Final

Site Inspection Report
Duncan Readiness Center and Army Aviation Support Facility
New Castle, Delaware

Per- and Polyfluoroalkyl Substances Impacted Sites
ARNG Installations, Nationwide

March 2022

Prepared for

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

UNCLASSIFIED

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
%	Percent
µg/kg	Microgram(s) per kilogram
µg/L	Microgram(s) per liter
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film Forming Foam
amsl	Above mean sea level
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
bgs	Below ground surface
bmsl	Below mean sea level
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual site model
DA	Department of the Army
DANG	Delaware Air National Guard
DNREC	Delaware Department of Natural Resources and Environmental Control
DEARNG	Delaware Army National Guard
DoD	Department of Defense
DPT	Direct-push technology
DQI	Data Quality Indicator
DQO	Data Quality Objectives
EA	EA Engineering, Science, and Technology, Inc., PBC
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
ft	Foot (feet)
HA	Health Advisory
HDPE	High-density polyethylene
HQ	Hazard Quotient
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council

LC/MS/MS	Liquid Chromatography Tandem Mass Spectrometry
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOQ	Limit of quantification
MS	Matrix spike
MSD	Matrix spike duplicate
NCANGB	New Castle Air National Guard Base
NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethylperfluorooctane sulfonamidoacetic acid
ng/L	Nanogram(s) per liter
NMeFOSAA	N-methylperfluorooctane sulfonamidoacetic acid
No.	Number
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutanesulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
TCRA	Time Critical Removal Action
TOC	Total organic carbon
TPP	Technical Project Planning
UCMR3	Unregulated Contaminant Monitoring Rule 3
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

EXECUTIVE SUMMARY

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). An SI was completed at the Duncan Readiness Center (RC) and Army Aviation Support Facility (AASF). The Duncan RC and AASF is also referred to as the "facility" throughout this document.

The facility, operated by the Delaware ARNG (DEARNG), encompasses approximately 17.3 acres in New Castle, Delaware. The facility is located adjacent to the New Castle Airport, approximately 5.6 miles southwest of the City of Wilmington. Delaware's Air National Guard base is located across airport taxiways to the northeast. The Duncan RC and AASF lies within the Coastal Plain region of Delaware, which is composed of variegated silts and clays. DEARNG leased the property from the New Castle Airport in 1973 for a 50-year term and has been used as an active military facility since. The Duncan RC and AASF is currently, and has been historically, used for aircraft maintenance and administrative purposes. The facility includes an aircraft hangar, administrative offices, and helicopter landing pads.

The PA Report (AECOM Technical Services, Inc. 2020) identified one potential PFAS release area at the facility, the 1970s Helicopter Crash Site. Additionally, during SI scoping meetings with the ARNG, the Hangar was determined to be a potential PFAS release area. The release areas were grouped into two AOIs: AOI 1, which includes the Helicopter Crash Site, and AOI 2, which includes the Hangar. The SI field activities were conducted from 2 to 3 June 2021 and included the collection of soil and groundwater samples.

To fulfill the project Data Quality Objectives set forth in the approved installation-specific Uniform Federal Policy – Quality Assurance Project Plan Addendum (EA 2021b), samples were collected and analyzed for a subset of 24 PFAS via liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual Version 5.3 Table B-15. The 24 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.8** of this SI Report.

The Department of Defense (DoD) has adopted a policy to retain facilities in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense dated 15 September 2021 (Deputy Assistant Secretary of Defense 2021). The ARNG PFAS SIs follow this DoD policy and, should the maximum site concentration for sampled media exceeds the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table ES-1**. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater within the boundaries of the facility may be impacted with other PFAS analytes.

Chemical concentrations from samples were compared against the project SLs as described in **Table ES-1**. A summary of the results of the SI data relative to the SLs is as follows:

- AOI 1 – PFOS or PFOA were detected in groundwater at concentrations exceeding the individual SLs of 40 nanograms per liter (ng/L) in all temporary well locations associated with AOI 1, with maximum concentrations of PFOS at 150 ng/L and PFOA at 120 ng/L at locations AOI01-02 and AOI01-01, respectively. PFBS was detected in groundwater at AOI 1, but did not exceed the SL.

- AOI 2 – PFOA, PFOS, and PFBS were detected in groundwater at AOI 2. PFOA exceeded the SL in groundwater with a concentration of 230 ng/L at AOI02-01. PFOS and PFBS did not exceed the SLs.

