FINAL
Site Inspection Report
Fixed Wing Army Aviation Training Site
Bridgeport, West Virginia

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

September 2023

Prepared for:

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

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Farhenheit
µg/kg	Microgram(s) per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film forming foam
amsl	Above mean sea level
AOI	Area of interest
ARNG	Army National Guard
BAA	Benedum Airport Authority
bgs	Below ground surface
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	Chain-of-custody
CSM	Conceptual site model
DoD	Department of Defense
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EB	Equipment blank
EIS	Extraction internal standard
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FB	Field Blank
FedEx	Federal Express
FTA	Fire Training Area
ft	Foot (feet)
FWAATS	Fixed Wing Army National Guard Aviation Training Site
GIS	Geographic Information System
HAZMAT	Hazardous material
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
ID	Identification
IDW	Investigation-derived waste
in.	Inch(es)
ITRC	Interstate Technology Regulatory Council

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

LC/MS/MS	Liquid chromatography tandem mass spectrometry
MS	Matrix spike
MSD	Matrix spike duplicate
ng/L	Nanogram(s) per liter
No.	Number
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
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	Remedial investigation
SI	Site inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning
UCMR 3	Unregulated Contaminant Monitoring Rule 3
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
WVARNG	West Virginia Army National Guard
WWTP	Wastewater Treatment Plant

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EXECUTIVE SUMMARY

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based 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) (Assistant Secretary of Defense) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)[1]. 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 stored, disposed, or released historically (see Table ES-2 for AOI descriptions). 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 a comparison of SI results to screening levels (SLs) for the relevant compounds. This SI was completed at the Fixed Wing Army Aviation Training Site (FWAATS) in Bridgeport, West Virginia and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1 and AOI 2. FWAATS will be referred to as the "Facility" throughout this document.

The Facility, operated by West Virginia ARNG (WVARNG), encompasses approximately 6.87 acres in Bridgeport, West Virginia. The Facility is located approximately 0.3 miles southeast of the North Central West Virginia Airport. Construction for the facility was completed in 1996 and is currently and has historically been used for fixed wing training instruction for Active Duty, Reserve, and National Guard Aviators. FWAATS is located on part of the Western Allegheny Plateau, a section of the Appalachian Plateau characterized by steep hills and narrow ravines and is located approximately 1,020 feet above mean seal level (AECOM Technical Services, Inc. 2020).

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOIs. Based on the results of this SI, further evaluation under CERCLA is warranted in a remedial investigation (RI) is warranted 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[2]	Residential (Soil) (µg/kg)[1] 0 to 2 ft bgs	Industrial/Commercial Composite Worker (Soil) (µg/kg)[1] 0 to 15 ft bgs	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using U.S. Environmental Protection Agency's Regional SL Calculator. Hazard Quotient=0.1. May 2022.
2. 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.

µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

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

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area[1]	Future Action
1	HAZMAT Room	◐	●[1]	Proceed to RI
2	Flammable Liquids Shed and Soap and Water Fire Training Area	◐	●	Proceed to RI

Legend:
● = Detected; exceedance of SLs
◐ = Detected; no exceedance of SLs
○ = Not detected

[1] No wells installed within the source area, but exceedances of PFOA detected 200 feet downgradient of AOI 1.

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) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on 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 perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide-dimer acid (HFPO-DA)[2] at ARNG facilities nationwide. The ARNG performed this SI at the Fixed Wing Army Aviation Training Site (FWAATS) in Bridgeport, West Virginia. FWAATS will be referred to as the "Facility" throughout this report.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. 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 Army requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at FWAATS (AECOM Technical Services, Inc. [AECOM] 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials were 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.

[2] 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 FWAATS occupies 6.87 acres in Bridgeport, West Virginia, within Harrison County (**Figure 2-1)**. The facility is located approximately 0.3 miles southeast of the North Central West Virginia Airport. Land to the north, south, and east of the Facility is primarily forested. To the west of the Facility is the City of Bridgeport, which is more densely populated with homes and businesses (AECOM 2020).

The Facility is operated by the West Virginia ARNG (WVARNG). FWAATS sits on land leased from the Benedum Airport Authority (BAA), which owns the North Central West Virginia Airport. Terms of the lease are for 50 years beginning 12 July 1994. FWAATS has operated as a military facility since 1996, following the completion of construction. Prior to the facility's construction, the WVARNG in Bridgeport operated out of the adjacent airport's former firetruck hangar (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

FWAATS is located on part of the Western Allegheny Plateau. The Western Allegheny Plateau is a section of the Appalachian Plateau, characterized by steep hills with narrow ravines (**Figure 2-2**). The facility is approximately 1,020 feet (ft) above mean sea level. The land on which FWAATS was constructed was formerly the far end of North Central West Virginia Airport's Runway 13 (AECOM 2020) that was presumably graded to achieve a relatively flat runway surface. The land surrounding the Facility to the north, east, and south (i.e., all directions except adjacent airport runways) slope steeply down from the facility elevation.

2.2.1 Geology

The Facility is located within Unglaciated Allegheny Plateau section of the Appalachian Plateau physiographic province (BAA 2014). On the eastern side of Harrison County, the geology is primarily of the Paleozoic era and Pennsylvanian period (West Virginia Geologic and Economic Survey 2011). The Facility is underlain by Pennsylvanian sedimentary units. The youngest and stratigraphically uppermost unit is the Conemaugh Group, which is composed of cyclic sequences of red and gray shale, siltstone, and sandstone with thin limestones and shales. The Conemaugh Group is underlain by the Allegheny Formation, which comprises cyclic sequences of sandstone, siltstone, shale, limestone, and coal (Cardwell et al. 1968).

Surficial soils at the Facility were classified by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service as Urban Land, generally defined as areas where the soils have been altered or obscured by urban works and structures. Nearby surrounding surficial geology includes Clarksburg silt loam, Westmoreland silt loam, and Gilpin-Upshur complex (mix of silt loam, rock, and silty clay) (USDA 2022).

Soils observed during the SI included silty clays with small fractions of sand or gravel. Weathered rock including shale fragments was encountered frequently at varying discontinuous depths and competencies. The observations from the SI supported the documented geology of the

area, and the hypothesis that the area had been reworked during its development as an airport/runway. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The Pennsylvanian-aged Conemaugh Group and Allegheny Formation form the uppermost aquifers underlying the facility. In Harrison County, two wells screened in the Conemaugh Group aquifer had depths of 50 and 86 ft with well yields of 6.7 and 3 gallons (gal) per minute, respectively (Kozar and Mathes 2001).

Groundwater regionally is inferred to follow topography flow to the northwest, as elevation decreases from east to west, and shallow groundwater likely follows the same path as surface water (**Figure 2-3**). Immediately around the Facility, groundwater is inferred to follow topography southwest, towards a low-lying off-site retention basin, before joining regional surface water flow to the northwest. This is roughly corroborated by groundwater elevation data collected during the SI, though a perched groundwater table was observed at two locations and skewed results. Water was encountered at depths ranging from 8-31 ft below ground surface (bgs) (**Figure 2-5**).

The Facility is served by the public water supply. Harrison County does not use groundwater for public water supply. The public water supply for the City of Bridgeport is purchased from the Clarksburg Water Board, which uses surface water from the West Fork River (City of Bridgeport 2017).

As stated in the EDR™ Report, a well search was conducted for a 1-mile radius surrounding the facility during the PA. Using additional online resources, such as state and local geographic information system (GIS) databases, the PA also identified groundwater wells within a 4-mile radius of the facility. Based on the EDR™ Report, there are no private or public potable water wells within 1 mile of the facility. There are 10 inactive USGS monitoring wells within a 4-mile radius of the Facility, 4 to the east and 6 to the west. Additional GIS data for wells located within a 4-mile radius of the Facility was unavailable at the city, county, state, and national levels. Therefore, it is possible that additional unidentified public or private wells may be located within 4 miles of the facility (AECOM 2020).

In 2021, the City of Bridgeport, as the drinking water purveyor for FWAATS, collected a potable water sample as part of Department of Defense's (DoD) PFAS strategy to ensure drinking water provided to installation consumers does not contain PFOA/PFOS above ppt for either compound or combined total. PFOA was detected at 2.95 nanograms per liter (ng/L) and PFOS was detected at 1.81 ng/L,[3] below the USEPA Health Advisory at that time.

[3] At the time of the study, the Health Advisory was 70 parts per trillion for PFOS and PFOA, individually or combined.

2.2.3 Hydrology

The Facility is located within the Headwaters Simpson Creek Watershed (**Figure 2-4**), which is part of the larger West Fork Watershed. The two closest tributaries to the Facility are Peddler Run and Simpson Creek, located to the east and south. Surface water from the facility drains downhill to the southeast towards the off-site retention basin or southwest to Simpson Creek, then continues with the regional flow direction northwest to the West Fork River and the Monongahela River.

The West Fork Watershed is composed of 73 percent forested land, 15 percent cultivated/planted land, 15 percent developed land, and 3.6 percent impervious surface. The West Fork Watershed and the area surrounding the Facility, including parts of West Virginia, Maryland, and Pennsylvania, are part of the larger Monongahela River basin. The Monongahela River is used for recreational activities. In Harrison County, 100 percent of the drinking water comes from surface water. There are currently three public water supply facilities within the West Fork Watershed: the Clarksburg Water Board (approximately 7 miles southwest of the Facility), Lumberport Water (approximately 9 miles northwest of the Facility), and West Virginia American Water – Weston (approximately 23 miles southwest of the Facility) (West Virginia Department of Environmental Protection 2013). The exact locations of the surface water intakes for each public water supply facility were not available.

Sanitary effluent from the Facility is to the City of Bridgeport's sanitary sewer system. FWAATS has a National Pollutant Discharge Elimination System permit in place that allows the facility to discharge pollutants to the Bridgeport Wastewater Treatment Plant (WWTP) located 2.6 miles west of the Facility. The wastewater approved for acceptance from FWAATS is runoff from engine washing, exterior plane washing, and plane and equipment de-icing. Runoff is first treated by an oil-water separator before continuing to the Bridgeport WWTP (AECOM 2020).

2.2.4 Climate

FWAATS is located in an area of West Virginia where precipitation is generally evenly distributed throughout the year, with somewhat higher amounts in the spring and summer (Herb et al. 1981). The average annual rainfall is 45.9 inches (in.), with varying amounts of the precipitation seen as snow based on elevation (U.S. Climate Data 2019). Bridgeport has a temperate climate with four distinct seasons (City of Bridgeport 2020). The annual average high temperature for Bridgeport is 63.1 degrees Fahrenheit (°F), and the average low temperature is 42.1°F. Elevation is a significant influence on climatic variations and temperature in West Virginia (U.S. Climate Data 2019). The region including Bridgeport, West Virginia is generally a few degrees cooler than the western side of West Virginia due to higher elevation (AECOM 2020).

2.2.5 Current and Future Land Use

FWAATS currently resides on a portion of land leased from the BAA under the terms of a 50-year lease, which started on 12 July 1994. The Facility is currently and has historically been used for fixed wing training instruction for Active Duty, Reserve, and National Guard Aviators. Future land use is not anticipated to change (AECOM 2020). The Facility boundary is fenced

and secured, either by the FWAATS fence or within the fence line and restricted runway access areas of the North Central West Virginia Airport.

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility, and the Facility does not have any significant areas of habitat. The following species have not been identified at the facility but may be present in the surrounding area. The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Harrison County, West Virginia (U.S. Fish and Wildlife Service 2022):

- Clams: Clubshell (*Pleurobema clava*) – Federally Endangered; Snuffbox Mussel (*Epioblasma triquetra*) – Federally Endangered

- Insects: Monarch Butterfly (Danaus plexippus) – Federal Candidate

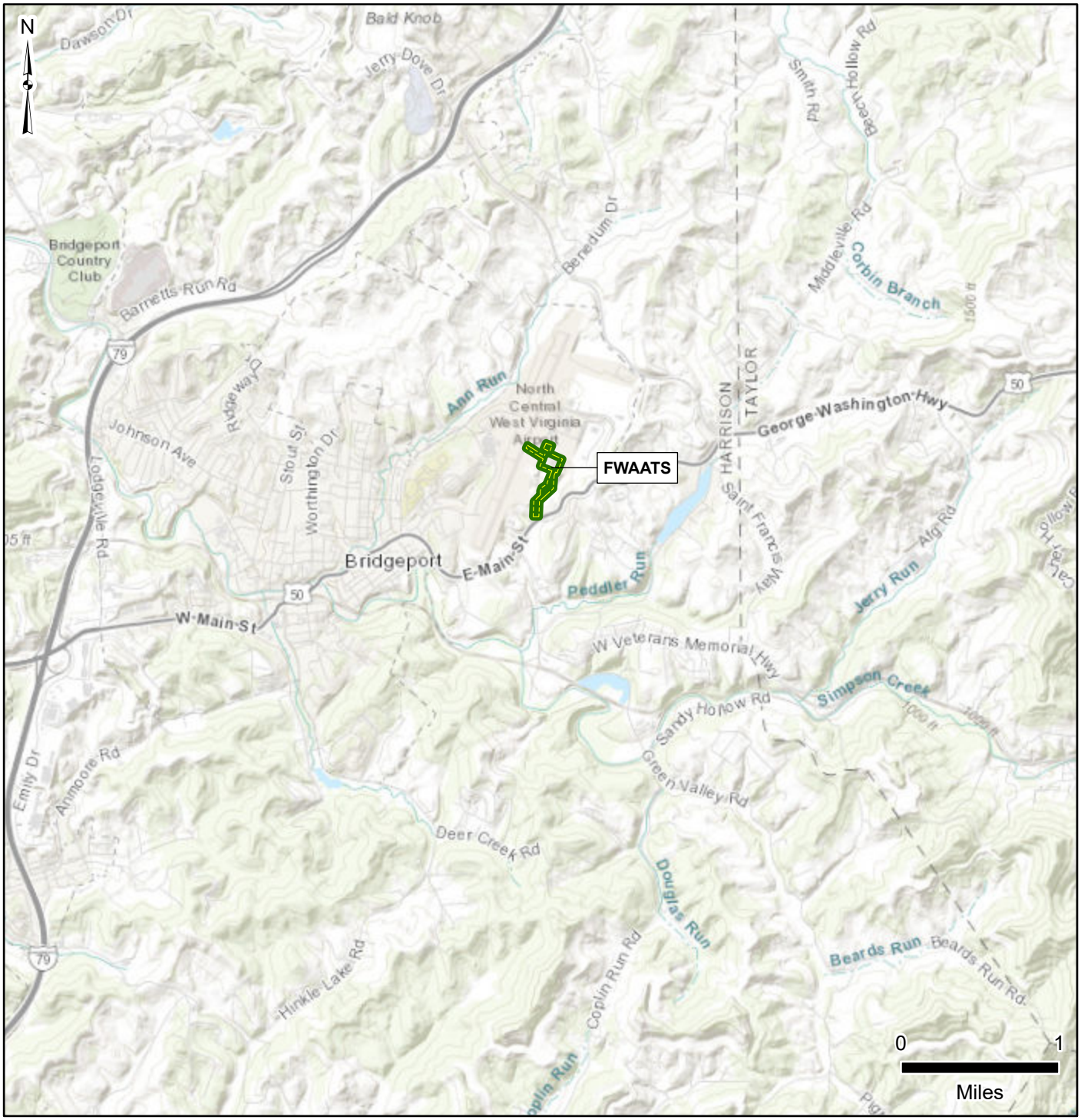
  Mammal: Indiana Bat (Myotis sodalist) – Federally Endangered; and Northern Long-eared Bat (Myotis septentrionalis) – Federally Threatened.

