generated during the SI activities.

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 PFAS characteristics of the associated soil samples collected from that source location. Based on laboratory results, containerized soil cuttings will be managed and disposed by ARNG, either by offsite disposal or, where PFAS concentrations are below the Industrial/Commercial Composite Worker OSD SLs, ARNG will distribute the soil on the downgradient side of the associated borehole.

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 onsite in a designated waste storage area. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location. Additionally, petroleum impacts (i.e., sheening and odor) were observed in the purge water from temporary well AOI01-06. The liquid IDW from this location was segregated and containerized in a separate 55-gallon drum and stored in the northern portion of the hanger exterior. Containerized liquid IDW will be managed and disposed of by ARNG (either by offsite disposal or onsite disposal with treatment, as appropriate) under a separate contract in accordance with SOP No. 042A (EA, 2021). ARNG will further manage liquid IDW in accordance with the Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018). ARNG will coordinate transportation and disposal of the liquid IDW.

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.

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**Table 5-1**
**Site Inspection Samples by Medium**
**Site Inspection Report, Holman Field AASF, Minnesota**

| 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 | 5/24/2022 12:05 | 0-2 | x | | | | |
| AOI01-01-SB-00-02-D | 5/24/2022 12:05 | 0-2 | x | | | | FD |
| AOI01-01-SB-00-02-MS | 5/24/2022 12:05 | 0-2 | x | | | | MS |
| AOI01-01-SB-00-02-MSD | 5/24/2022 12:05 | 0-2 | x | | | | MSD |
| AOI01-01-SB-03-05 | 5/24/2022 12:25 | 3-5 | x | x | x | x | |
| AOI01-01-SB-03-05-D | 5/24/2022 12:25 | 3-5 | | x | x | | FD |
| AOI01-01-SB-03-05-MS | 5/24/2022 12:25 | 3-5 | | x | x | | MS |
| AOI01-01-SB-03-05-MSD | 5/24/2022 12:25 | 3-5 | | x | x | | MSD |
| AOI01-01-SB-05-07 | 5/24/2022 12:45 | 5-7 | x | | | | |
| AOI01-02-SB-00-02 | 5/24/2022 9:00 | 0-2 | x | | | | |
| AOI01-02-SB-05-07 | 5/24/2022 9:10 | 5-7 | x | | | | |
| AOI01-02-SB-05-07-D | 5/24/2022 9:10 | 5-7 | x | | | | FD |
| AOI01-02-SB-07-09 | 5/24/2022 9:15 | 7-9 | x | | | | |
| AOI01-03-SB-00-02 | 5/24/2022 10:30 | 0-2 | x | | | | |
| AOI01-03-SB-03-05 | 5/24/2022 10:35 | 3-5 | x | | | | |
| AOI01-04-SB-00-02 | 5/24/2022 11:15 | 0-2 | x | | | | |
| AOI01-04-SB-03-04 | 5/24/2022 11:30 | 3-4 | x | | | | |
| AOI01-05-SB-00-02 | 5/24/2022 13:40 | 0-2 | x | | | | |
| AOI01-05-SB-02-03 | 5/24/2022 13:45 | 2-3 | x | | | | |
| AOI01-06-SB-00-02 | 5/24/2022 14:55 | 0-2 | x | | | | |
| AOI01-06-SB-04-06 | 5/24/2022 15:15 | 4-6 | x | | | | |
| AOI01-06-SB-08-10 | 5/24/2022 15:25 | 8-10 | x | | | | |

**Table 5-1**
**Site Inspection Samples by Medium**
**Site Inspection Report, Holman Field AASF, Minnesota**

| 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 |
|---|---|---|---|---|---|---|---|
| **Groundwater Samples** | | | | | | | |
| AOI01-01-GW | 5/25/2022 13:45 | NA | x | | | | |
| AOI01-01-GW-D | 5/25/2022 13:45 | NA | x | | | | FD |
| AOI01-01-GW-MS | 5/25/2022 13:45 | NA | x | | | | MS |
| AOI01-01-GW-MSD | 5/25/2022 13:45 | NA | x | | | | MSD |
| AOI01-02-GW | 5/25/2022 12:30 | NA | x | | | | |
| AOI01-03-GW | 5/25/2022 16:10 | NA | x | | | | |
| AOI01-04-GW | 5/25/2022 15:25 | NA | x | | | | |
| AOI01-05-GW | 5/25/2022 14:25 | NA | x | | | | |
| AOI01-06-GW | 5/25/2022 10:30 | NA | x | | | | |
| **Quality Control Samples** | | | | | | | |
| HF-ERB-01 | 5/24/2022 9:55 | NA | x | | | | From HA |
| HF-ERB-02 | 5/24/2022 13:00 | NA | x | | | | From DPT Shoe |
| HF-FRB-01 | 5/24/2022 15:45 | NA | x | | | | |
| HF-DECON-01 | 1/12/2022 12:42 | NA | x | | | | |

**Notes:**
ASTM = American Society for Testing and Materials
bgs = below ground surface
DPT = direct push technology
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
HA = hand auger
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
NA = not applicable
pH = potential of hydrogen
QSM = Quality Systems Manual
SB = soil boring
SS = surface soil
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, Holman Field AASF, Minnesota**

| 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 | 15 | 8-13 | 700.733 | 700.829 | 6.56 | 6.66 | 694.17 |
| | AOI01-02 | 15 | 9-14 | 701.450 | 701.423 | 6.03 | 6.00 | 695.42 |
| | AOI01-03 | 10 | 5-10 | 700.684 | 700.607 | 5.30 | 5.22 | 695.38 |
| | AOI01-04 | 10 | 5-10 | 700.372 | 700.406 | 4.98 | 5.01 | 695.39 |
| | AOI01-05 | 10 | 5-10 | 699.059 | 699.141 | 3.75 | 3.83 | 695.31 |
| | AOI01-06 | 15 | 10-15 | 701.324 | 701.303 | 7.13 | 7.11 | 694.19 |