- AOI 1 and 2 – PFOA and PFOS were detected in soil at both AOI 1 and 2 at low concentrations, several orders of magnitude below the SLs. There were no detections of PFBS at either AOI.

- Upgradient Boundary Samples – PFOA, PFOS, and PFBS were detected in groundwater upgradient of AOI 1 and AOI 2 in samples taken from locations DAASF-01 and DAASF-02. The sample taken from location DAASF-02 exceeded the PFOA SL with a concentration of 150 ng/L, but there were no exceedances in the sample taken from location DAASF-01. The sample taken from location DAASF-03, located along the northeastern facility boundary, also exceeded the SL for PFOA with a concentration of 280 ng/L.

- Downgradient Boundary Samples - PFOA was detected in groundwater at downgradient location MW-15 with a concentration of 100 ng/L, exceeding the SL. PFBS and PFOS were detected at this location below their respective SLs.

- Recommendations – Based on the results of the SI, further evaluation of AOIs 1 and 2 are warranted in a Remedial Investigation.

Table ES-2 summarizes the SI results for soil and groundwater. Based on the conceptual site models which were updated with the SI findings, there is potential for exposure to residential drinking water receptors caused by potential DoD activities at the facility as well as potential and known off-facility adjacent sources.

Table ES-3 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 1: Helicopter Crash Site and AOI 2: Hangar.

Table ES-1 Screening Levels (Soil and Groundwater)

Analyte	Residential (Soil) (µg/kg) [1]	Industrial / Commercial Composite Worker (Soil) (µg/kg) [1]	Tap Water (Groundwater) (ng/L) [1]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	1,900	25,000	600

Notes:

1. Deputy Assistant Secretary of Defense. 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. 15 September 2021.

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

Table ES-2 Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Helicopter Crash Site	◐	●	●
2	Hangar	◐	●	●

Legend:
● = Detected; exceedance of screening levels.
◐ = Detected; no exceedance of screening levels.
○ = Not detected.

Table ES-3. Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Helicopter Crash Site	Exceedances of the SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
2	Hangar	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI

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1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Per- and Polyfluoroalkyl Substances (PFAS)-impacted sites at ARNG facilities nationwide. This work is supported by the U.S. Army Corps of Engineers (USACE) Baltimore District and their contractor, EA Engineering, Science, and Technology, Inc., PBC, (EA) under Contract Number (No.) W912DR-19-D-0005, Task Order No. W912DR20F0383. The ARNG performed this SI at the Duncan Readiness Center (RC) and Army Aviation Support Facility (AASF) (also referred to as the "facility") in Delaware.

The SI project elements were performed by EA in accordance with the 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, including specific requirements for sampling for perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as PFAS. The term PFAS will be used throughout this plan to encompass all PFAS chemicals being evaluated, including PFOS, PFOA, and PFBS, which are the key components of the suspected releases being evaluated, along with the other 21 related compounds listed in the task order.

1.2 SI PURPOSE

A PA was performed at the facility (AECOM Technical Services, Inc. [AECOM] 2020) that identified a single potential PFAS release area, which was grouped into one Area of Interest (AOI). The SI was performed as the next step in the CERCLA process. During the SI scoping process a second AOI was identified. The objective of the SI was to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA 2005), an SI has five goals:

1) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.

2) Determine the potential need for a removal action (i.e., Time Critical Removal Action [TCRA]; applies to drinking water only).

3) Collect or develop data to evaluate the release.

4) Collect additional data to develop the conceptual site model (CSM) in preparation for an effective remedial investigation (RI).

5) Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

In addition to the USEPA identified goals of an SI, the ARNG SI effort also identifies whether there are any impacts from potential off-facility PFAS sources.

2. SITE BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The facility occupies 17.3 acres in New Castle, Delaware, adjacent to the New Castle Airport. Wilmington, Delaware, located 5.6 miles from the facility, is the nearest metropolitan area. Delaware's Air National Guard (DANG) base is located across the airport taxiways to the northeast. The surrounding properties are primarily zoned for single-family homes and businesses.

The facility property and the present day Wilmington Airport was an active duty Air Force Base in the 1940s. In 1949, the War Department started parceling the property. In 1973, the State of Delaware issued the DEARNG a certificate of title for the portion of the property containing the AASF and Duncan RC, and has since been used as an active military facility. The facility is comprised of an aircraft hangar to house machinery, several administrative offices, and helicopter landing pads. The AASF houses the maintenance hangar and the Duncan RC houses the administrative offices. Airport runways and taxiways are located directly adjacent to the facility, which is protected by a guarded gate (AECOM 2020). The facility location and layout are shown on **Figure 2-1**.