2.3 HISTORY OF PFAS USE

Three potential PFAS release areas were identified at the Facility during the PA (AECOM 2020). The AOIs include areas where aqueous film forming foam (AFFF) may have been used, stored, disposed, or released historically at the FWAATS. Interviews and records obtained during the PA indicate that AFFF was stored within the HAZMAT Room from 1996 until 2019. Additionally, 5-gal buckets of AFFF were also stored within the Flammable Liquids Shed. Training was conducted on-site with a Tri-Max^{TM} fire extinguisher; however, the extinguisher was reportedly filled with soap and water prior to the training activities. To interviewee recollection or knowledge, AFFF has not been released on-site at FWAATS; however, there is potential for incidental or residual release of AFFF on-site. The potential PFAS 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**.

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 2-1
Site Location



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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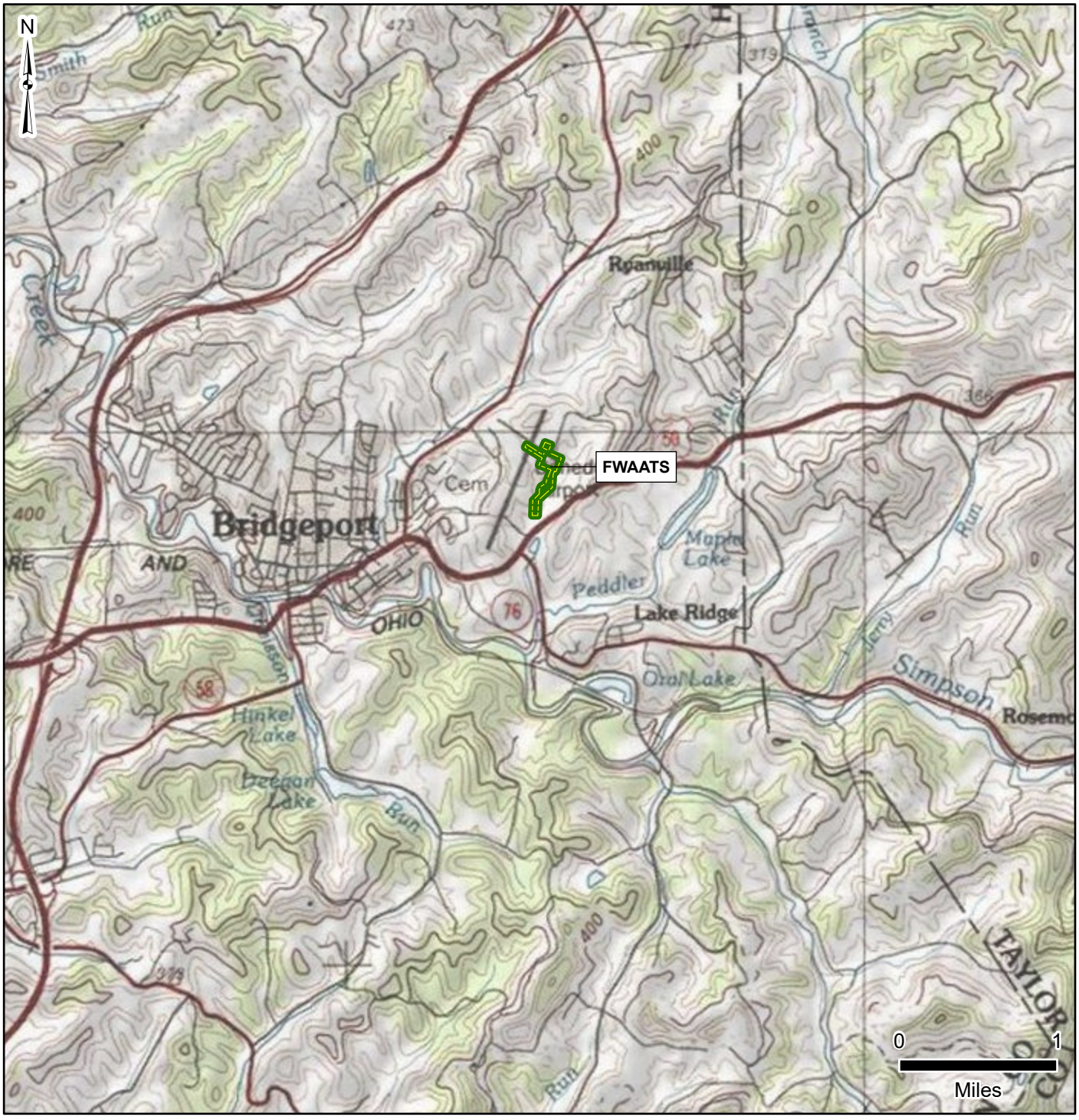
Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 2-2
Topography



Facility Data

Facility Boundary

*Contour interval = 20 ft.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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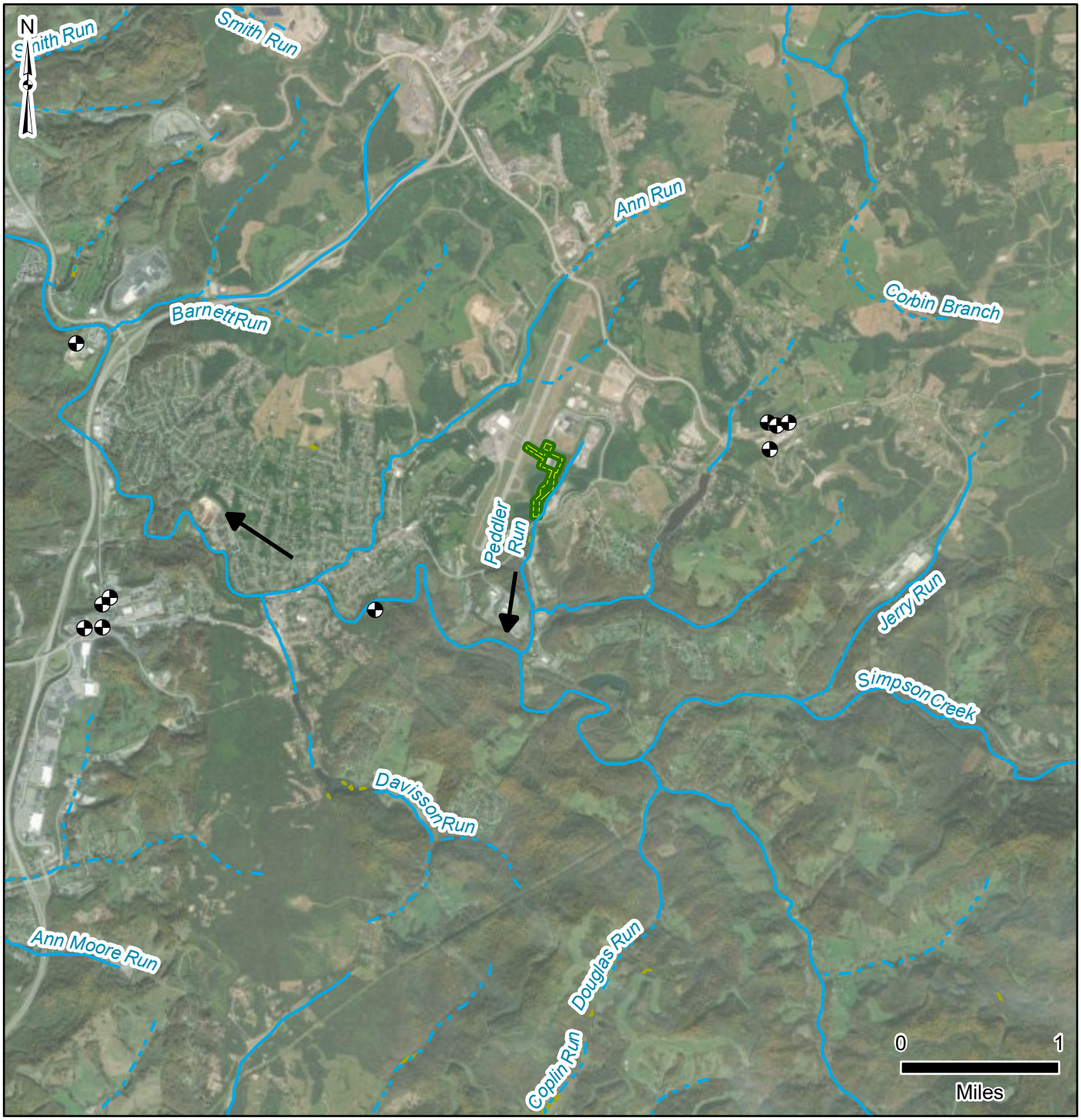
Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 2-3
Groundwater Features



Facility Data
- Facility Boundary

Well Type
- USGS Inactive Monitoring Well

Hydrology/Hydrogeology
- Inferred Groundwater Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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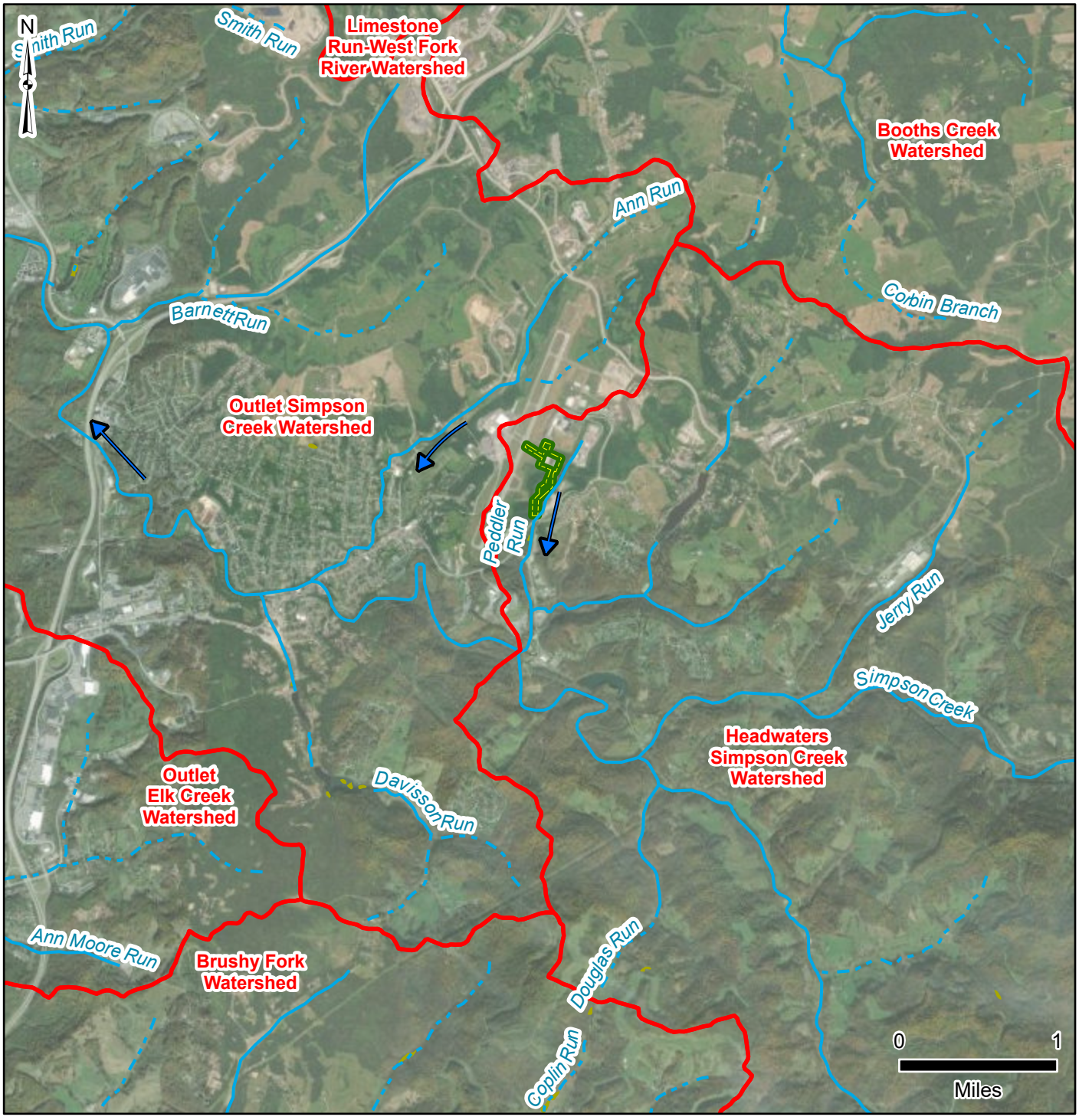
Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 2-4
Surface Water Features