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

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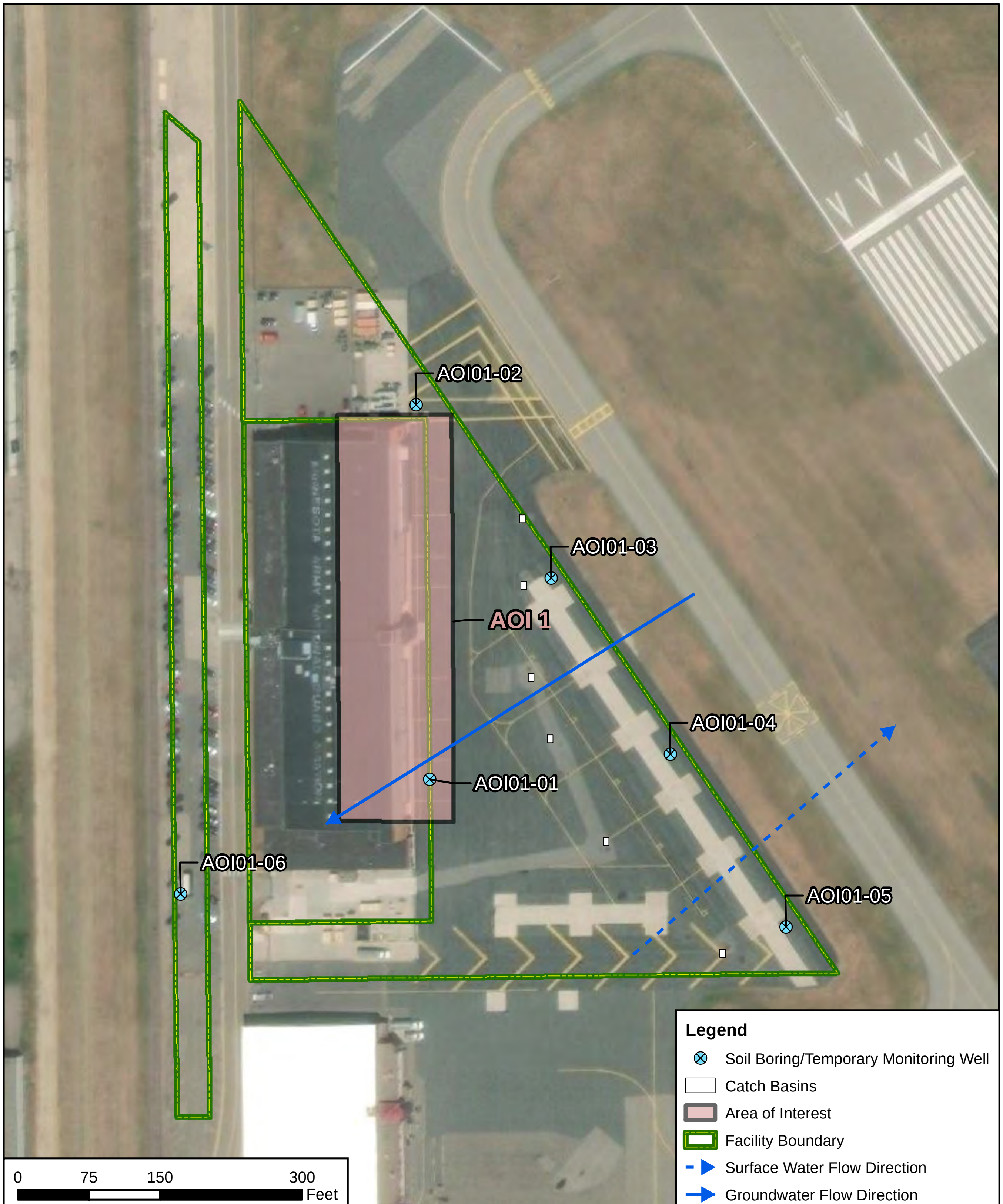


| CLIENT | ARNG | | | | |
|---|---|---|---|---|---|
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 | |
| SCALE | 1:1,800 | CHK BY | GR | 5/11/2023 | |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 | |

## 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 the AOI is provided in **Section 6.3** through **Section 6.5**. **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, pH, and grain size, which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC, pH, and grain size 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: South Hanger Ramp and Fire Truck Storage Area. 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.

Surface soil was sampled from 0 to 2 feet bgs at boring locations AOI01-01 through AOI01-06. Soil was also sampled at all six locations from two shallow subsurface intervals between 2 to 10 feet bgs). Deeper subsurface soil was not sampled at borings AOI01-03, AOI01-04, and AOI01-05 due to groundwater being shallower than 15 feet bgs at all locations. On Figures 6-1 through 6-5, the two shallow subsurface sampling zones are labeled ‘intermediate’ and ‘deep.’

PFOS was detected in surface soil below the SL of 13 micrograms per kilogram (µg/kg) at four of the six locations, with the highest concentration of 3.54 µg/kg occurring at AOI01-03. PFHxS, PFNA, and PFBS were detected in surface soil at concentrations several orders of magnitude lower than their SLs at all locations. PFOA was not detected in surface soil.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in shallow subsurface soil, at concentrations several orders of magnitude lower than their SLs at all six locations.

### 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.

Groundwater was sampled from temporary monitoring wells AOI01-01 through AOI01-06. PFNA and PFBS were detected below their SLs of 6 ng/L and 601 ng/L, respectively, in all six wells. The following exceedances of the SLs for PFOA, PFOS, and PFHxS were measured:

- PFOA was detected above the SL of 6 nanograms per liter (ng/L) in four of the six wells, with concentrations ranging from 7.71 ng/L at AOI01-02 to 103 J- ng/L at location AOI01-01.

- PFOS was detected above the SL of 4 ng/L in the six wells with concentrations ranging from of 9.65 ng/L at AOI01-06 to 37.3 ng/L at location AOI01-03.
- PFHxS was detected above the SL of 39 ng/L in two of the six wells, with concentrations of 239 J- ng/L at AOI01-01 and 69.7 ng/L at AOI01-02.

### 6.3.3 AOI 1 Conclusions

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

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

| | **Area of Interest** | AOI01 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Sample ID** | AOI01-01-SB-00-02 | | AOI01-01-SB-00-02-D | | AOI01-02-SB-00-02 | | AOI01-03-SB-00-02 | | AOI01-04-SB-00-02 | | AOI01-05-SB-00-02 | | AOI01-06-SB-00-02 | |
| | **Sample Date** | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | |
| | **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 | U | ND | U | ND | U | ND | U | ND | U | 0.027 | J |
| PFHxS | 130 | ND | U | ND | U | ND | U | ND | U | ND | U | ND | U | 0.191 | J |
| PFNA | 19 | ND | UJ | 0.021 | J | ND | U | ND | U | ND | U | 0.044 | J | 0.024 | J |
| PFOA | 19 | ND | U | ND | U | ND | U | ND | U | ND | U | ND | U | ND | U |
| PFOS | 13 | 0.638 | J+ | 1.19 | J+ | 0.091 | J | 3.54 | | ND | U | ND | U | 0.817 | 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 incidential 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, Holman Field AASF**