2.2 FACILITY ENVIRONMENTAL SETTING

Located in northern New Castle County, Delaware, southwest of Wilmington, Delaware, the facility is approximately 64 feet (ft) above mean sea level (amsl). The Christina River, located north of the facility, is part of the Christina River Basin reaching into Pennsylvania and Maryland and flows generally northeast into the Delaware River. The Delaware River, located east of the facility, flows south until it merges into the Delaware Bay. Ground surface within the facility is predominantly covered by buildings, asphalt, and concrete; however, green space exists around the parking lot and on the southwestern corner of the property, surrounding the stormwater detention basin. The facility lies within the Coastal Plain region of Delaware, which is composed of variegated silts and clays and is a predominantly low, flat area about 100 ft amsl (AECOM 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, and current and future land use. The facility topography at Duncan RC and AASF are shown on **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features and drainage basins are shown on **Figure 2-4**. Groundwater elevations and contours are presented on **Figure 2-5**.

2.2.1 Geology

The facility lies within the northern edge of the Atlantic Coastal Plain Province, which consists of semi- and unconsolidated fluvial deposited sediments. The Columbia Formation, middle Pliestocene in age, overlies the older Cretaceous Potomac Formation at the facility, dipping to the east. These formations were deposited in non-marine, fluvial environments (EA 2019).

The Columbia formation is characterized by fine to coarse, feldspathic quartz sand with varying amounts of gravel and scattered beds of tan to reddish-gray clayey silt. The Columbia Formation in New Castle County ranges in thickness from less than 10 ft to over 130 ft, where it occurs in channel deposits.

Eroded surfaces within the underlying Potomac Formation are filled by sediments of the Columbia Formation, forming paleo-channels that trend northeast to southwest with a thickness of approximately 70 ft. A paleo-channel is located adjacent to the New Castle Airport to the east. The Potomac Formation consists of interbedded dark-red, gray, pink, and white silty clay to clayey silt and fine to medium sand. Underlying the Potomac Formation is the Lower Paleozoic Wilmington Complex, consisting of felsic and mafic gneiss and minor schist, as well as the Brandywine Blue Gneiss, consisting of granulite facies felsic gneisses (EA 2019).

Soils encountered during the SI consisted mainly of silts, sands, some gravel, and minor clay lenses. Bedrock was not encountered during drilling.

2.2.2 Hydrogeology

New Castle County, Delaware, has two aquifers: the Columbia and Potomac. The Columbia is the surficial aquifer in this area and can either be perched or act as a hydrologic unit with the Potomac aquifer. A previous investigation was conducted by the ANG approximately 1 mile from the facility. At the time of the PA, it was inferred that the geologic information provided in this investigation was similar to that at the facility due to its proximity. The study indicated that the Columbia Formation in this area is predominantly dry, with perched water tables present. The Potomac aquifer consists of two independent (Upper and Middle), laterally continuous sand bodies within the water-bearing zones of the Potomac Formation. The water table under normal conditions sits at an elevation of approximately 20 to 30 ft amsl (AECOM 2020). During the SI, depth to water ranged from 25.88 to 32.89 ft (**Figure 2-5**).

The Upper Potomac aquifer lies in both the shallow and intermediate groundwater-bearing zones. The shallow zone extends from 0 to 30 ft amsl, and there is no clear distinction between the surficial Columbia aquifer and the Upper Potomac aquifer. Separated from the shallow zone by a semi-confining layer of clay, the intermediate groundwater-bearing zone ranges from 1 to 20 ft thick, extends approximately 50 ft below mean sea level (bmsl), and is considered to be part of the Upper Potomac aquifer. Results of groundwater elevation data from a previous investigation at the adjacent ANG facility suggest that the shallow and intermediate zones are interconnected, as they show similar trends in groundwater levels and flow directions (Amec Foster Wheeler 2019). Groundwater elevations calculated using depth to groundwater measurements and survey data collected during the SI indicated groundwater within the shallow and intermediate aquifer underlying the southern and western portions of the facility flows primarily to the north/northeast and to the northwest in the eastern portion of the facility.