Facility Data
- Facility Boundary

Hydrology
- Surface Water Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Wetlands
- Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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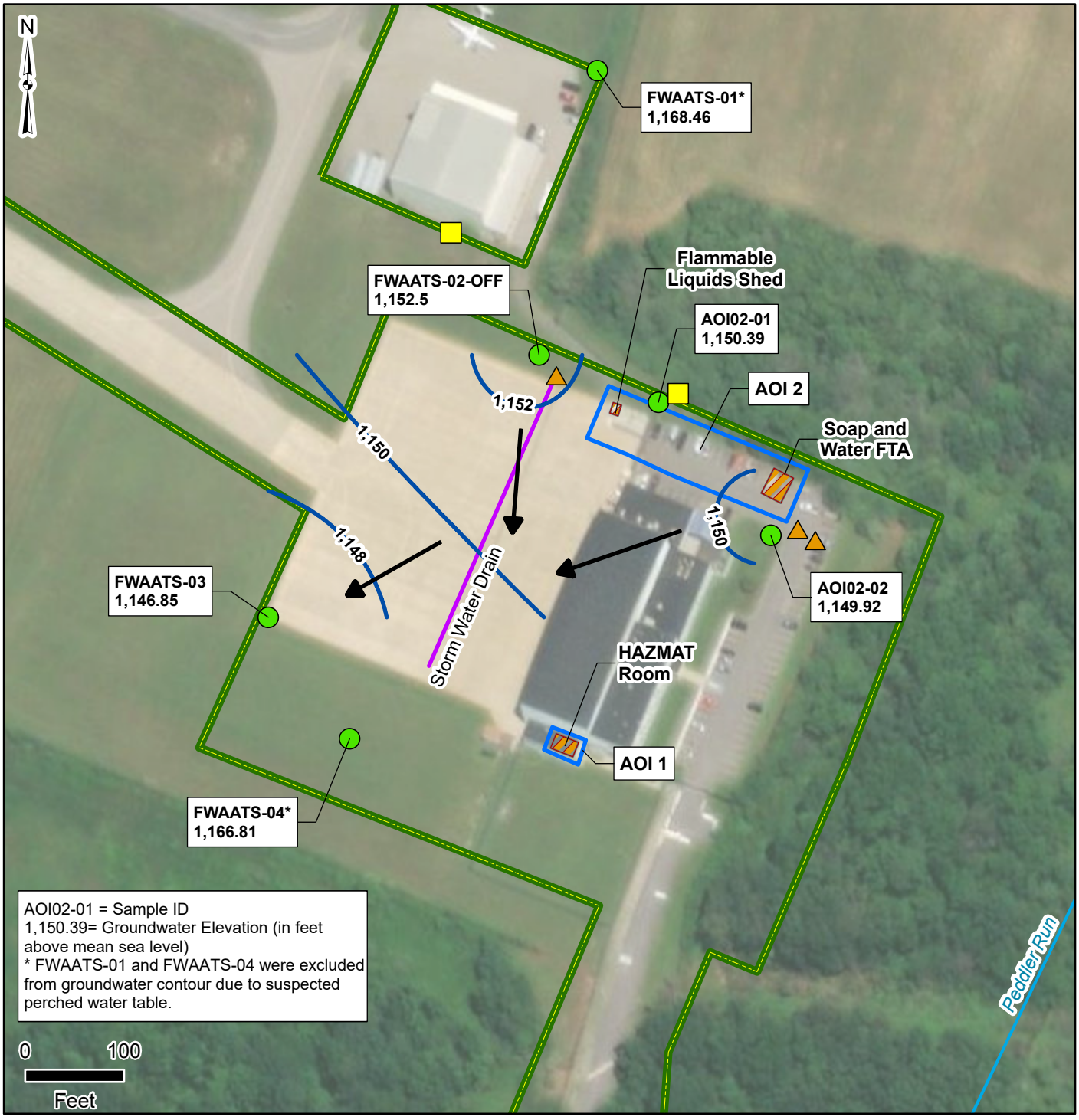
Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 2-5
Groundwater Elevations, March 2022



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- Storm Water Drain
- Drop Inlet
- Oil-water Separator

Sample Location
- Sample Location

Hydrology/Hydrogeology
- Shallow Groundwater Flow Direction
- Groundwater Elevation Contour Interval (2 foot)
- Perennial Creek/Stream

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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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, three potential release areas were identified at FWAATS and grouped into two AOIs identified as: AOI 1 HAZMAT Room and AOI 2 Flammable Liquids Shed and Water Fire Training Area (FTA). The potential AOIs are shown on **Figure 3-1**.

3.1 AOI 1 – HAZMAT ROOM

AOI 1 consists of the HAZMAT Room, a room located on the southern edge of the FWAATS hangar building with a main door that opens to the south. During interviews with FWAATS personnel, the HAZMAT Room was identified as a location where AFFF was known to be stored from 1996 until 2019. Two 5-gal containers of AFFF were discovered in the HAZMAT Room in 2019, which were subsequently disposed of by the Defense Reutilization and Marketing Office. Disposal documentation was provided in the PA. Interviewees had no recollection of spills or releases of AFFF at this location. However, due to gaps in knowledge regarding AFFF storage, the HAZMAT Room is considered a potential PFAS-release area (AECOM 2020).

3.2 AOI 2 – FLAMMABLE LIQUIDS SHED AND SOAP AND WATER FTA

AOI 2 consists of the Flammable Liquids Shed and the Soap and Water FTA. These two potential release areas were grouped into one AOI based on proximity along the northern facility boundary.

3.2.1 Flammable Liquids Shed

The Flammable Liquids Shed is located on the northern side of the property. While AFFF was kept at FWAATS (beginning in 1996), 5-gal buckets were stored in the Flammable Liquids Shed. One 5-gal bucket of AFFF was found in the Flammable Liquids Shed in 2019, which was subsequently disposed of by the Defense Reutilization and Marketing Office. There are no known spill or releases of AFFF at this location. However, due to gaps in knowledge regarding AFFF storage at the facility, the Flammable Liquids Shed is considered a potential PFAS-release area (AECOM 2020).

3.2.2 Soap and Water FTA

The Soap and Water FTA is located in the parking lot in the northeastern corner of the Facility. According to interviewees, the training consisted of filling an empty Tri-Max™ extinguisher with a soap and water solution to demonstrate the use of a Tri-Max™ extinguisher. It is unknown if the Tri-Max™ extinguisher unit(s) contained AFFF before being used with soap and water for training in this area. Due to the potential for residual PFAS in the Tri-Max™ extinguishers and lack of documentation, the FTA is considered a potential PFAS release area (AECOM 2020).

There were no live fire training events at the Facility. To interviewee recollection, which dates back to 1996, there have never been off-facility fire training events conducted by FWAATS personnel, nor have any outside entities come on-facility for fire training (AECOM 2020).

3.3 ADJACENT SOURCES

Four potential off-facility sources of PFAS are adjacent to the Facility and are not under the control of the WVARNG. A description of each off-facility source is presented below and shown on **Figure 3-1**.

3.3.1 Aviation Industries

Northrop Grumman and Pratt & Whitney aerospace companies are located directly north of FWAATS. Pratt & Whitney is an aircraft engine repair company and Northrop Grumman is an aircraft manufacturer. It is unknown if PFAS-containing substances are used at these facilities, and personnel of these companies were not interviewed as part of the PA. However, because PFAS are common in substances used in the aviation industry, this location is considered a potential adjacent PFAS-release area (AECOM 2020). This area is located upgradient of FWAATS.

3.3.2 North Central West Virginia Airport

The North Central West Virginia Airport is located adjacent to the Facility to the west and north (**Figure 3-1**). Four potential adjacent sources within the airport were determined in the PA to have potentially released PFAS based on interviews with airport staff.

3.3.2.1 Former Nozzle Check Area

The airport currently has two firetrucks: one equipped with AFFF, which replaced the former AFFF firetruck, and one equipped to handle only water. Airport personnel are required to perform nozzle checks once per month to ensure the AFFF firetruck is in working order, should there be an event requiring emergency response with AFFF. Nozzle checks formerly took place on the pavement in the rear of the Old Fire House. Nozzle checks were performed at this location until 2006. Following the nozzle check, during which a small amount of AFFF was released, the AFFF was left to sit on pavement and dissipate; therefore, this area is considered a potential adjacent PFAS-release area (AECOM 2020). This area is located cross-gradient of FWAATS.

3.3.2.2 Old Fire House

The airport's former AFFF firetruck was kept in the Old Fire House from 1992 to 1996. It is unknown what year the former firetruck was removed. The AFFF was stored in 55-gal drums in the rear of the firetruck. The airport purchased 3 percent AFFF from Oshkosh and initially had four drums to refill the AFFF firetrucks with, which have been reduced to two with use in nozzle checks and off-specification AFFF removal over time by J.T. Martin Fire & Safety. The firetruck had a pour-fill system to refill the AFFF tank. While airport personnel do not recall any spills or releases of AFFF, there is a possibility that unintended releases occurred during refilling while the previous firetruck was in service. Therefore, the Old Fire House is considered a potential adjacent PFAS-release area (AECOM 2020). This area is located cross-gradient of FWAATS.

3.3.2.3 Current Firetruck and AFFF Storage

The current AFFF firetruck has been stored in a building directly south of the Old Fire House since it was acquired in 2006. The current firetruck has a pump filling system for the AFFF to prevent spills while filling with AFFF. The AFFF is currently stored behind the AFFF firetruck in 55-gal drums labeled as Oshkosh 3 percent AFFF. It is unknown whether the truck is decontaminated following nozzle checks. Due to the potential for unintended spills or releases of AFFF, this area is considered a potential adjacent PFAS-release area (AECOM 2020). This area is located cross gradient of FWAATS.

3.3.2.4 Current Nozzle Check Area

After 2006, the Airport began conducting nozzle checks at a new location south of the current firetruck and AFFF storage area and east of the main airport building. Nozzle checks have been conducted monthly in this location since 2006. The AFFF released during the nozzle checks is not rinsed away and is left on the tarmac to dissipate. AFFF in surface runoff from this area may enter the drain running along the tarmac to the east of the nozzle check area, and from there, it would be directed to the public sanitary sewer system. This location is considered a potential adjacent PFAS release area (AECOM 2020). This area is located cross-gradient of FWAATS.

3.3.3 Meadowfill Landfill

The Meadowfill Landfill is located approximately 3 miles north-northwest of the Facility. Details of the landfill provided by the Waste Management Solutions operator indicate the landfill accepts waste including industrial waste and municipal solid waste, both of which may include PFAS-containing refuse. Though the landfill does not accept hazardous waste, PFAS were not historically considered hazardous. Therefore, there is a potential for PFAS-containing products to be included in materials within the landfill. As such, the Meadowfill Landfill is considered a potential adjacent, off-facility PFAS release area (AECOM 2020). This area is located cross-gradient to the FWAATS and is hydraulically separated by at least three streams: Ann Run, Stouts Run, and Barnett Run.

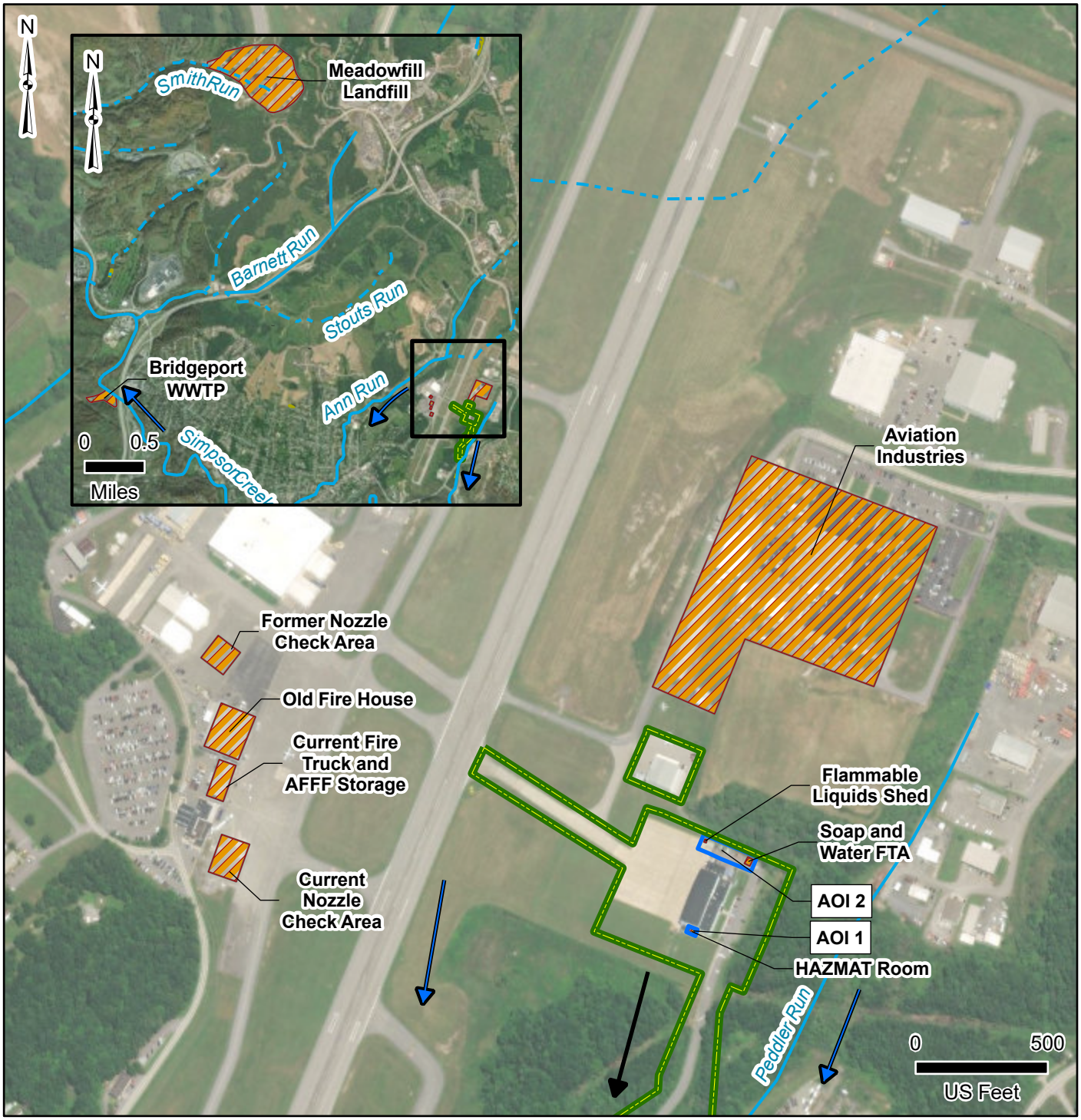
3.3.4 Bridgeport Wastewater Treatment Plant

The Bridgeport WWTP is located 2.6 miles west of the Facility, on a parcel of land owned by the City of Bridgeport. The WWTP is owned and operated by the City of Bridgeport and is considered a potential adjacent source of PFAS. The WWTP treats wastewater for the City of Bridgeport's 25,000 residents before releasing it via an outfall to Simpson Creek. Surface water from Simpson Creek flows to the West Fork River where it is collected by the Clarksburg Water Board for public supply. The Clarksburg Water Board provides water for the City of Bridgeport. Wastewater treatment facilities are not usually considered primary potential release areas of PFAS, but sludges and liquids treated at WWTPs may create a secondary source of contamination if they receive PFAS-impacted waste from other release areas, personal care products, and other household waste. PFAS releases that may have occurred within the City of Bridgeport could have resulted in the migration of PFAS in water to the Bridgeport WWTP. Sludge generated at wastewater treatment facilities is typically removed and disposed of at an off-site location; the location of sludge disposal for the Bridgeport WWTP is unknown. Due to

the potential for PFAS releases to have occurred elsewhere in the City of Bridgeport sanitary sewer system, the WWTP is considered a potential adjacent, off-facility PFAS release area (AECOM 2020). This area is located downgradient and downstream of FWAATS.

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 3-1
Areas of Interest



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the data quality objective (DQO) process and outlined in the SI Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) Addendum (EA Engineering, Science, and Technology, Inc., PBC [EA] 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 PROBLEM STATEMENT

ARNG will recommend AOIs for remedial investigation (RI) if site-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 for the SI include the following:

- The PA Report for FWAATS (AECOM 2020)
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the UFP-QAPP Addendum (EA 2021a)
- 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 horizontally by the property limits of the Facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins Lancaster Laboratories Env, LLC, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP); Accreditation No. 1.01). PFAS data underwent 100 percent Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019a) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual (QSM) Table B-15 (2020).

PFAS data were compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA 2021a).