| | Area of Interest | AOI01 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample ID | AOI01-01-SB-03-05 | | AOI01-01-SB-05-07 | | AOI01-02-SB-05-07 | | AOI01-02-SB-05-07-D | | AOI01-02-SB-07-09 | | AOI01-03-SB-03-05 | | AOI01-04-SB-03-04 | | AOI01-05-SB-02-03 | | AOI01-06-SB-04-06 | | AOI01-06-SB-08-10 | |
| | Sample Date | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | |
| | Depth | 3-5 ft | | 5-7 ft | | 5-7 ft | | 5-7 ft | | 7-9 ft | | 3-5 ft | | 3-4 ft | | 2-3 ft | | 4-6 ft | | 8-10 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 | 0.043 | J | ND | U |
| PFHxS | 1600 | 0.562 | J | 0.560 | J | ND | UJ | 0.039 | J | 0.041 | J | 0.093 | J | ND | U | 0.036 | J | 0.035 | J | ND | U |
| PFNA | 250 | ND | U | ND | U | ND | UJ | 0.032 | J | 0.031 | J | ND | U | ND | U | 0.108 | J | ND | U | ND | U |
| PFOA | 250 | ND | U | ND | U | ND | U | ND | U | ND | U | ND | U | ND | U | 0.109 | J | ND | U | ND | U |
| PFOS | 160 | 0.137 | J | 0.284 | J | 0.359 | J | 0.553 | J | 0.876 | J | 0.336 | J | ND | U | 0.201 | J | 0.063 | J | 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

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 Groundwater**
**Site Inspection Report, Holman Field AASF**

| | **Area of Interest** | AOI01 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Sample ID** | AOI01-01-GW | | AOI01-01-GW-D | | AOI01-02-GW | | AOI01-03-GW | | AOI01-04-GW | | AOI01-05-GW | | AOI01-06-GW | |
| | **Sample Date** | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | | 05/24/2022 | |
| **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 | 25.8 | | 21.9 | | 2.05 | J | 1.78 | J | 1.14 | J | 2.34 | J | 3.00 | J |
| PFHxS | 39 | 239 | J- | 197 | J- | 69.7 | | 14.4 | | 7.02 | | 26.4 | | 25.3 | |
| PFNA | 6 | 1.14 | J | ND | UJ | ND | U | 4.21 | | ND | U | 1.86 | J | ND | U |
| PFOA | 6 | 103 | J- | 86.6 | J- | 7.71 | | 12.0 | | 5.69 | | 10.5 | | 4.18 | |
| PFOS | 4 | 33.7 | | 27.3 | | 33.1 | | 37.3 | | 20.3 | | 21.4 | | 9.65 | |

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 low
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 |
| 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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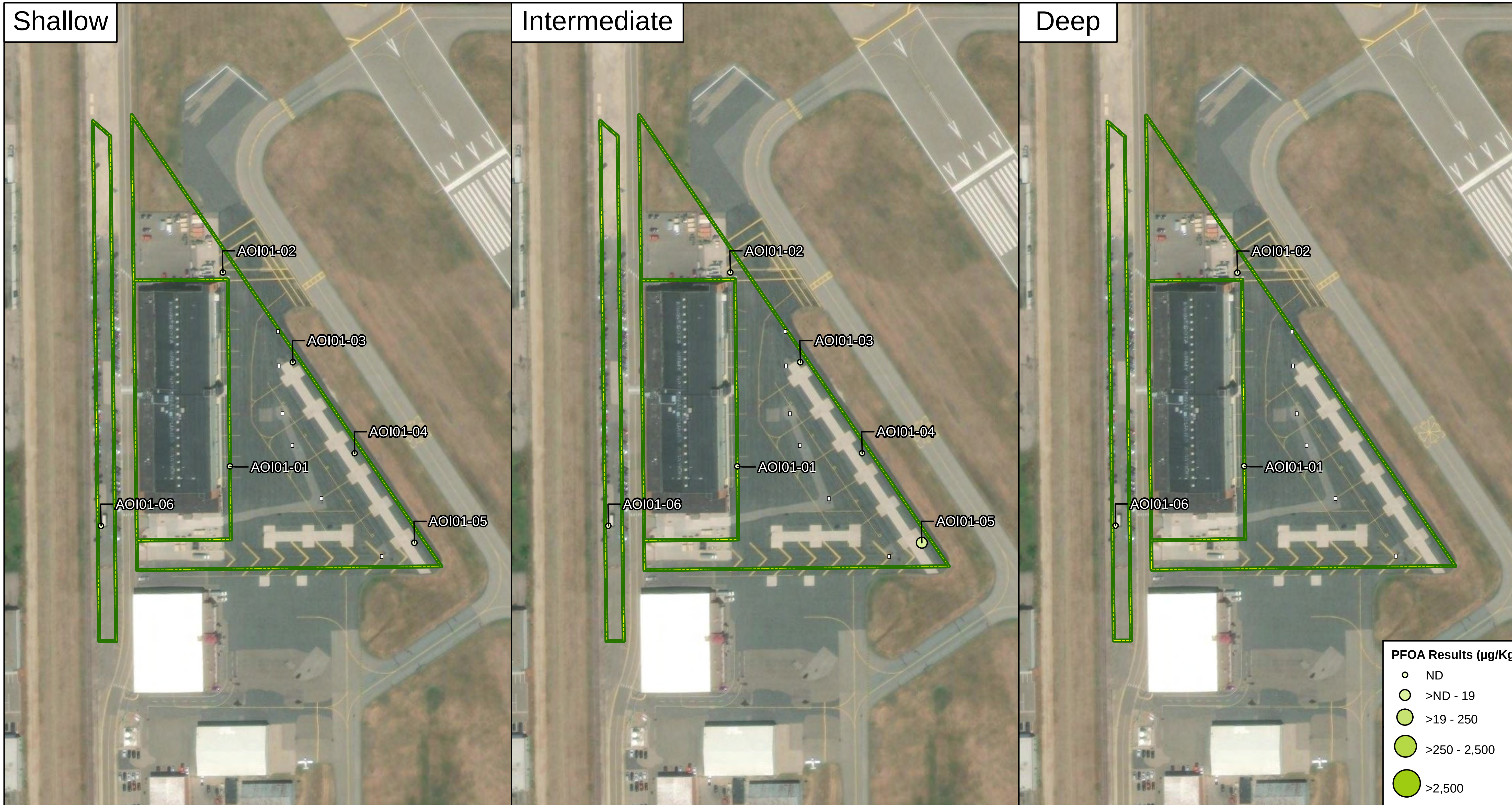


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| CLIENT | ARNG | | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | |
| REVISED | 5/3/2023 | GIS BY | MS | 5/3/2023 | |
| SCALE | 1:2,400 | CHK BY | GR | 5/3/2023 | |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/3/2023 | |