The Middle Potomac aquifer is considered the deep groundwater-bearing zone and is separated from the Upper Potomac aquifer by a layer of clay 60 to 80 ft thick; it does not vertically transmit water. Below the clay layer, the aquifer's water-bearing sands extend from 120 to 130 ft bmsl. Groundwater levels are about 5 to 10 ft bmsl, suggesting that the groundwater is confined, and there is little transmission of water vertically between the Upper and Middle Potomac aquifers. Groundwater in the Middle Potomac aquifer flows to the south-southeast (AECOM 2020).

In New Castle County, south of the Chesapeake and Delaware Canal, approximately 10 miles south of the facility, nearly all drinking water is from groundwater provided by public and private wells. However, north of the canal in northern New Castle County, where the facility is located, groundwater supplies only 30 percent (%) of drinking water (AECOM 2020).

Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated during the PA that PFAS were detected in a public water system above the Health Advisory (HA) within 20 miles of the facility between 2013 and 2015. In May 2016, USEPA replaced provisional HAs with a more conservative HA of 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed prior to 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today. The Delaware Department of Natural Resources and Environmental Control (DNREC) reported that Artesian Water Company, a primary drinking water provider in the area, and the City of New Castle Municipal Services Commission detected PFAS in public water supply wells within the area of the facility. The area of investigation is approximately 7 square miles and is bounded to the north by Interstate 295, the Delaware River to the east, Route 273 to the south, and Route 13 and New Castle Airport to the west. This area of PFAS contamination includes New Castle County Airport, the facility property, and surrounding residential areas. The public water supply is treated for PFAS contamination prior to distribution (AECOM 2020).

EDR™ conducted a well search for a 1-mile radius surrounding the facility and it was noted that there are eight private domestic groundwater supply wells within 1 mile of the facility. In November 2016, in response to the previously described lowering of the HA levels, USEPA collected samples from one of these private wells located approximately 1 mile northwest of Duncan RC and AASF. While PFOS was not detected in any collected samples, PFOA was detected in exceedance of the HA. Attempts were made by DNREC and USEPA to further investigate the well, however, the owner did not respond (USEPA 2018a).

Using additional online resources, such as state and local geographic information system databases, wells were researched to a 4-mile radius of the facility. According to data from the state of Delaware, the majority of wells to the southeast of the facility, deep groundwater's downgradient direction, are monitoring wells. A 2019 USEPA report figure shows four Artesian public water supply wells located 3 miles south of the facility. However, according to interviews with DNREC, there are additional Artesian and City of New Castle Municipal Service Commission public wells located within 3 miles of the facility to the northeast, east, and southeast. North of the facility, shallow groundwater's downgradient direction to the Christina River, there are a combination of monitoring and domestic groundwater wells (AECOM 2020).

2.2.3 Hydrology

North of the facility is the Christina River, a part of the Christina River Basin that extends from Pennsylvania through New Castle County, Delaware. The Christina River Basin is characterized by dendritic interconnected rivers, streams, and wetlands, with outflow to the Delaware River. The Christina River is in the southernmost area of the basin and flows northeast, into the Delaware River. Surface water accounts for 70% of New Castle County's water supply, the majority of which comes from the Christina River Basin, which provides 60% of New Castle County's water overall. The majority of the Christina River is in New Castle County, with headwaters in Maryland. The Christina River is tidal from just south of the town of Christiana to its convergence with the Delaware River. This section of the Christina lies approximately 1 mile west of the facility and tidal freshwater wetlands occur throughout the area (AECOM 2020).

The facility sits on the Lower Christina River Watershed, at the edge of the Christina Basin, with wetlands lying north of the facility. On facility grounds, runoff flows away from the paved areas and structures into a detention basin on the southern end of the property, where runoff will infiltrate or evaporate. However, surrounding the facility, general surface water flow is north into the Christina River and Nonesuch Creek, which converge downstream and continue northeast to the Delaware River (AECOM 2020).

The facility is closest to the 68-mile marker of the Delaware River. A presentation from the Delaware River Basin Commission provides 2009 PFAS concentration data for media tested along the Delaware River. PFAS were detected in surface water in the section closest to the facility, between river miles 68 and 70. The 2009 PFOA concentration at river mile 68.1 was 0.0277 micrograms per liter (µg/L), and the PFOS concentration was 0.00575 µg/L (AECOM 2020).