4.5 DATA USABILITY ASSESSMENT

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD 2019a, 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 UFP-QAPP Addendum (EA 2021a).

5. SITE INSPECTION ACTIVITIES

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

- *Final Preliminary Assessment Report, Fixed Wing Army Aviation Training Site, Bridgeport, West Virginia,* dated August 2020 (AECOM 2020)
- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA 2020a)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Fixed Wing Army Aviation Training Site, Bridgeport, West Virginia,* dated December 2021 (EA 2021a)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA 2020b)
- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum, Fixed Wing Army Aviation Training Site, Bridgeport, West Virginia,* dated October 2021 (EA 2021b).

The SI field activities were conducted from 22 February to 3 March 2022 and consisted of hollow stem auger and hand auger borings and soil sample collection, temporary monitoring well installation and grab groundwater sample collection. Two preparatory facility visits without intrusive work were also conducted on 16 November 2021 (source water sampling) and 11 February 2022 (utility location). Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as noted in **Section 5.9**.

The following samples were collected during the SI and analyzed for a subset of 24 PFAS via liquid chromatography/tandem mass spectrometry (LC/MS/MS) compliant with QSM Version 5.3 Table B-15 to fulfill the project DQOs:

- Twenty two (22) soil samples from eight primary locations and two offset locations (soil borings locations)
- Six (6) grab groundwater samples from six temporary well locations
- Thirteen (13) samples quality assurance/quality control 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 medium. 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 is provided in **Appendix B3**. Field change request forms are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

The U.S. Army Corps of Engineers (USACE) TPP Process, Engineers Manual (EM) 200-1-2 (Department of the Army 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 19 November 2021, prior to SI field activities. Meeting minutes are provided in **Appendix D**. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include ARNG, USACE, and West Virginia Department of Environmental Protection representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA 2021a).

A TPP Meeting 3 was held [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

EA contracted Ground Penetrating Radar Systems (GPRS) Inc., a private utility location service, to perform utility clearance at the facility. Utility clearance was performed at each of the proposed boring locations on 11 February 2022 with input from the EA field team. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 ft of boring location AOI02-02 was pre-cleared by EA's drilling subcontractor, Triad Engineering, Inc., using a hand auger to verify utility clearance due to the presence of an unknown line noted by GPRS Inc. Hand auger clearance of the remaining boring locations was unsuccessful as outlined in **Section 5.9**.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was sampled prior to the start of field activities. A sample from a potable water source within the main hangar was collected on 16 November 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS

compliant with QSM 5.3 Table B-15. The results indicated that the potable water source contained trace levels of PFAS, with all relevant compound concentrations below the SLs. PFHxS and PFNA were not detected, while PFBS was detected at a concentration less than one-tenth of the SL of 600 ng/L. PFOS and PFOA were detected at concentrations less than one-third of the SLs of 4 and 6 ng/L, respectively. Based on these low-level detections, the water was deemed acceptable for use in decontamination, although does introduce limited uncertainty in environmental media samples below the SLs. Further discussion is provided in the DUA (**Appendix A**). Analytical results for this sample can be found in **Appendix F**.

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures appendix to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

One boring was completed exclusively by hand auger due to time limitations and addition of an additional surface soil sample (AOI 01-02, see Section 5.9). No borings beyond AOI 02-02 were advanced exclusively by hand auger based on terminal depth. All soil sample locations are shown on Figure 5-1 and described in the subsequent section. Non-dedicated sampling equipment (i.e., hand auger) was decontaminated between sampling locations.

Beyond 5 ft depth, soil samples were collected via hollow stem auger drilling method in accordance with the UFP-QAPP Addendum (EA 2021a). A CME-550 drill rig with a split spoon sampling system was used to collect continuous soil cores to the target depth. Additionally, as outlined in **Section 5.2**, a decontaminated hand auger was used to collect a surface soil sample from the top 5 ft of the boring in compliance with utility clearance procedures.

Three discrete soil samples were collected for chemical analysis from each soil boring (except as noted in **Section 5.9**): one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table, and one collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 8-31 ft during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 13 to 46 ft bgs.

All soil sample locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. The soil boring locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2021a). Several boring locations were adjusted within a 50-ft offset for reasons including drill rig access, utility avoidance, and drill equipment refusal.

During the mobilization, the soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector (PID) was used to screen the breathing zone during boring activities as a part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook. Depth interval, recovery thickness, PID concentrations,

moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

Each sample was collected into a laboratory-supplied PFAS-free HDPE bottle 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 for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM International D422) in accordance with the UFP-QAPP Addendum (EA 2021a).

Field duplicate samples were collected at a rate of 10 percent and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/matrix spike duplicates (MSDs) were collected at a rate of 5 percent 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, one equipment blank (EB) was collected per day 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.

Hollow stem auger borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA 2021a). After removal of the casings, boreholes were abandoned using bentonite chips. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces. Restoration of the drilling areas was completed per the FWAATS request including leveling and the placement of several yards of soil and spreading of grass seed in denuded areas.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using the CME-550 hollow stem auger drill rig. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 10-ft section of 1-inch (in.) Schedule 40 polyvinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location 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 intervals, using a peristaltic or bladder pump, depending on depth to groundwater, with PFAS-free HDPE tubing. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. 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 in a separate container. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA 2021a).

Field duplicate samples were collected at a rate of 10 percent and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5 percent and analyzed for the same parameters as the accompanying samples. Two FBs were collected in accordance with the UFP-QAPP Addendum (EA 2021a). In instances when non-dedicated sampling equipment was used, such as a bladder pump, one EB was collected a day and analyzed for the same parameters as the groundwater samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor sitewide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements were collected from the newly installed temporary monitoring wells (**Figure 2-5**), taken from the survey mark on the northern side of the well casing. Groundwater elevation data is provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a GEOMAX Zoom 90 Robotic total station by EA's West Virginia licensed professional surveyor subcontractor, Bell Land Surveying. Positions were collected in the applicable datum as referenced on the survey report. Surveying data were collected on 3 March 2022 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA 2021a).

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water) generated during the SI activities were containerized in fifteen properly labeled 55-gal drums and staged in an approved, climate-controlled room located within the Annex Building. The groundwater drum remains inside the Annex Hangar on secondary containment. The fourteen soil drums have been moved outside the annex hangar because of space issues. The soil and liquid IDW will be disposed of in a Resource Conservation and Recovery Act Subtitle C landfill. Specifics on the disposal of solid and liquid IDW will be summarized in a IDW Technical Memorandum.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, and unused monitoring well construction materials 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 Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Environmental, LLC, in Lancaster, Pennsylvania, a DoD ELAP- and National Environmental Laboratory Accreditation Program-certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D, and grain size by ASTM International D422.

5.8 DEVIATIONS FROM SITE INVESTIGATION UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on field conditions. These deviations were discussed between EA, ARNG, and USACE. Deviations from the UFP-QAPP Addendum are noted below and are documented in the field change requests forms in **Appendix B4**:

- Due to the rocky subsurface encountered on-site, a hand auger was not used to clear 5 ft of the boring locations, with the exception of boring location AOI02-02.

- Groundwater and refusal/bedrock was encountered at variable depths across the Facility. As such, the third sample outlined in the UFP-QAPP Addendum (EA 2021a) was not collected from boring locations AOI01-01, FWAATS-02, FWAATS-02-OFF (the offset location), and FWAATS-04 due to unanticipated shallow depths to groundwater and/or weathered bedrock. Additionally, only one sample (surface soil) was collected at FWAATS-01 due to weathered bedrock encountered at 4 ft below grade (i.e., no granular media for laboratory analysis).

- During utility clearance, soil boring/temporary monitoring well location AOI02-01 was relocated approximately 15 ft northwest of the original proposed location due to issues accessing the location with a drill rig. This relocation was submitted in a Field Change Request (see **Appendix B4**).

- During drilling, auger refusal occurred at boring locations FWAATS-02 and AOI01-01 due to the rocky subsurface. Boring location FWAATS-02 was relocated east of the original proposed location as outlined in a Field Change Request Form (**Appendix B4**) and a temporary well was able to be installed at the offset location. A temporary well was not installed to assess AOI 1 due to auger refusal. Several attempts to relocate the boring (up to six) were made. Per the Field Change Request, an additional hand auger sample location was added to the sampling scope in order to assess the soil directly adjacent to the Hazmat Room (AOI 1) door, called AOI01-02.

  Temporary well AOI02-02 was removed on 25 February 2022 prior to sampling and survey due to a construction issue discovered when attempting to remove the bladder pump from down-well. Portions of the PVC were not able to be removed from the borehole. In order to obtain a groundwater sample, boring AOI02-02 was redrilled on 28 February 2022 at an offset location 5 ft away. A surface soil associated with the offset was collected and called AOI02-02-OFF. The replacement temporary well was sampled on 3 March 2022.

Table 5-1. Site Inspection Samples by Medium
FWAATS, Bridgeport, West Virginia
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC	pH	Grain Size	Comments
Soil Samples							
AOI01-01-SB-[0-2]	2/24/2022	0-2	X	X	X		
AOI01-01-SB-[10-12]	2/24/2022	10-12	X				
AOI01-02-SB-[0-2]	2/28/2022	0-2	X				
AOI02-01-SB-[0-2]	2/22/2022	0-2	X				
AOI02-01-SB-[8-9]	2/22/2022	8-9				X	
AOI02-01-SB-[13-14]	2/22/2022	13-14	X				
AOI02-01-SB-[34-36]	2/23/2022	34-36	X				
AOI02-02-SB-[0-2]	2/25/2022	0-2	X				MS/MSD
AOI02-02-OFF-SB-[0-2]	2/28/2022	0-2	X				
AOI02-02-SB-[3-4]	2/25/2022	3-4		X	X		pH and TOC only, not validated
AOI02-02-SB-[14-15]	2/25/2022	14-15	X				
AOI02-02-SB-[42-43]	2/25/2022	42-43	X				
FWAATS-01-SB-[0-2]	2/22/2022	0-2	X				
FWAATS-02-SB-[0-2]	2/22/2022	0-2	X				
FWAATS-02-OFF-[0-2]	3/1/2022	0-2	X				
FWAATS-02-SB-[3-4]	2/22/2022	3-4	X				
FWAATS-02-OFF-SB-[14-15]	3/1/2022	14-15	X				
FWAATS-03-SB-[0-2]	2/23/2022	0-2	X				
FWAATS-03-SB-[13-15]	2/23/2022	13-15	X				
FWAATS-03-SB-[32-33]	2/23/2022	32-33	X				
FWAATS-04-SB-[0-2]	2/24/2022	0-2	X				
FWAATS-04-SB-[13-14]	2/24/2022	13-14	X				
FWAATS-DUP-SB-01	2/23/2022	34-36	X				Field duplicate of AOI02-01-SB-[34-36]
FWAATS-DUP-SB-02	2/24/2022	0-2	X				Field duplicate of FWAATS-04-SB-[0-2]
FWAATS-DUP-SB-03	2/25/2022	0-2	X				Field duplicate of AOI02-02-SB-[0-2]
Groundwater Samples							
AOI02-01-GW	3/2/2022		X				
AOI02-02-GW	3/3/2022		X				
FWAATS-01-GW	3/2/2022		X				
FWAATS-02-GW	3/3/2022		X				
FWAATS-03-GW	3/2/2022		X				
FWAATS-04-GW	3/2/2022		X				
FWAATS-DUP-GW-01	3/2/2022		X				Field duplicate of AOI02-01-GW
Blank Samples							
FWAATS-FB-01	3/2/2022		X				Field Blank
FWAATS-FB-02	3/3/2022		X				Field Blank
FWAATS-EB-GW-01	3/2/2022		X				Equipment Blank
FWAATS-EB-GW-02	3/3/2022		X				Equipment Blank
FWAATS-EB-01	2/22/2022		X				Equipment Blank
FWAATS-EB-02	2/23/2022		X				Equipment Blank
FWAATS-EB-SB-03	2/24/2022		X				Equipment Blank
FWAATS-EB-04	2/24/2022		X				Equipment Blank

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC	pH	Grain Size	Comments
FWAATS-EB-SB-05	3/1/2022		X				Equipment Blank

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
FWAATS, Bridgeport, West Virginia
Site Inspection Report

Area of Interest	Boring ID	Ground Surface Elevation ft amsl	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
AOI 1	AOI01-01	-	23	N/A
	AOI01-02	-	2	N/A
AOI 2	AOI02-01	1,175.94	40	35-40
	AOI02-02	1,175.47	46	41-46
Site Wide	FWAATS-01	1,177.41	13	8-13
	FWAATS-02	1,176.38	43.5	38.5-43.5
	FWAATS-03	1,177.95	40	35-40
	FWAATS-04	1,174.81	18	13-18

Notes:
Only terminal/final depths associated at locations at AOI02-02, FWAATS-02, and AOI01-01 are tabulated herein, though intermediate/additional/original locations may have had various shallower depths prior to offsets.