**Legend**

Catch Basins

Facility Boundary

0 100 200 400 Feet

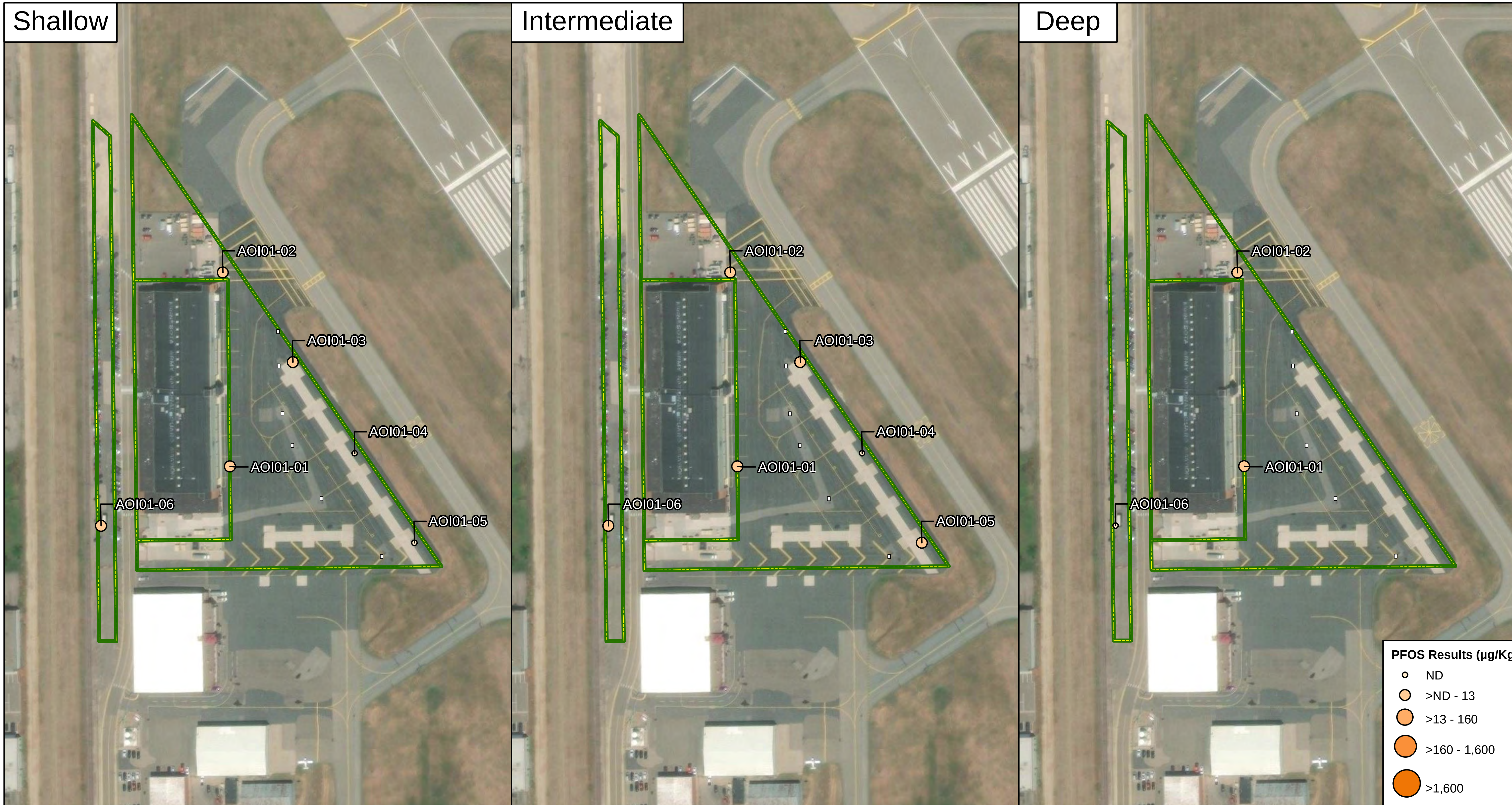
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

## PFOA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-1**

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| CLIENT | ARNG | | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | |
| REVISED | 5/3/2023 | GIS BY | MS | 5/3/2023 | |
| SCALE | 1:2,400 | CHK BY | GR | 5/3/2023 | |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/3/2023 | |