2.2.4 Climate

The climate at the facility is humid continental. The Delaware Bay and Atlantic Ocean to the east and south, and the Chesapeake Bay to the west moderate temperature extremes in the winter and summer months. Although the extremes are lessened, the climate at the facility is still continental with hot summers, cold winters, and precipitation throughout the year. Mean annual temperature in New Castle is 54 degrees Fahrenheit (°F). Average annual high temperature for Wilmington, Delaware, in New Castle County, is 64.1 °F and average annual low temperature is 45.8 °F. Annual precipitation for Wilmington is approximately 43 inches of rain and 19 inches of snowfall (AECOM 2020).

2.2.5 Current and Future Land Use

The facility currently resides on a portion of land leased from the New Castle Airport under the terms of a 50-year lease. It has been an active military facility since the signing of the lease in December 1973. The facility is currently used for aircraft maintenance and administrative activities. Future land use is not anticipated to change (AECOM 2020).

2.2.6 Critical Habitat and Threatened/Endangered Species

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in New Castle, Delaware (U.S. Fish and Wildlife Service 2021):

- Birds: Eastern Black Rail, *Laterallus jamaicensis* ssp. *jamaicensis* (Threatened)

- Reptiles: Bog Turtle, *Clemmys muhlenbergii* (Threatened)

- Flowering Plants: Small Whorled Pogonia, *Isotria medeoloides* (Threatened); and Swamp Pink, *Helonias bullata* (Threatened)

- Mammals: Northern Long-eared Bat, *Myotis septentrionalis* (Threatened).

2.3 HISTORY OF AQUEOUS FILM FORMING FOAM USE

Aqueous film forming foam (AFFF), a firefighting agent, was commonly used by the U.S. military to extinguish petroleum fires, for firefighting training, and for the suppression of fires in uncontained areas. Military use of AFFF began in the 1970s and was most widely used at DoD installations with airfields. Two Potential PFAS release areas were identified at the Duncan RC and AASF. The first AOI was identified where AFFF-containing firefighting foam may have been released onsite at the Duncan RC and AASF by the municipal fire department when they responded to a helicopter crash that occurred at the site boundary in the 1970s. Interviews and records obtained during the PA indicate that the facility's hangar fire suppression system has contained JET-X since a 2011 retrofitting. This synthetic foam concentrate is intended for firefighting applications but it is unknown if it is PFAS-containing. There is also uncertainty as to what type of foam was contained in the fire suppression system prior to the 2011 retrofitting. As such, the SI included the hangar as a potential AOI for investigation. A more detailed description of each AOI is presented in **Chapter 3**.

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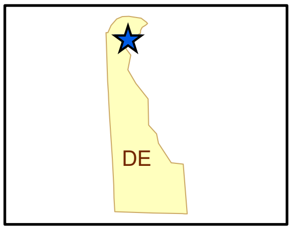
Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

Figure 2-1
Facility Location



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Facility Data

🟩 Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
Prepared By:..............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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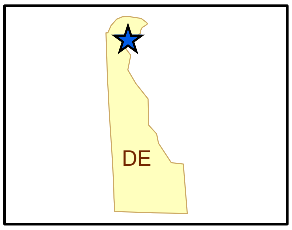
Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

Figure 2-2
Topography



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Facility Data

🟩 Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
Prepared By:..............................EA
Prepared For:.....................USACE
Projection:.......WGS 84 UTM 18N

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Army National Guard Site Inspections
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Duncan RC and AASF, Delaware