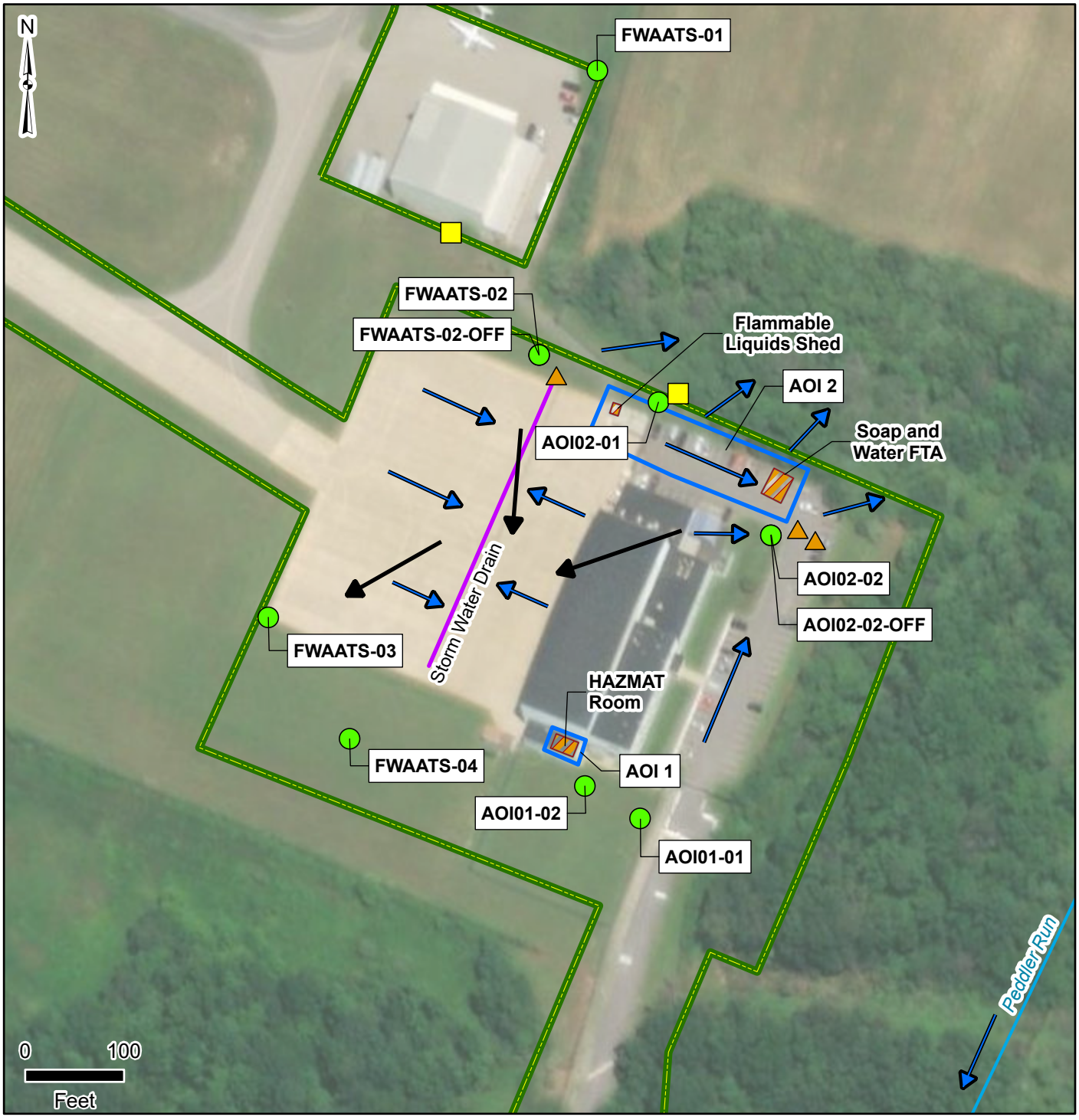
Table 5-3. Groundwater Elevation
FWAATS, Bridgeport, West Virginia
Site Inspection Report

Temporary Well ID	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
AOI02-01	1175.94	25.55	25.23	1150.39
AOI02-02	1175.47	25.55	25.25	1149.92
FWAATS-01	1177.41	8.95	6.9	1168.46
FWAATS-02	1177.35	24.85	23.88	1152.5
FWAATS-03	1177.95	31.1	31.05	1146.85
FWAATS-04	1174.81	8.0	7.97	1166.81

Notes:
Amsl = Above mean sea level
btoc = Below top of casing

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- Storm Water Drain
- Drop Inlet
- Oil-water Separator

Sample Locations
- Sample Location

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Shallow Groundwater Flow Direction
- Perennial Creek/Stream

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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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 AOIs is provided in **Sections 6.3 through 6.5**. **Tables 6-2 through 6-5** present results for 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[2]	Residential (Soil) (µg/kg)[1] 0 to 2 ft bgs	Industrial/Commercial Composite Worker (Soil) (µg/kg)[1] 2 to 15 ft bgs	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using USEPA's Regional Screening Level Calculator. Hazard Quotient=0.1. May 2022.
2. 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 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 ft bgs). The SLs are not applied to deep subsurface soil results (greater than 15 ft bgs) because 15 ft 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 PFAS 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 (e.g., pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC 2018).

Soil pH and TOC was analyzed in soil samples AOI01-01-SB-[0-2] and AOI02-02-SB-[3-4]. Results were similar, with pH results of 7.2 and 7.1, respectively, and TOC results of 6,300 and 13,000 milligrams per kilogram, respectively. The grain size analysis conducted on sample AOI02-01-SB-[8-9] consisted of approximately 30 percent sand and gravel and 70 percent fines (silt and clay). This result corresponds to a soil texture of "clay loam."

6.3 AOI 1

This section presents the analytical results for soil in comparison to SLs for AOI 1, which includes the HAZMAT Room. The soil results are summarized on **Tables 6-2 through 6-4**. Soil results are presented on **Figures 6-1 through 6-5**. Due to shallow refusal depths above the water table, no groundwater samples were able to be collected in AOI 1. However, boundary location FWAATS-04 is located downgradient from AOI 1 based on the groundwater elevations observed in this SI. Location FWAATS-03 is located cross gradient of AOI 1.

6.3.1 AOI 1 – Soil Analytical Results

Tables 6-2 through 6-4 summarize the detected compounds in soil. **Figures 6-1 through 6-5** present the ranges of detections in soil.

Soil was sampled in two boring locations associated with the potential release areas at AOI 1 and two borings located cross gradient and downgradient of the release areas. Soil was sampled from one surface interval at location AOI01-02 (0-2 ft bgs), two intervals (surface [0-2 ft bgs] and shallow subsurface [10-14 ft bgs]) at locations AOI01-01and FWAATS-04, and three intervals at FWAATS-03 (Surface [0-2 ft bgs], shallow subsurface [13-15 ft bgs], and deep subsurface [32-33 ft bgs]). The only detections of relevant compounds occurred in the surface soil samples at borings AOI01-02, FWAATS-03, and FWAATS-04 (sample FWAATS-04-SB-DUP). PFNA was detected at AOI01-02 at a concentration of 0.41 J µg/kg, which is below the associated SL of 19 µg/kg. PFOA was detected at concentrations of 0.51 µg/kg, 0.6 µg/kg, and 0.28 µg/kg, at

locations AOI01-02, FWAATS-03, and FWAATS-04, respectively. All detections of PFOA were well below the SL of 19 µg/kg.

6.3.2 AOI 1– Groundwater Analytical Results

Although no groundwater samples were collected directly from AOI 1, samples were collected from four temporary wells at the facility boundary during the SI, including FWAATS-03 and FWAATS-04, which are cross-gradient and downgradient of AOI 1, respectively. At location FWAATS-04, PFOA was detected at a concentration of 110 ng/L, which exceeded the SL of 6 ng/L. Additionally, PFOS, PFBS, PFHxS, and PFNA were detected at FWAATS-04 at concentrations of 3.4 ng/L, 1.5 ng/L, 2.1 ng/L, and 2.1 ng/L, respectively. These concentrations were below associated SLs of 4 ng/L, 601 ng/L, 39 ng/L, and 6 ng/L. At FWAATS-03, PFBS and PFOA were detected at concentrations of 0.68 J ng/L and 5.8 J ng/L, which is below associated SLs of 601 and 6, respectively.

PFOS, PFBS, PFHxS, and PFNA were all detected at concentrations below their associated SLs.

6.3.3 AOI 1 – Conclusions

Based on the results of the SI, no relevant compounds were detected in soil above their respective SLs. Although groundwater samples were not collected from AOI 1, detections of PFOA approximately 200 ft downgradient of the AOI exceeded SLs. Therefore, 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, which includes the Flammable Liquids Shed and Soap and Water FTA. The soil and groundwater results are summarized on **Tables 6-2 through 6-5**. Soil and groundwater results are presented on **Figures 6-1 through 6-7**.

6.4.1 AOI 2 – Soil Analytical Results

Tables 6-2 through 6-4 summarize the detected compounds in soil. **Figures 6-1 through 6-5** present the ranges of detections in soil.

Soil was sampled in three boring locations associated with the potential release areas at AOI 2 and two borings along the facility's upgradient boundary. Soil was sampled from three intervals (Surface [0-2 ft bgs], shallow subsurface [13-15 ft bgs], and deep subsurface [34-43 ft bgs]) at locations AOI02-01 and AOI02-02, two intervals at location FWAATS-02 (Surface [0-2 ft bgs], and shallow subsurface [14-15 ft bgs]), and one interval at FWAATS-01 (Surface [0-2 ft bgs]). The only detections of relevant compounds occurred in the surface soil samples at borings AOI02-01, FWAATS-01, and FWAATS-02 at concentrations below respective SLs. PFNA was detected at concentrations of 0.58 J µg/kg (FWAATS-02) and 1 µg/kg (FWAATS-01), which are below the SL of 19 µg/kg. PFOS was detected at FWAATS-01 at a concentration of 0.29 J µg/kg, which is below the SL of 13 µg/kg. PFOA was detected at concentrations of 0.43 J µg/kg (FWAATS-01), 0.39 J µg/kg (FWAATS-02), 0.58 J µg/kg (FWAATS-02-OFF), and 2 µg/kg

(AOI02-01), which are below the SL of 19 µg/kg. There were no other detections of relevant compounds in soil at AOI 2.

6.4.2 AOI 2 – Groundwater Analytical Results

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

Groundwater samples were collected from two temporary wells at AOI 2 and two temporary wells along the facility's upgradient boundary during the SI. Relevant compounds were detected in groundwater at concentrations both above and below the SLs. PFOA concentrations at three temporary well locations (AOI02-01, AOI02-02, AOI02-01-GW DUP, and FWAATS-01) of 32 ng/L, 12 ng/L, 31 ng/L, and 9.9 ng/L exceeded the SL of 6 ng/L. PFNA was detected at FWAATS-01 at a concentration of 31 ng/L, which exceeds the SL of 6 ng/L. Each of the three other relevant compounds were detected in one or more samples at concentrations below their respective SLs. PFBS concentrations ranged from non-detect to 0.79 J ng/L, below the SL of 601 ng/L. PFHxS concentrations ranged from non-detect to 1.1 J ng/L. PFOS concentrations ranged from non-detect to 3 J+ ng/L.

6.4.3 AOI 2 – Conclusions

Based on the results of the SI, none of the relevant compounds were detected in soil above their respective SLs. PFOA was detected in groundwater at concentrations above the SL; and PFBS, PFHxS, PFNA, and PFOS were detected in groundwater at concentrations below their respective SLs. Based on the exceedances of the SLs in groundwater further evaluation at AOI 2 is warranted.

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

		Location ID	AOI01-01-SB		AOI01-02-SB		AOI02-01-SB		AOI02-02-OFF-SB		AOI02-02-SB		AOI02-02-SB	
		Sample Name	AOI01-01-SB-[0-2]		AOI01-02-SB-[0-2]		AOI02-01-SB-[0-2]		AOI02-02-OFF-SB-[0-2]		AOI02-02-SB-[0-2]		FWAATS-DUP-SB-03	
		Parent Sample ID											AOI02-02-SB-[0-2]	
		Sample Date	2/24/2022		2/25/2022		2/22/2022		2/28/2022		2/25/2022		2/25/2022	
		Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)														
Perfluorobutanesulfonic acid (PFBS)	1900	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	µg/kg	ND	U	0.41	J	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	13	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	19	µg/kg	ND	U	0.51	J	2		ND	U	ND	U	ND	U

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit.

1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

Values exceeding the Screening Level are shaded gray.
AOI = Area of Interest
DUP = Duplicate
ft bgs = Foot (feet) below ground surface
LCMSMS = Liquid chromatography–mass spectrometry
ND = Analyte not detected above the limit of detection.
µg/kg = Microgram(s) per kilogram
QSM = Quality Systems Manual
Qual = Qualifier

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

		Location ID	FWAATS-01-SB		FWAATS-02-OFF		FWAATS-02-SB		FWAATS-03-SB		FWAATS-04-SB		FWAATS-04-SB	
		Sample Name	FWAATS-01-SB-[0-2]		FWAATS-02-OFF-[0-2]		FWAATS-02-SB-[0-2]		FWAATS-03-SB-[0-2]		FWAATS-04-SB-[0-2]		FWAATS-DUP-SB-02	
		Parent Sample ID											FWAATS-04-SB-[0-2]	
		Sample Date	2/22/2022		3/1/2022		2/22/2022		2/23/2022		2/24/2022		2/24/2022	
		Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)														
Perfluorobutanesulfonic acid (PFBS)	1900	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	µg/kg	1		ND	U	0.58	J	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	13	µg/kg	0.29	J	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	19	µg/kg	0.43	J	0.58	J	0.39	J	0.6	J	ND	U	0.28	J

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit.

1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

Values exceeding the Screening Level are shaded gray.
AOI = Area of Interest
DUP = Duplicate
ft bgs = Foot (feet) below ground surface
LCMSMS = Liquid chromatography–mass spectrometry
ND = Analyte not detected above the limit of detection.
µg/kg = Microgram(s) per kilogram
QSM = Quality Systems Manual
Qual = Qualifier

Table 6-3. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil, Site Inspection Report, Fixed Wing Army Aviation Training Site, West Virginia

		Location ID	AOI01-01-SB		AOI02-01-SB		AOI02-02-SB		FWAATS-02-OFF-SB		FWAATS-02-SB		FWAATS-03-SB		FWAATS-04-SB	
		Sample Name	AOI01-01-SB-[10-12]		AOI02-01-SB-[13-14]		AOI02-02-SB-[14-15]		FWAATS-02-OFF-SB-[14-15]		FWAATS-02-SB-[3-4]		FWAATS-03-SB-[13-15]		FWAATS-04-SB-[13-14]	
		Parent Sample ID														
		Sample Date	2/24/2022		2/22/2022		2/25/2022		3/1/2022		2/22/2022		2/23/2022		2/24/2022	
		Depth (ft bgs)	10-12		13-14		14-15		14-15		3-4		13-15		13-14	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																
Perfluorobutanesulfonic acid (PFBS)	25000	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit.
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

Values exceeding the Screening Level are shaded gray.
AOI = Area of Interest
DUP = Duplicate
ft bgs = Foot (feet) below ground surface
LCMSMS = Liquid chromatography–mass spectrometry
ND = Analyte not detected above the limit of detection.
µg/kg = Microgram(s) per kilogram
QSM = Quality Systems Manual
Qual = Qualifier

1122 *This page intentionally left blank*

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil, Site Inspection Report, Fixed Wing Army Aviation Training Site, West Virginia

Location ID		AOI02-01-SB		AOI02-01-SB		AOI02-02-SB		FWAATS-03-SB	
Sample Name		AOI02-01-SB-[34-36]		FWAATS-DUP-SB-01		AOI02-02-SB-[42-43]		FWAATS-03-SB-[32-33]	
Parent Sample ID				AOI02-01-SB-[34-36]					
Sample Date		2/23/2022		2/23/2022		2/25/2022		2/23/2022	
Depth (ft bgs)		34-36		34-36		42-43		32-33	
Analyte	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)									
Perfluorobutanesulfonic acid (PFBS)	µg/kg	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	µg/kg	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	µg/kg	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	µg/kg	ND	U	ND	U	ND	U	ND	U

Notes:

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

1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

Values exceeding the Screening Level are shaded gray.
AOI = Area of Interest
DUP = Duplicate
ft bgs = Foot (feet) below ground surface
LCMSMS = Liquid chromatography–mass spectrometry
ND = Analyte not detected above the limit of detection.
µg/kg = Microgram(s) per kilogram
QSM = Quality Systems Manual
Qual = Qualifier

1124 *This page intentionally left blank*

**Table 6-5. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater,
Site Inspection Report, Fixed Wing Army Aviation Training Site, West Virginia**