**Legend**

Catch Basins

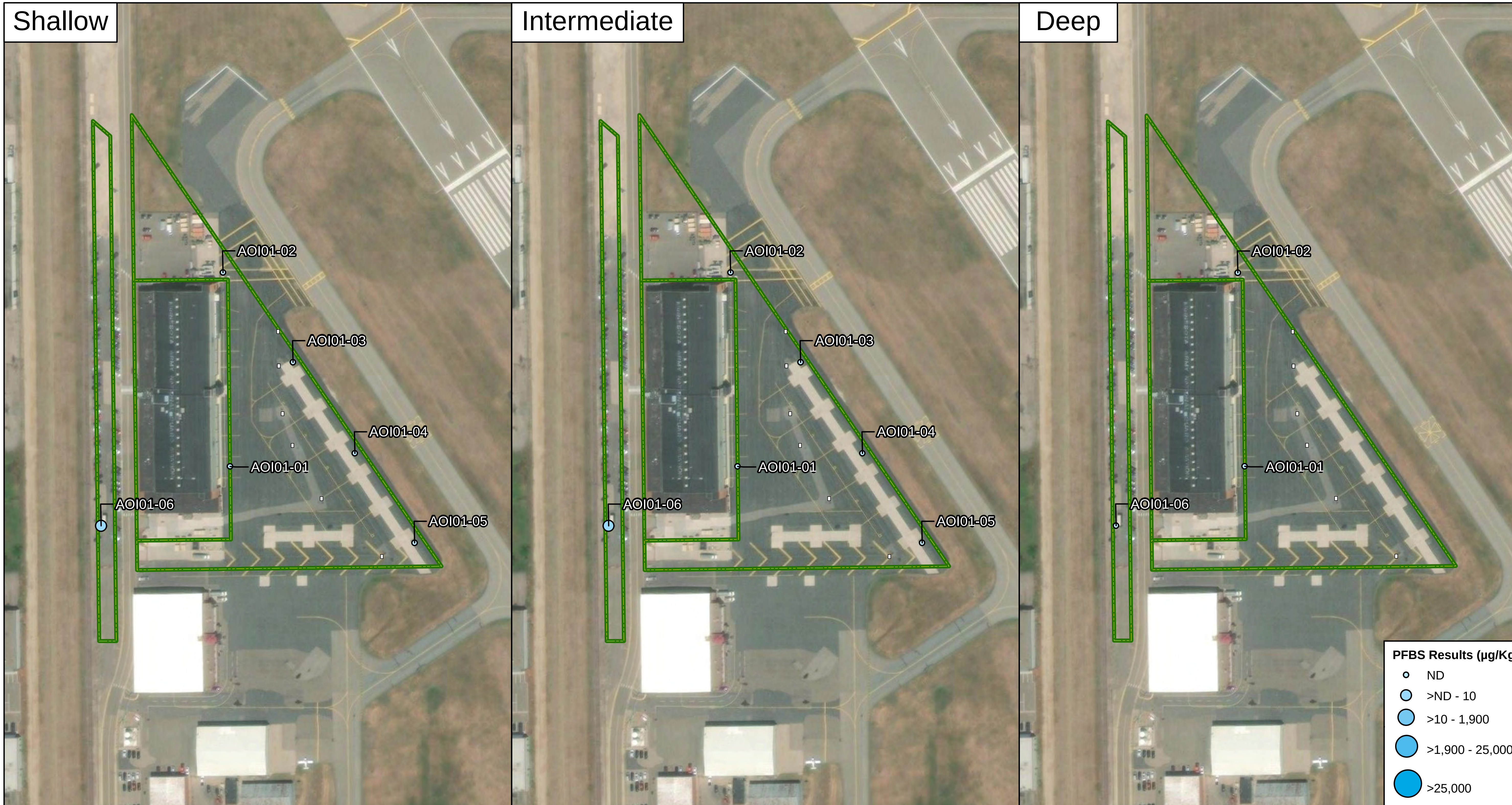
Facility Boundary

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

**PFOS Detections in Soil**

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-2**

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|---|---|---|---|---|---|
| CLIENT | ARNG | | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | |
| REVISED | 5/3/2023 | GIS BY | MS | 5/3/2023 |
| SCALE | 1:2,400 | CHK BY | GR | 5/3/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/3/2023 |

**Legend**

Catch Basins

Facility Boundary

0 100 200 400 Feet

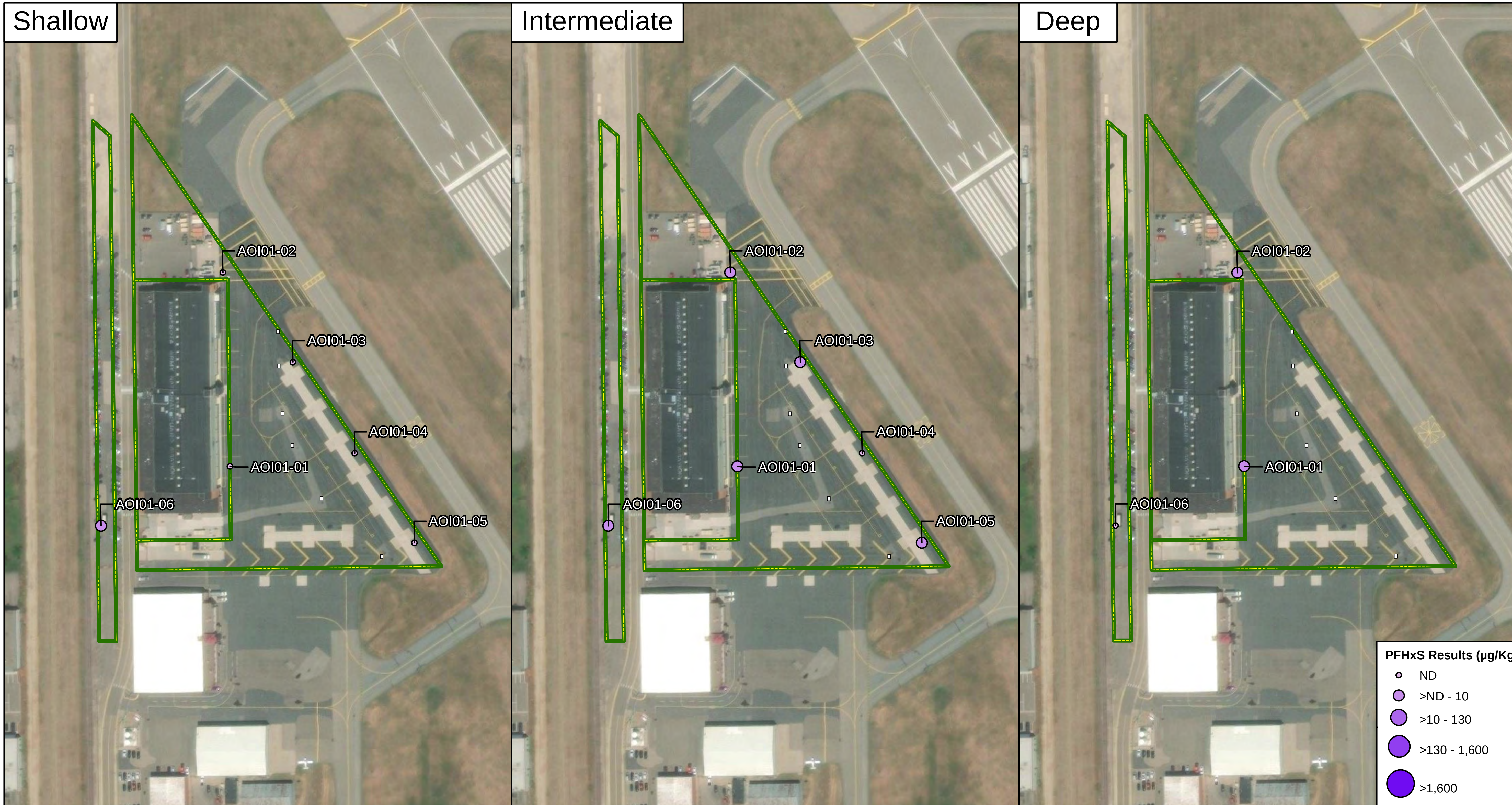
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

## PFBS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-3**




| | | | | | |
|---|---|---|---|---|---|
| CLIENT | ARNG | | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | | |
| REVISED | 5/3/2023 | GIS BY | MS | 5/3/2023 |
| SCALE | 1:2,400 | CHK BY | GR | 5/3/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/3/2023 |