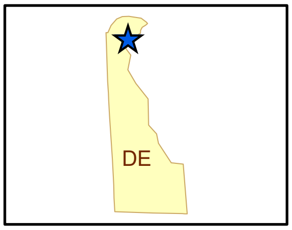
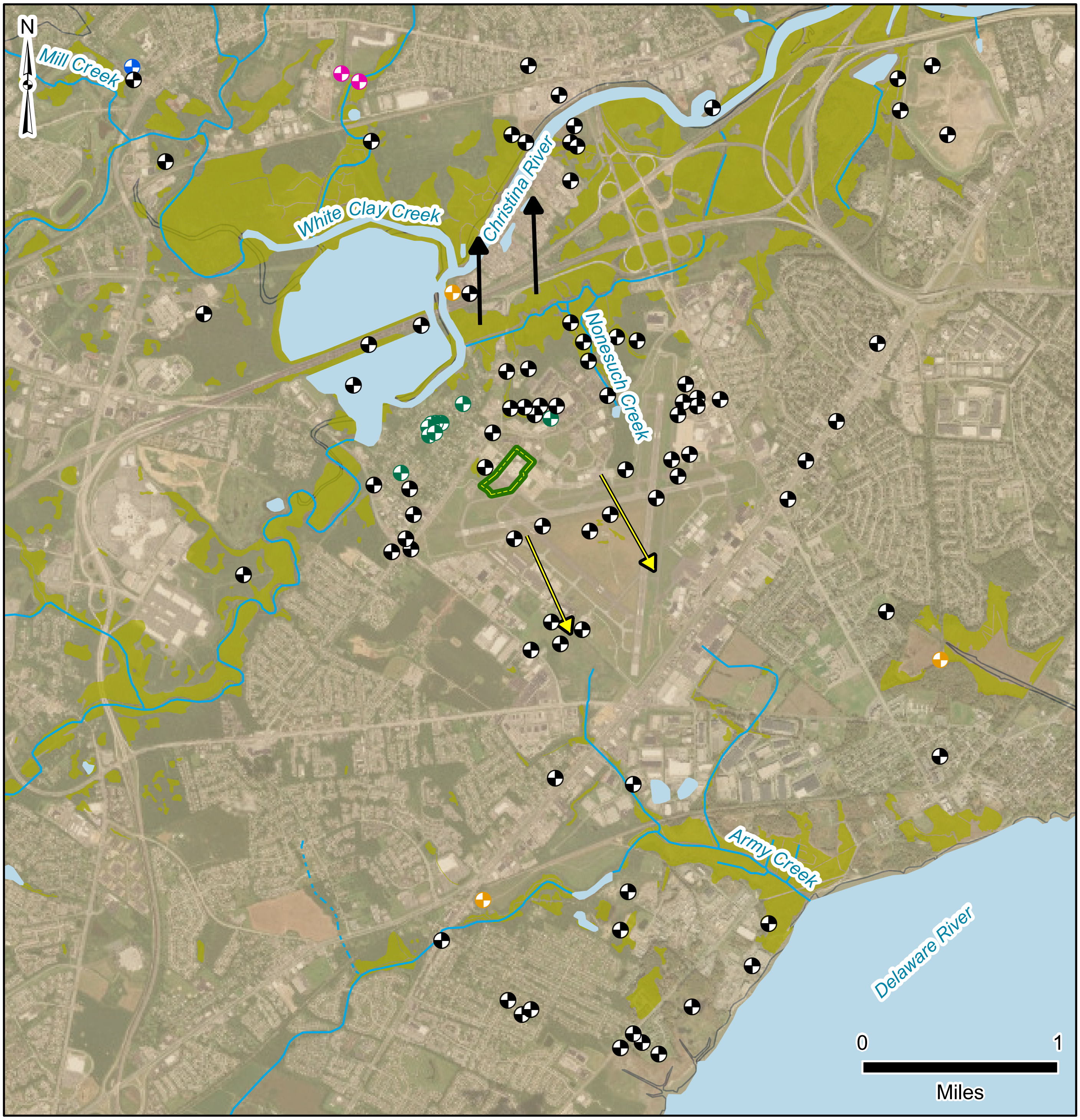


Figure 2-3
Groundwater Features



Facility Data
🟩 Facility Boundary

Well Type
● Agriculture
● Domestic
● Irrigation
● Monitoring
● Other

Hydrogeology
➡ Inferred Shallow Groundwater Flow Direction
➡ Inferred Deep Groundwater Flow Direction

Geology
▭ Potomac Formation

Hydrology
Perennial Stream/Creek
Intermittent Stream/Creek
Waterbody
Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
Prepared By:..............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

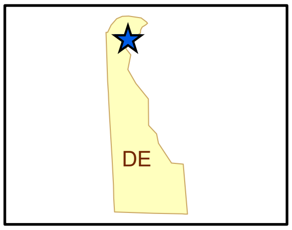

Figure 2-4
Surface Water Features

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Facility Data
- ▭ Facility Boundary