		Location ID	AOI02-01-GW		AOI02-01-GW		AOI02-02-GW		FWAATS-01-GW		FWAATS-02-GW		FWAATS-03-GW		FWAATS-04-GW	
		Sample Name	AOI02-01-GW		FWAATS-DUP-GW-01		AOI02-02-GW		FWAATS-01-GW		FWAATS-02-GW		FWAATS-03-GW		FWAATS-04-GW	
		Parent Sample ID			AOI02-01-GW											
		Sample Date	3/2/2022		3/2/2022		3/3/2022		3/2/2022		3/3/2022		3/2/2022		3/2/2022	
Analyte	**Screening Level[1]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)																
Perfluorobutanesulfonic acid (PFBS)	601	ng/L	0.64	J	0.79	J	0.63	J	ND	U	0.46	J	0.68	J	1.5	J
Perfluorohexanesulfonic acid (PFHxS)	39	ng/L	1.1	J	ND	U	ND	U	ND	U	ND	U	ND	U	2.1	
Perfluorononanoic acid (PFNA)	6	ng/L	3.1	J+	3.3	J+	0.99	J	31		0.5	J	ND	U	2.1	
Perfluorooctanesulfonic acid (PFOS)	4	ng/L	3	J+	ND	U	ND	U	2.1	J+	ND	U	ND	U	3.4	J+
Perfluorooctanoic acid (PFOA)	6	ng/L	32		31		12		9.9		1.5	J	5.8		110	

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

1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

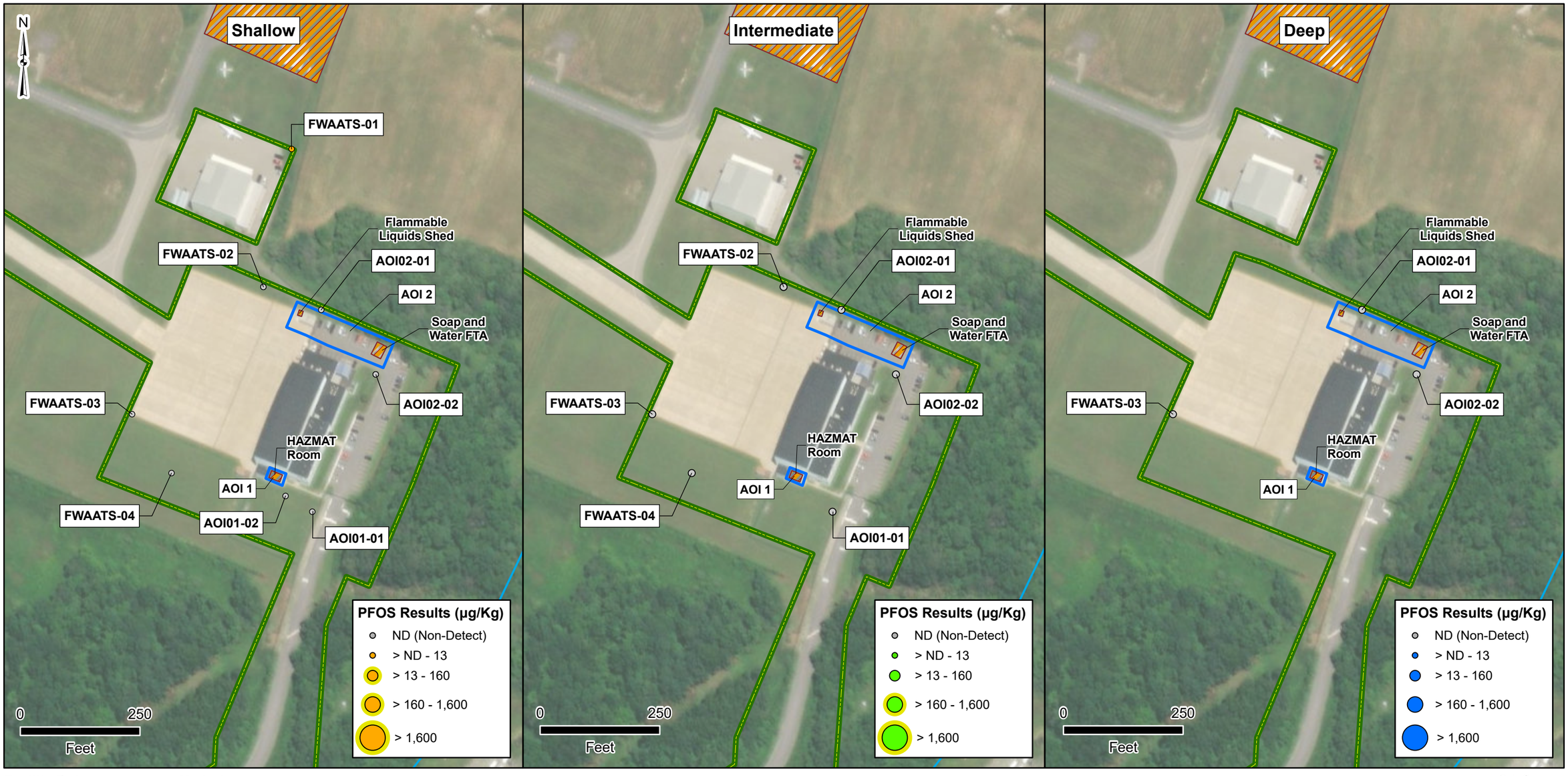
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.

Values exceeding the Screening Level are shaded gray.
AOI = Area of Interest
DUP = Duplicate
ft bgs = Foot (feet) below ground surface
LCMSMS = Liquid chromatography–mass spectrometry
ND = Analyte not detected above the limit of detection.
µg/kg = Microgram(s) per kilogram
QSM = Quality Systems Manual
Qual = Qualifier

1126 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-1
PFOS Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

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

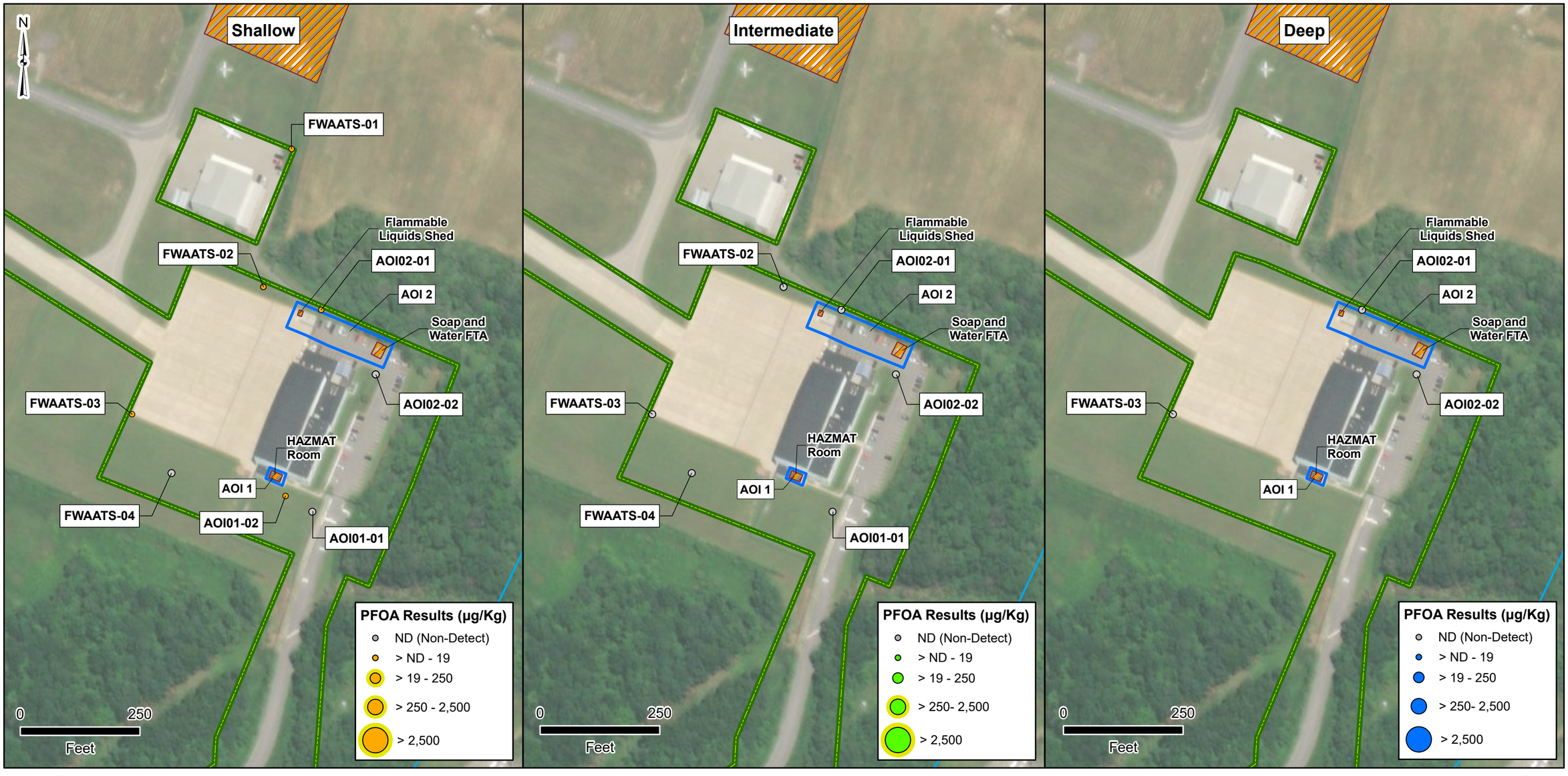
Data Sources:
ESRI 2022
AECOM 2019

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1129 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-2
PFOA Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

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

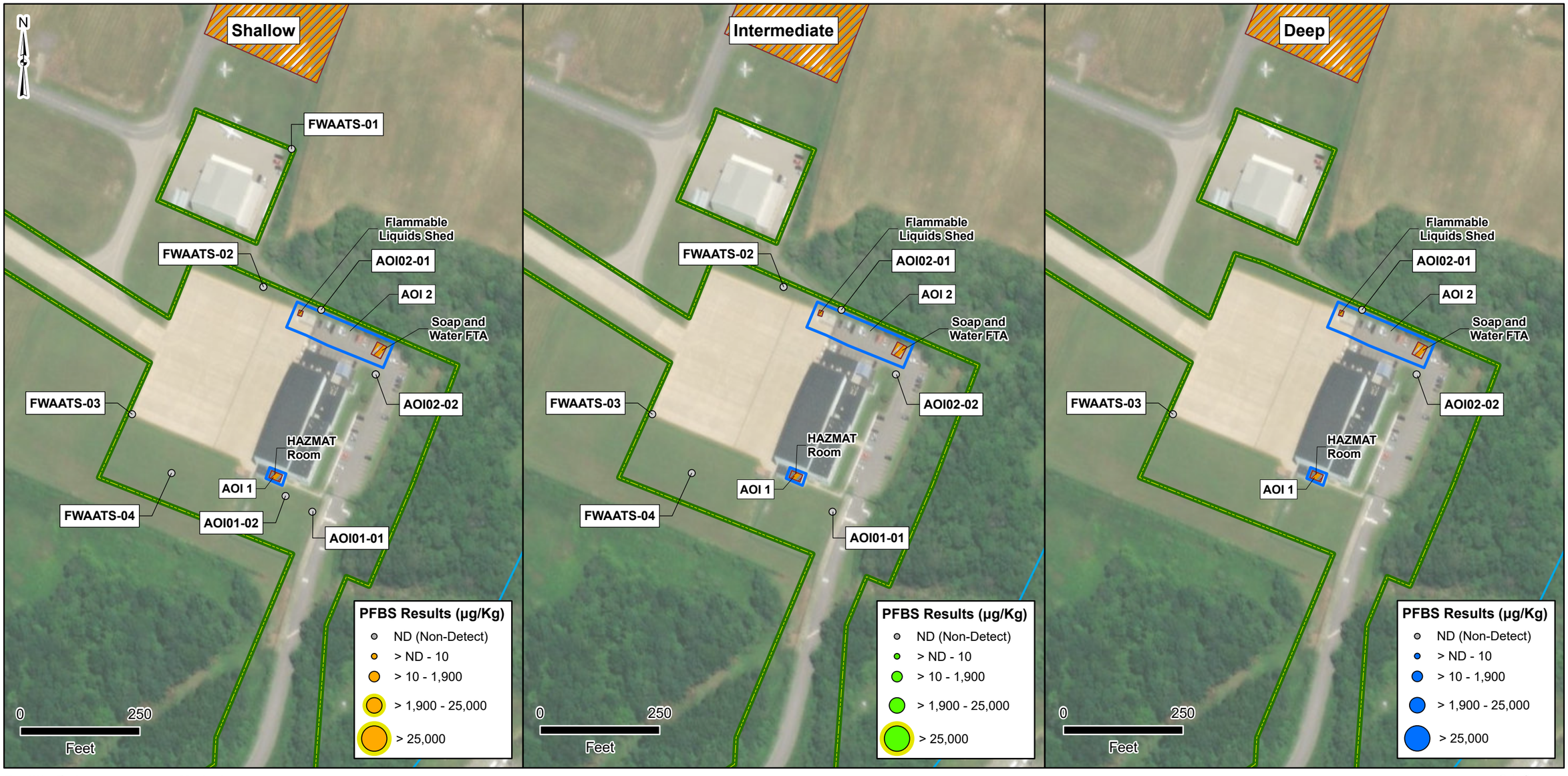
Data Sources:
ESRI 2022
AECOM 2019

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1132 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-3
PFBS Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