**Legend**

Catch Basins

Facility Boundary

0 100 200 400 Feet

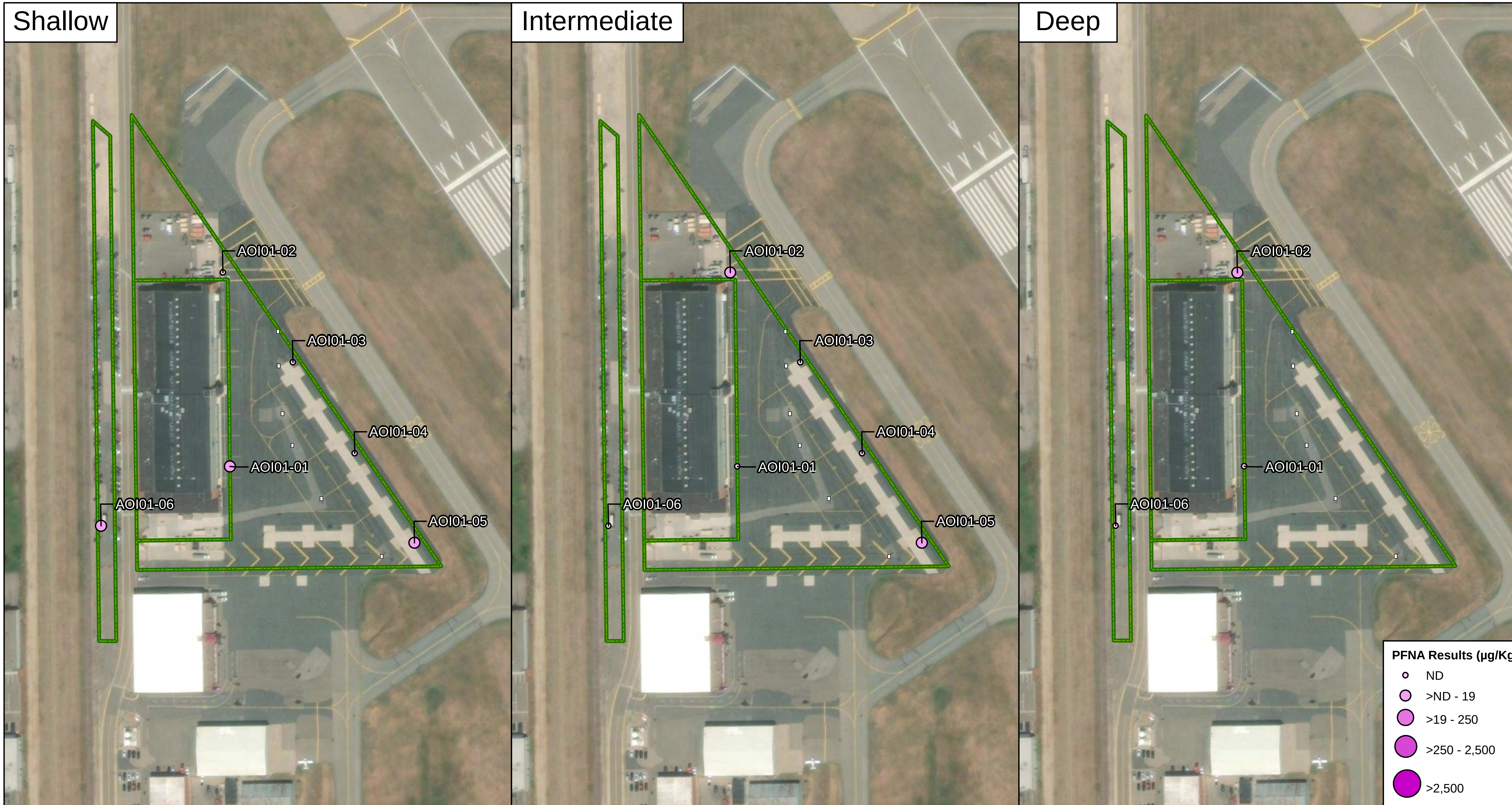
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

**PFHxS Detections in Soil**

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-4**

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|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 5/3/2023 | GIS BY | MS | 5/3/2023 |
| SCALE | 1:2,400 | CHK BY | GR | 5/3/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/3/2023 |

**Legend**

Catch Basins

Facility Boundary

0 100 200 400 Feet

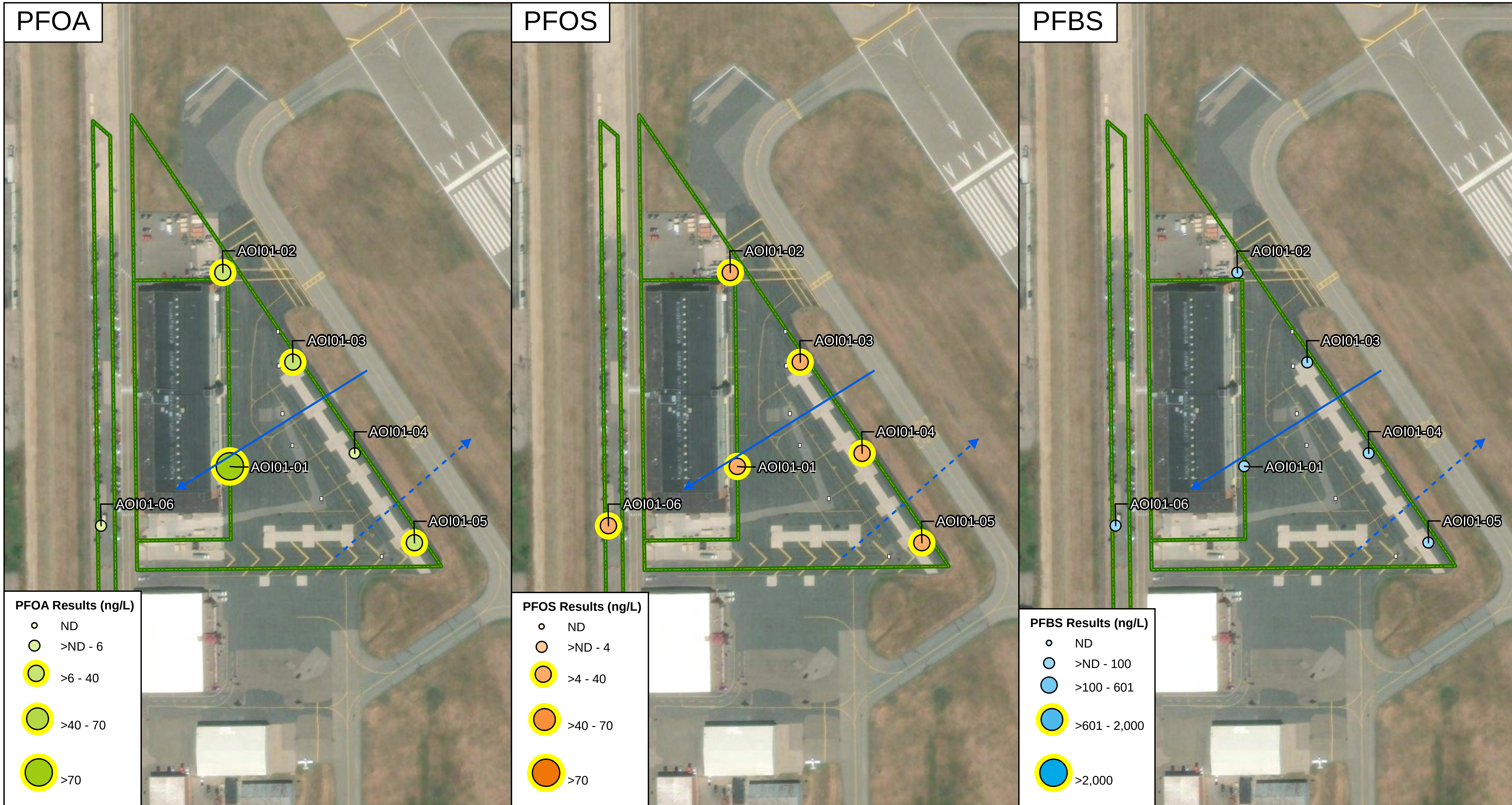
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