Hydrology
- ➔ Surface Water Flow Direction
- 〰 Perennial Stream/Creek
- ┄ Intermittent Stream/Creek
- ▬ Waterbody
- ◯ Retention Pond
- ▨ Wetlands
- 🟥 Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.......................March 2022
Prepared By:.............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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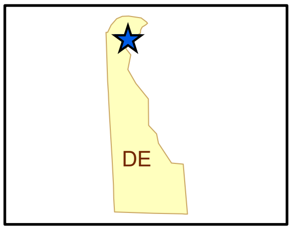
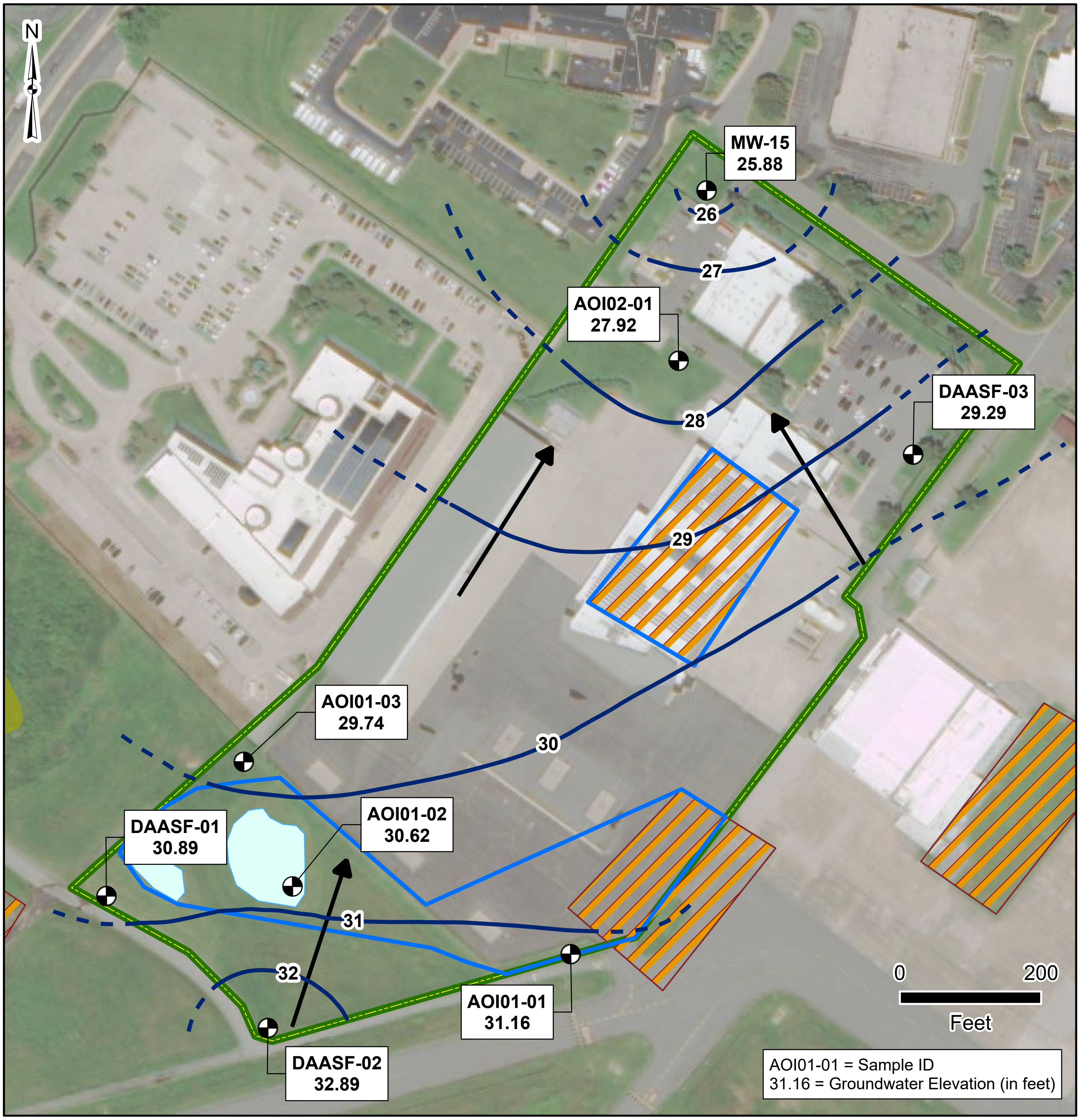
Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

Figure 2-5
Groundwater Contours and Elevation in Feet Above Mean Sea Level





AOI01-01 = Sample ID
31.16 = Groundwater Elevation (in feet)

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\DuncanArmory\DuncanArmory.aprx

Facility Data

- 🟩 Facility Boundary
- 🟦 Area of Interest
- ▨ Potential PFAS Release

Hydrogeology

- ⊕ Well Location
- ➜ Groundwater Flow Direction
- ∿ Groundwater Elevation Contour Interval (1 foot)
- ╱ ╲ Dashed where Inferred

Hydrology

- ⬭ Retention Pond
- ▨ Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
Prepared By:..............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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3. SUMMARY OF AREAS OF INTEREST

Based on the PA findings, one AOI was identified at the Duncan RC and AASF: AOI 1 Helicopter Crash Site. A second AOI was identified at the facility during scoping for the SI: AOI 2 Hangar. Additionally, several adjacent potential sources of PFAS have been identified (**Figure 3-1**). A summary of the AOIs and the adjacent potential sources is presented below.