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

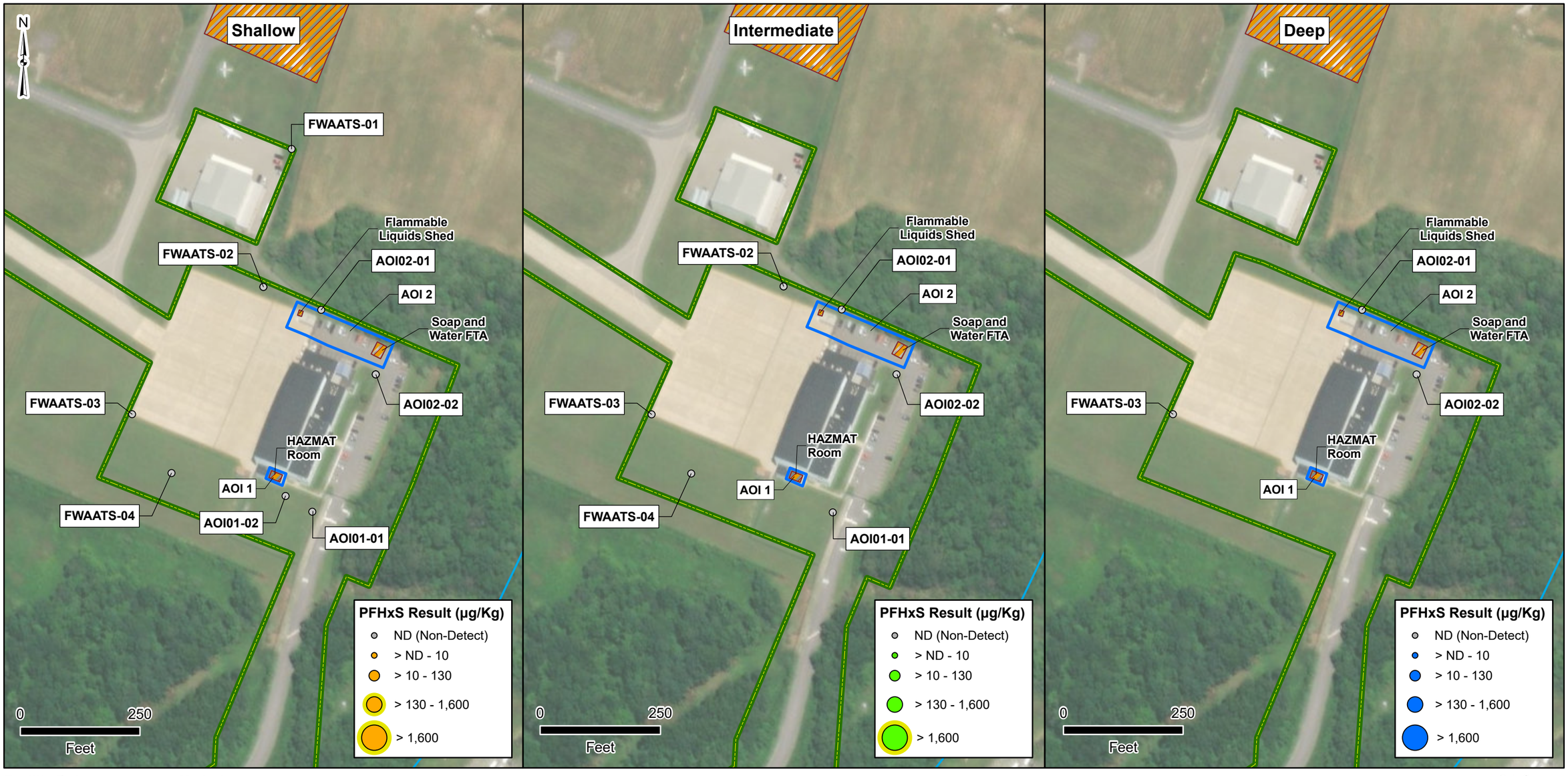
Data Sources:
ESRI 2022
AECOM 2019

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1135 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-4
PFHxS Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

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

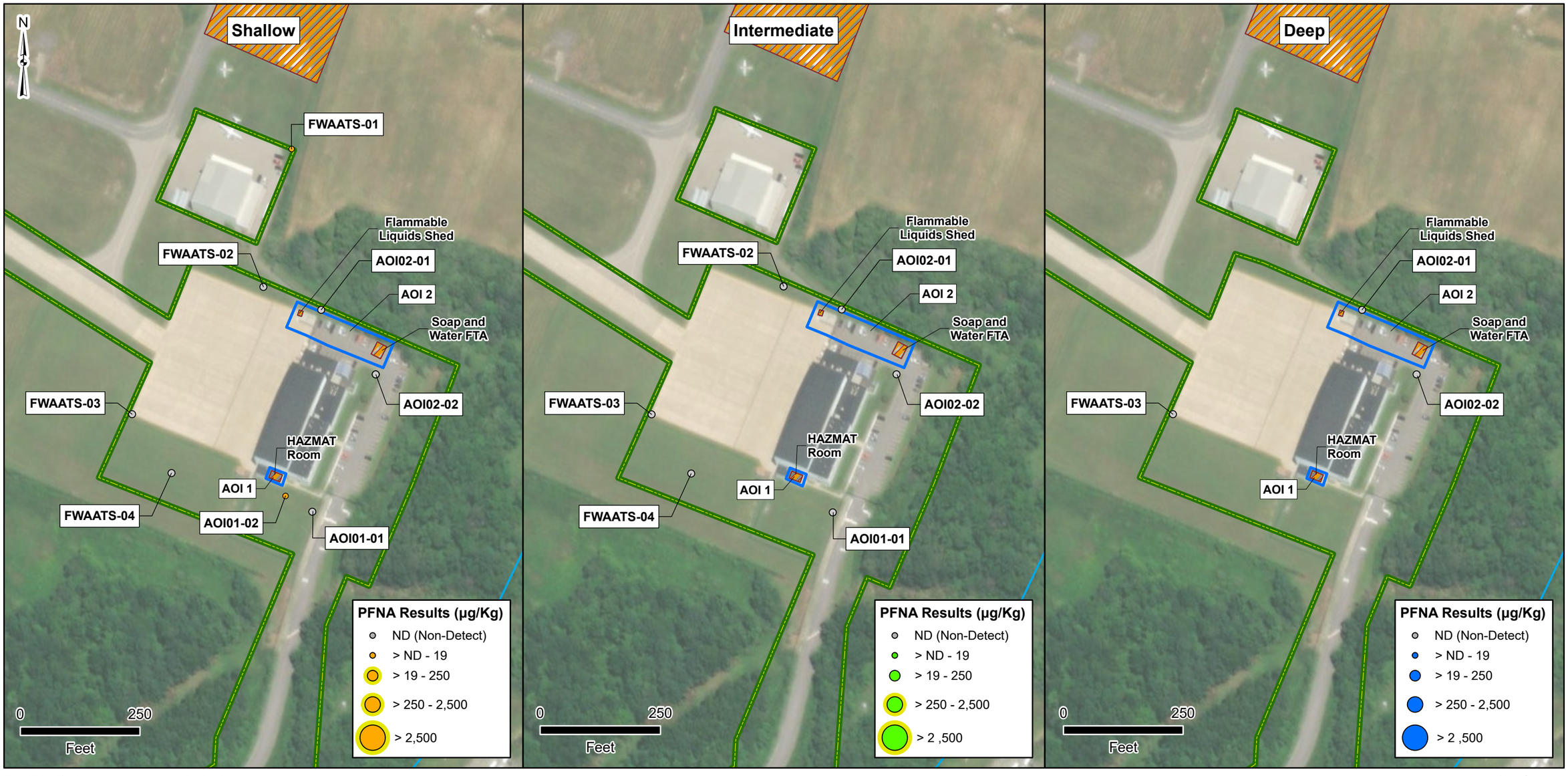
Data Sources:
ESRI 2022
AECOM 2019

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1138 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-5
AOI 1
PFNA Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

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

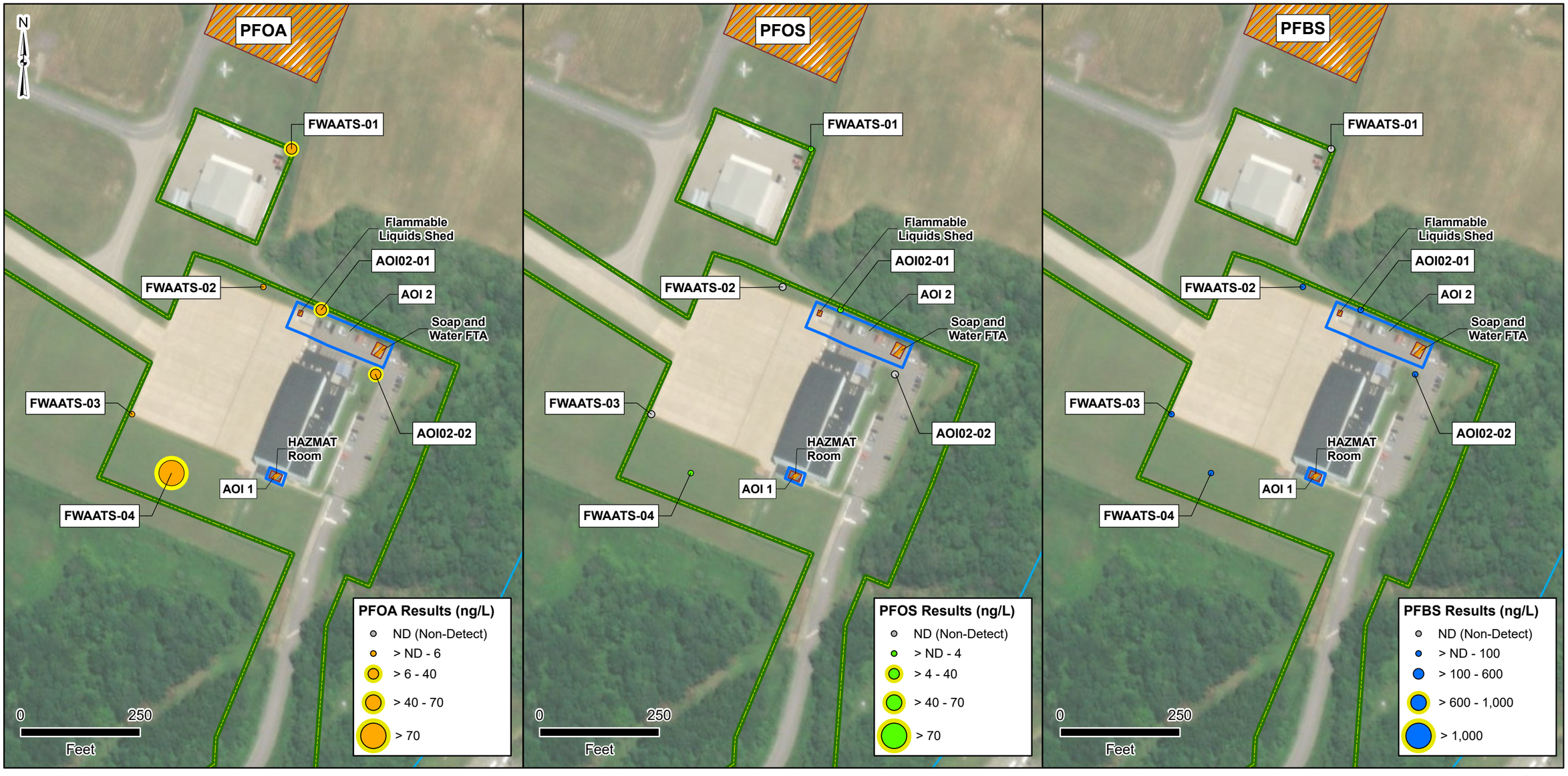
Data Sources:
ESRI 2022
AECOM 2019

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1141 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-6
PFOA, PFOS and PFBS Detections in Groundwater



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

Note:
PFOA = Perfluorooctanesulfonic acid
PFOS = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo.