## PFNA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

**Figure 6-5**

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|---|---|---|---|---|
| CLIENT | ARNG | | | |
| PROJECT | Site Inspection at Holman Field AASF, MN | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 |
| SCALE | 1:2,400 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

**Legend**

- Catch Basins
- Facility Boundary
- Groundwater Flow Direction
- Surface Water Flow Direction

0 100 200 400 Feet

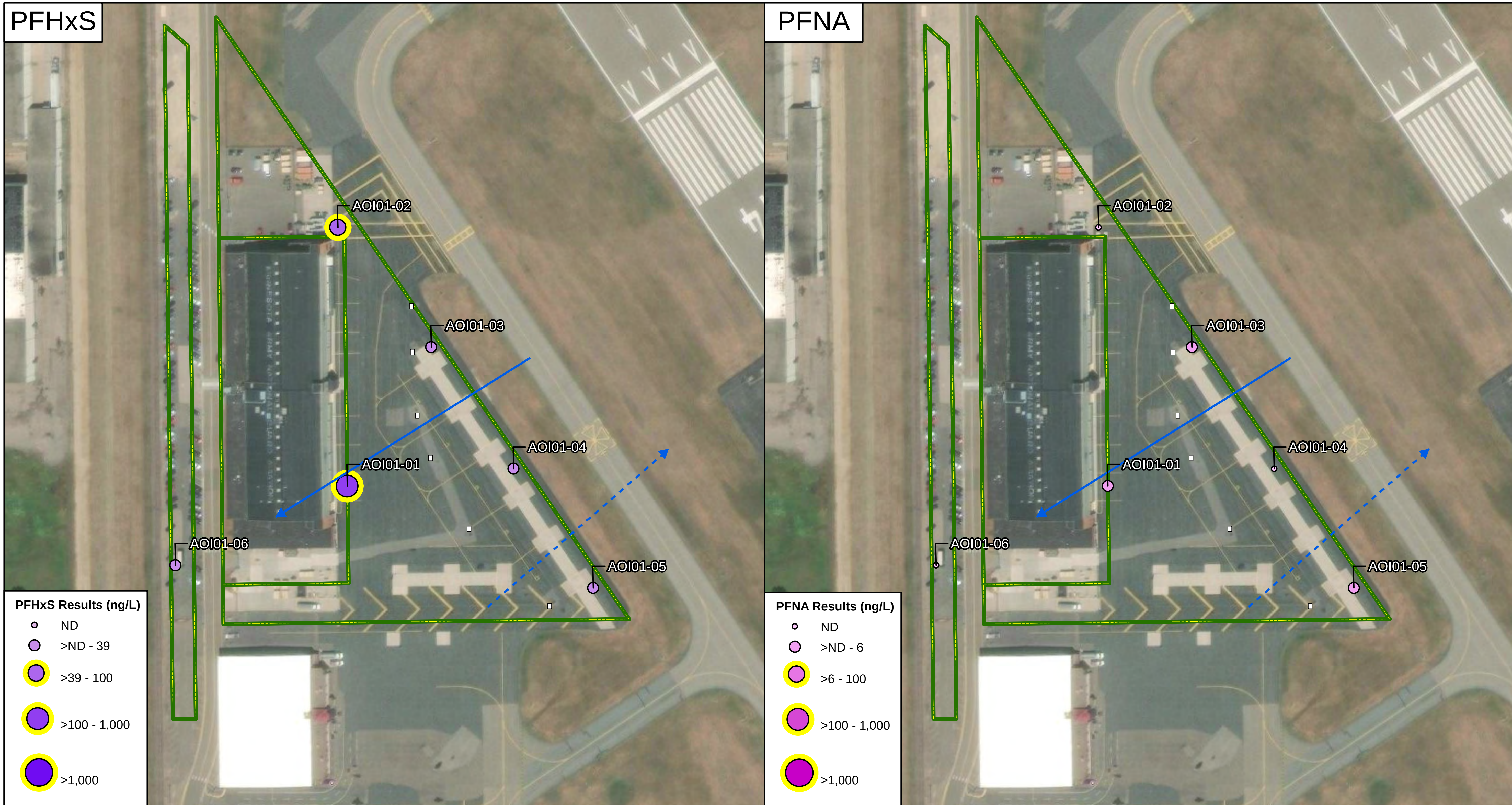
Exceedances of the OSD SL are depicted with a yellow halo.

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 Holman Field AASF, MN | | | |
| REVISED | 5/11/2023 | GIS BY | MS | 5/11/2023 |
| SCALE | 1:1,800 | CHK BY | GR | 5/11/2023 |
| Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community | | PM | CM | 5/11/2023 |

**Legend**

- Catch Basins
- Facility Boundary
- Groundwater Flow Direction
- Surface Water Flow Direction

0 75 150 300 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 CSM for AOI 1, revised based on the SI findings, is presented on **Figure 7-1**. 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 (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

## 7.1 Soil Exposure Pathway

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

### 7.1.1 AOI 1

AOI 1 is the South Hanger Ramp and Fire Truck Storage Area where one potential release of AFFF occurred in October 2013 when the Tri-Max™ fire extinguishers were emptied on the east side of the South Hangar Ramp by the MNARNG prior to being returned to Camp Ripley for demilitarization. In total, approximately 12 gallons of AFFF concentrate were released during this event.

Relevant compounds were detected in surface soil at AOI 1. Site workers, construction workers, and trespassers (though unlikely due to restricted access) could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and construction workers are potentially complete.

Relevant compounds were detected in subsurface soil at AOI 1. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

## 7.2 Groundwater Exposure Pathway

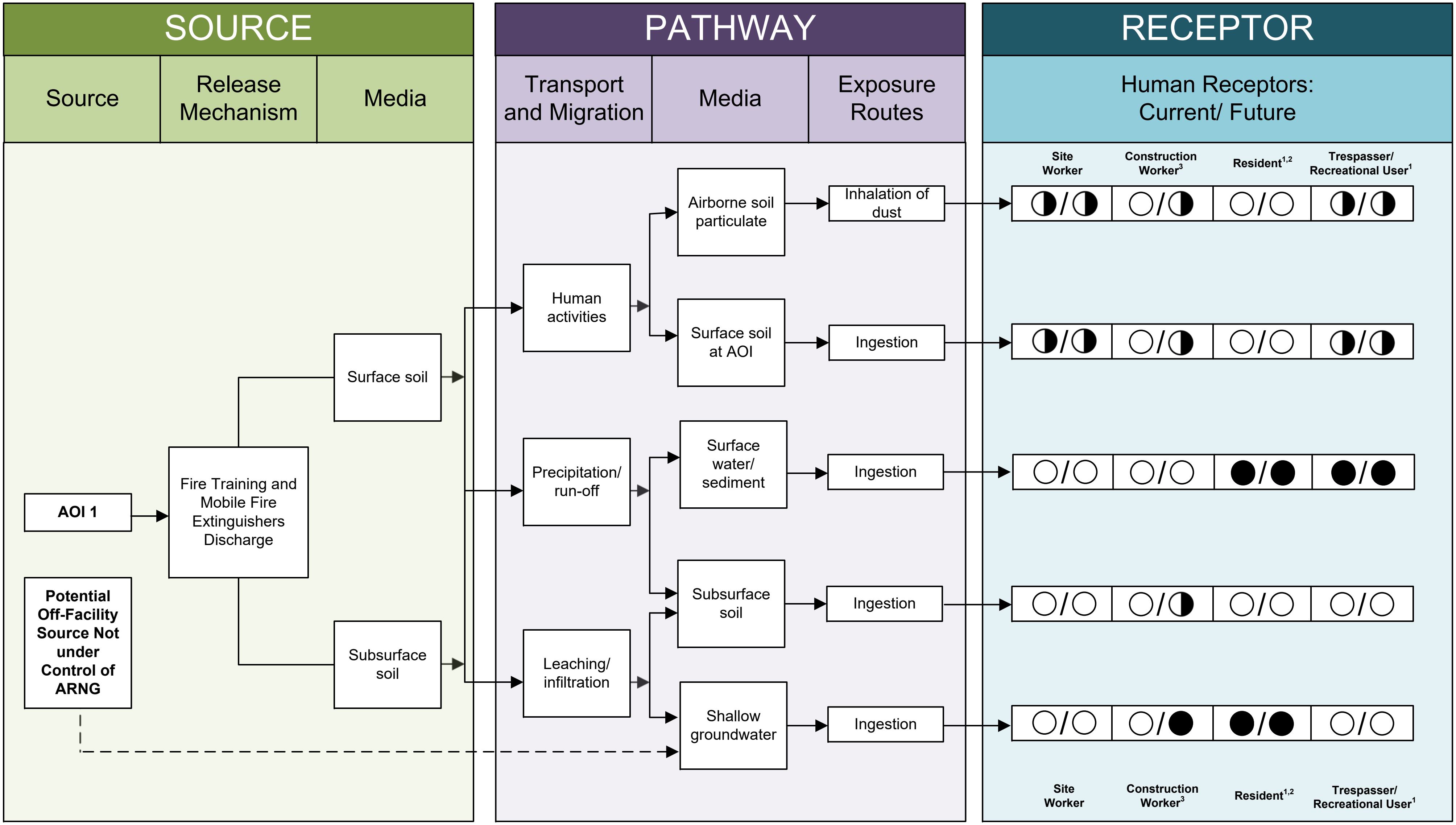
The SI results in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors based on the aforementioned criteria.

### 7.2.1 AOI 1

PFOA, PFOS, and PFHxS were detected above their SLs in groundwater samples collected at AOI 1. Due to the presence of public water system wells within a 4-mile radius of the facility, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete. No potable water wells are located within the boundary of the AASF. Several monitoring, commercial, and industrial wells are within 4 miles of the facility, and one domestic well is located less than 0.5 miles due north of the facility. Drinking water for the AASF is supplied by the City of St. Paul, which obtains its municipal water through the Saint Paul Regional Water Services. The Saint Paul Regional Water Services predominantly uses the Mississippi River as its drinking water source, although some water is supplied by groundwater aquifers. The Mississippi River surface water intakes are located upgradient of the facility, approximately 18 miles north near Fridley, Minnesota; therefore, the pathway for exposure to site workers and trespassers (though unlikely due to restricted access) via ingestion of groundwater is considered incomplete. Depths to water measured at AOI 1 in May 2022 during the SI ranged from 3.83 to 7.11 feet bgs. Therefore, the ingestion exposure pathway for current and future construction workers is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

## 7.3 Surface Water and Sediment Exposure Pathway

Surface water and sediment samples were not collected at AOI 1, however, data from 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. PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. There are no surface water bodies located within the facility; therefore, the surface water and sediment ingestion exposure pathway for site workers, construction workers, and trespassers (though unlikely due to restricted access) is considered incomplete. Because relevant compounds were detected in soil and groundwater at AOI 1, it is possible that those compounds may have migrated from soil and groundwater to the canal/ditch to the southwest of the facility via groundwater discharge. Due to potential recreational use of the canal/ditch, the surface water and sediment ingestion exposure pathway for off-facility residents and recreational users is also considered potentially complete.




**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
Holman Field AASF, St. Paul, Minnesota

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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 23 to 25 May 2022 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, 2022a).

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.

- Fifteen (15) soil samples from six boring locations;
- Six grab groundwater samples from six temporary wells;
- Fourteen (14) 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 AOI 1 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 CSM were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at AOI 1, 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 (see **Table 8-1**). Based on the CSM developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from AOI 1 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 relevant compounds in soil at AOI 1 were below their SLs.
    - PFOA, PFOS, and PFHxS in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 103 J- ng/L at location AOI01-01. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 37.3 ng/L at location AOI01-03. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 239 J- ng/L at location AOI01-01. Based on the results of the SI, further evaluation of AOI 1 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 | South Hanger Ramp and Fire Truck Storage Area | ◐ | ● | ● | Proceed to RI |

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

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