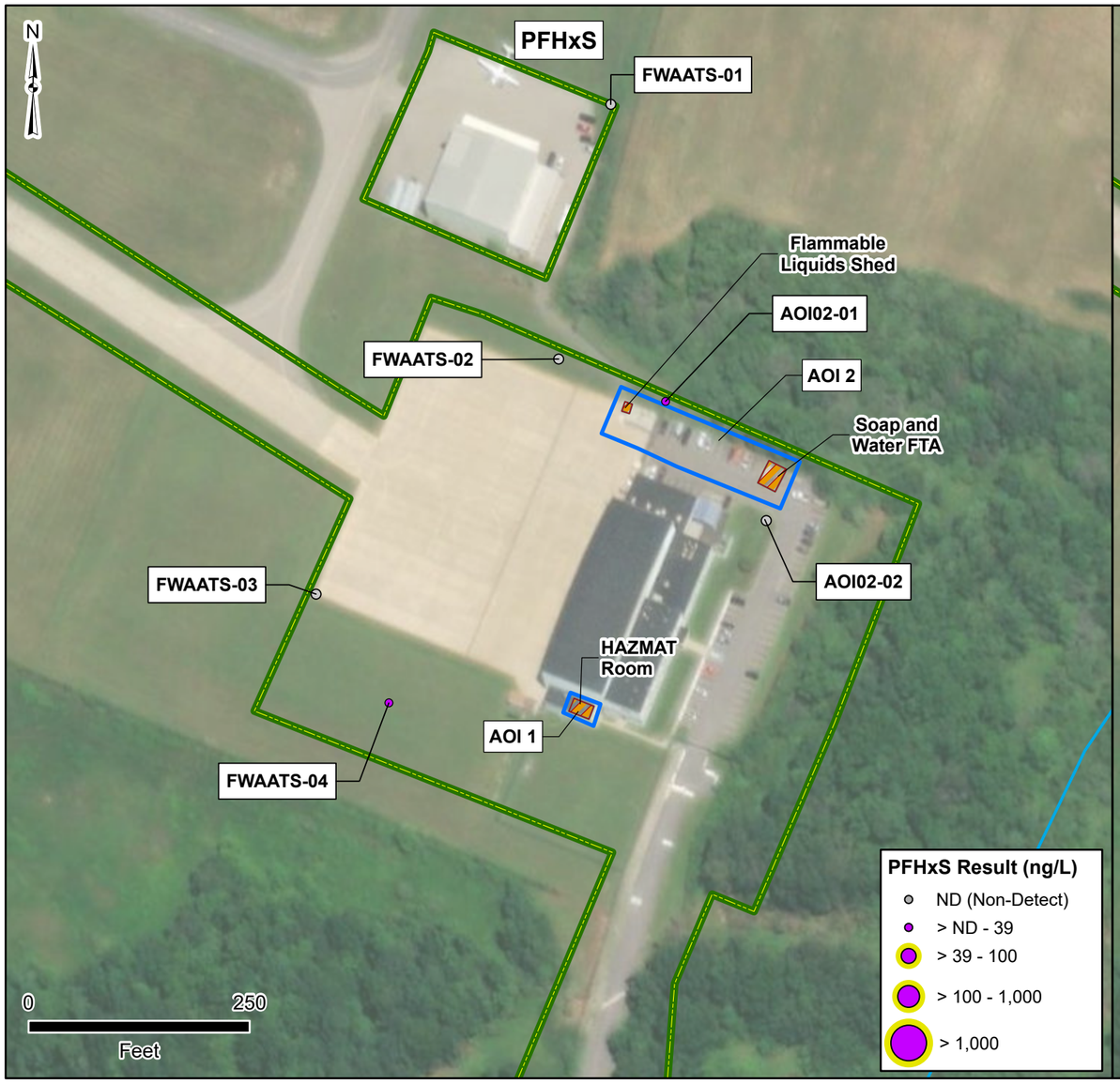
Data Sources:
ESRI 2022
AECOM 2019

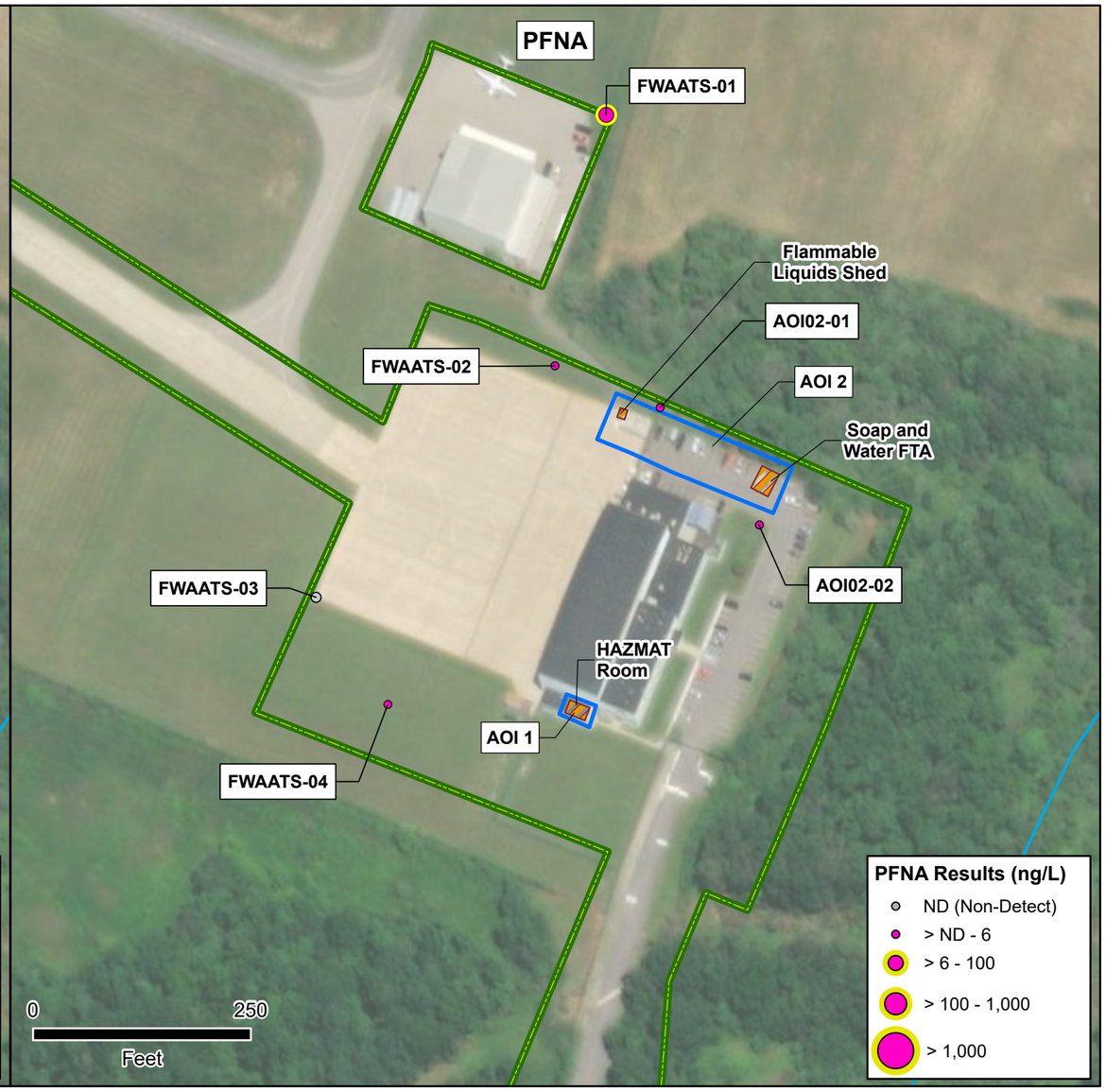
Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

1144 *This page intentionally left blank*

Army National Guard Site Inspections
Site Inspection Report
Fixed Wing Army Aviation Training Site, West Virginia

Figure 6-7
PFHxS and PFNA Detections in Groundwater





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology
- Perennial Creek/Stream

Notes:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....September 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 17N

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7. EXPOSURE PATHWAYS

The conceptual site model (CSM) for the AOI, 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
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 no identified complete 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., staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access), off-facility recreational users, and residents. The CSMs for AOI 1 and AOI 2, revised based on the SI findings, are presented on **Figure 7-1**.

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1

During interviews with FWAATS personnel, the HAZMAT Room was identified as a location where AFFF was known to be stored from 1996 until 2019. The HAZMAT Room is on the southern side of the FWAATS hangar adjacent to the Ground Support Room. Two 5-gal containers of AFFF were discovered in the HAZMAT Room in 2019, which were subsequently disposed of. It should be noted that the two buckets were stored on a secondary containment spill pallet. Interviewees had no recollection of spills or releases of AFFF at this location.

PFOA and PFNA were detected in surface soils at AOI 1 and at the boundary downgradient of the AOI, at concentrations below the respective SLs. Although there are no current construction activities occurring, future site workers, construction workers, and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for future site workers, construction workers, and trespassers are potentially complete. There were no detections of the relevant compounds in subsurface soil at AOI 1 or the associated boundary sample locations. Therefore, the exposure pathways for subsurface soil is incomplete. The CSM is presented in **Figure 7-1**.

7.1.2 AOI 2

AFFF was kept at FWAATS (beginning in 1996); 5-gal buckets were stored in the Flammable Liquids Shed. One 5-gal bucket of AFFF was found in the Flammable Liquids Shed in 2019, which was subsequently disposed of. There are no known spill or releases of AFFF at this location. The Soap and Water FTA is located in the parking lot in the northeast corner of the Facility. According to interviewees, the training consisted of filling an empty Tri-Max™ extinguisher with a soap and water solution to demonstrate use of a Tri-Max™ extinguisher. It is unknown of extinguishers had ever held PFAS-containing substances such as AFFF, or if the extinguishers were cleaned between uses.

Relevant compounds were detected in surface soil at AOI 2 and the upgradient boundary at concentrations below associated SLs. Although there are no current construction activities occurring, future site workers, construction workers, and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for future site workers, construction workers, and trespassers are potentially complete. There were no detections of the relevant compounds in subsurface soil at AOI 2 or the associated boundary sample locations. Therefore, the exposure pathways for subsurface soil is incomplete. The CSM is presented in **Figure 7-1**.

7.2 GROUNDWATER EXPOSURE PATHWAY

The SI results for 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

There were no groundwater samples collected from AOI 1 due to shallow refusal depths above the water table elevation. However, boundary location FWAATS-04 is located in a downgradient

direction from AOI 1 based on the groundwater elevations observed in this SI. PFOA was detected in groundwater at FWAATS-04 at a concentration which exceeded the associated SL. Additionally, each of the other four relevant compounds were detected in groundwater at FWAATS-04 at concentrations below their respective SLs.

The Facility receives drinking water from the municipal water system, and there were no identified private drinking water wells located immediately downgradient of the Facility. As such, the ingestion exposure pathway of groundwater for off-facility residents that are located downgradient of AOI 1 is incomplete. The pathway for off-facility recreational users of surface water bodies is also potentially complete due to the potential for groundwater recharge of surface water. Additionally, the depth to groundwater at FWAATS-04 was less than 10 ft below grade, so trenching activities could result in future construction worker exposure via accidental ingestion; therefore, this pathway is considered potentially complete. The CSM is presented in **Figure 7-1**.

7.2.2 AOI 2

PFOA was detected in groundwater at AOI 2 at concentrations which exceeded the associated SL. Additionally, each of the other four relevant compounds were detected in groundwater at AOI 2 at concentrations below their respective SLs.

The Facility receives drinking water from the municipal water system, and there were no identified private drinking water wells located immediately downgradient of the Facility. As such, the ingestion exposure pathway of groundwater for off-facility residents that are located downgradient of AOI 2 is incomplete. The pathway for off-facility recreational users of surface water bodies is also potentially complete due to the potential for groundwater recharge of surface water. Additionally, the depth to groundwater observed in the two temporary wells in AOI 2 was greater than 15 ft bgs; however, a perched shallow groundwater table was present elsewhere on-facility and could be present in AOI 2, so trenching activities could result in future construction worker exposure via accidental ingestion; therefore, this pathway is considered potentially complete. The CSM is presented in **Figure 7-1**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

Off-facility surface water and sediment were not sampled as part of this SI, as the scope of sampling was limited to the presence or absence of the relevant compounds in soil and groundwater within the facility boundary. Although no surface water features flow through the AOI, the Facility is within close proximity to adjacent streams and the potential exists for groundwater to discharge to the streams. The nearest stream to the southwest is Simpson Creek, which continues with the regional flow direction northwest to the West Fork River and the Monongahela River. The Monongahela River is popular for recreational use, including fishing, swimming, and boating. Based on the groundwater concentrations which exceeded SLs at AOI 2 and at the facility boundaries, the ingestion exposure pathway for surface water and sediment is considered potentially complete for recreational users of the downgradient water bodies. The CSM is presented in **Figure 7-1**.

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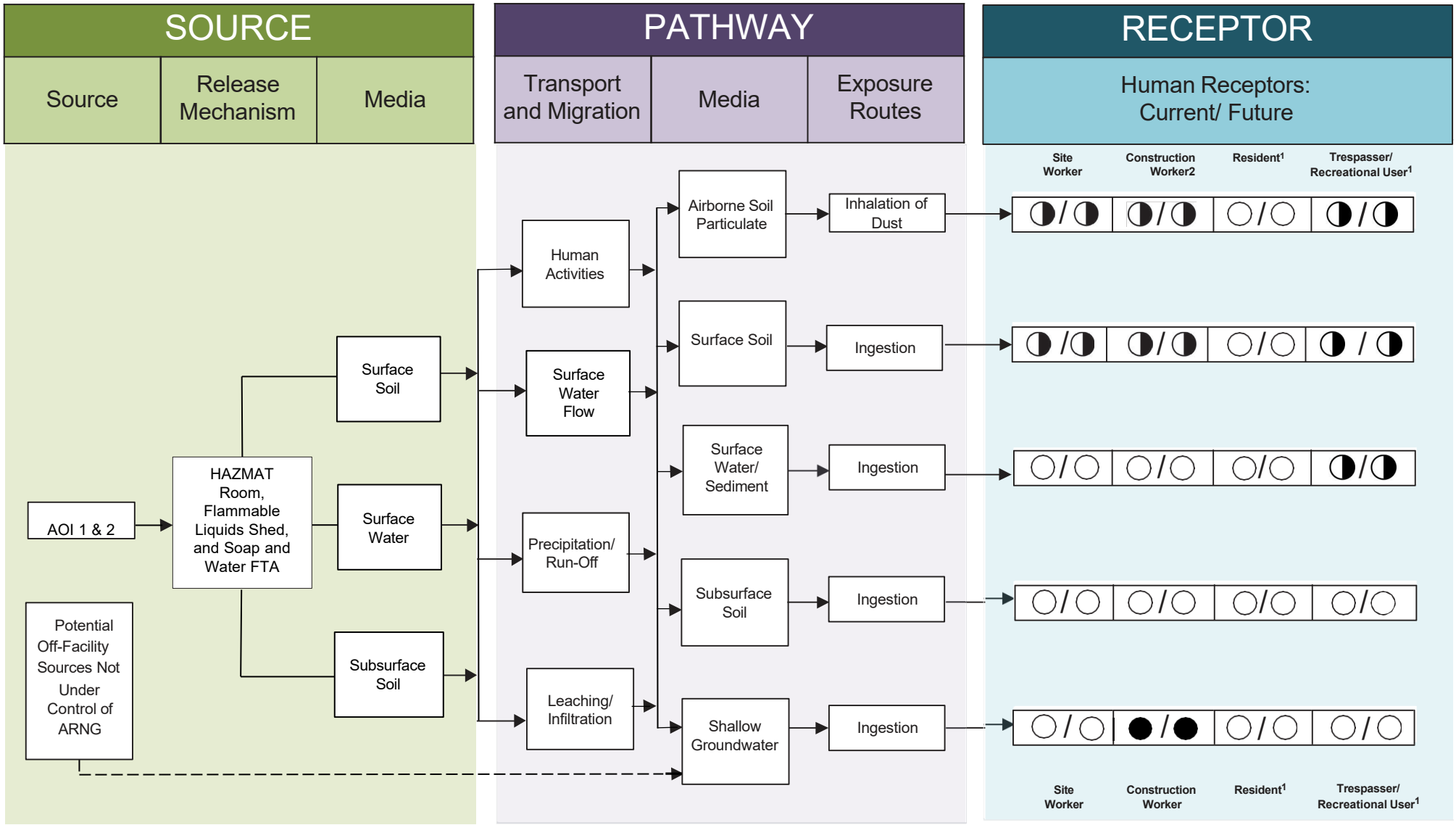

LEGEND

- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway with no Exceedances of Screening Levels
- Potentially Complete Pathway with Exceedance of Screening Levels

NOTES

1. The resident and recreational users refer to off-site receptors
2. Construction activities are not currently taking place at the facility

Figure 7-1 - Conceptual Site Model AOI 1 and AOI 2
Fixed Wing Army Aviation Training Site, WV

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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 SITE INSPECTION ACTIVITIES

The SI field activities at the facility were conducted from 22 February to 3 March 2022. The SI field activities included soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as previously noted in **Section 5.9**.

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

- Twenty one (21) soil samples from eight primary locations and two offset locations (soil borings locations)
- Six (6) grab groundwater samples from six temporary well locations
- Thirteen (13) samples quality assurance/quality control samples.

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

8.2 OUTCOME

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1: HAZMAT Room and AOI 2: Flammable Liquids Shed and Soap and Water FTA. Based on the CSM developed there is potential for exposure to receptors from AOI 1 and AOI 2 from sources on the facility resulting from historical DoD activities. Sample chemical analytical concentrations collected during this SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**.

A summary of the results of the SI data relative to SLs is as follows:

- AOI 1:
  - No groundwater samples were collected in AOI 1 due to shallow boring refusal above the water table depth. However, relevant compounds were detected in groundwater at FWAATS-04 and FWAATS-03, boundary locations located downgradient of AOI-01. PFOA exceeded the SL in groundwater at FWAATS-04, with a concentration of 110 ng/L. Uncertainties exist as to whether AOI 1 is the source of the detections at FWAATS-04 as the water table sampled at FWAATS-04 was shallow (less than 10 ft below grade) and likely perched. This perched water table may not be subject to the same local/regional flow regime as the deeper wells from which the groundwater contours were developed (**Figure 2-5**). Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.
  - PFNA and PFOA were detected in surface soil at AOI 1 at low concentrations below the SLs.
- AOI 2:
  - PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in groundwater at AOI 2. PFOA exceeded the SL in groundwater in both of AOI 2 temporary wells with a maximum concentration of 32 ng/L at AOI02-01. Additionally, PFNA, PFOS, and PFOA were detected at concentrations below SLs at upgradient boundary locations FWAATS-01 and FWAATS-02. The source area at AOI 2 is located on the northern property boundary, and it is uncertain from the data collected if detections are from DoD activities at the Facility or off-site sources.
  - PFOA was detected in soil at AOI 2 at low concentrations below the SL.

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[1]	Future Action
1	HAZMAT Room	◐	●[1]	Proceed to RI
2	Flammable Liquids Shed and Soap and Water Fire Training Area	◐	●	Proceed to RI

Legend:

● = Detected; exceedance of SLs

◐ = Detected; no exceedance of SLs

○ = Not detected

[1]No wells installed within the source area, but exceedances of PFOA detected 200 feet downgradient of AOI 1.

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