3.1 AOI 1

3.1.1 Helicopter Crash Site

The ARNG Helicopter Crash Site is located on the southeastern boundary between the facility and the New Castle Airport properties. The crash occurred sometime in the 1970s. Historical knowledge suggests the municipal fire department responded to the scene using a foam fire suppressant; however, it is unknown if the foam contained AFFF. The municipal fire department is known to use AFFF to extinguish fires. The released foam likely followed onsite surface water pathways towards the southwestern portion of the facility, where runoff collects in a detention basin until it evaporates or infiltrates to the subsurface. The facility layout has been reconstructed since the time of the crash, and the suspected crash area is now mostly covered by an impervious concrete surface (AECOM 2020).

3.2 AOI 2

3.2.1 Hangar

The hangar has been an active military facility since the signing of the property lease in December 1973. Based on a review of historical aerial photographs, the site was initially developed to include a hangar; however, no information regarding the previous fire suppression system associated with the original hangar was found. According to interviewees, at the completion of renovations of the hangar and administrative wing in 2011, the existing fire suppression system in the hangar was retrofitted with a Jet-X 2% high expansion foam concentrate system. During retrofitting, the previous system was discharged with an aqueous soap and water solution to test functionality before Jet-X was placed in the system. Prior to the installation of the Jet-X deluge system, the fire suppression system was equipped with foam which was suspected to be non-PFAS containing. However, interviewees could not confirm the foam type. The storage tank for the current deluge system is located inside the fire suppression equipment room, which is accessible from outside of the building. The foam deluge system, automatic sprinkler system, and dry pipe sprinkler system are all checked on a quarterly basis by Allegiant Fire Protection. A release in the hangar would follow surface water drainage pathways to the north, subsequently infiltrating in the surrounding grass. It is unknown if Jet X is PFAS-containing. However, there is uncertainty as to what type of foam was contained in the fire suppression system prior to the 2011 retrofitting. As a result, the ARNG conservatively operated under the potential for the historic (prior to 2011) fire suppression foam to be PFAS-containing.

3.3 ADJACENT SOURCES

Six potential off-facility sources of PFAS are adjacent to the facility and are not under the control of the Delaware ARNG (DEARNG). A description of each off-facility source is presented below and shown on **Figure 3-1**.

3.3.1 Delaware Auto Salvage Fire

A fire started in July 2018 at the Delaware Auto Savage, approximately 1.3 miles from the Duncan RC and AASF. An estimated 400 vehicles ignited, but it is unknown how the fire began. Emergency response units came from the surrounding cities in order to control the fire using only water, as reported by the local news agencies. There is no suspected PFAS release at this location attributable to the use of AFFF (AECOM 2020). The Delaware Auto Salvage Fire occurred downgradient and is unlikely to impact the facility.

3.3.2 Delaware State Fire School

Firefighting training exercises are conducted approximately 0.5 mile north of the Duncan RC and AASF at the Delaware State Fire School New Castle. It is unknown if the foam used during these trainings contains AFFF. The Delaware Fire School has been identified as a potential off-facility source of PFAS (AECOM 2020). The Delaware State Fire School is located downgradient and is unlikely to impact the facility.

3.3.3 Aircraft Crash Site

While on a test flight, a military aircraft touched the ground and ignited a small fire in 1991. The Delaware Air National Guard (DANG) fire department responded to this event, but it is unknown whether AFFF was used to extinguish the fire. Based on the prevalent use of AFFF by the DANG, the crash site has been identified as a potential off-facility source of PFAS (AECOM 2020). The Aircraft Crash Site is located upgradient and has the potential to impact the facility.

3.3.4 DANG Fire Training Area

The DANG's current operational Fire Training Area is located approximately 80 ft southwest of the southwestern corner of the Duncan RC and AASF property. Training with foam has been reported to occur at this location, but it is unknown if the foam is AFFF-containing. The DANG Fire Training Area has been identified as a potential off-facility source of PFAS (AECOM 2020). The DANG Fire Training Area is located up- and cross-gradient and has the potential to impact the facility.

3.3.5 Airplane Crash Site

An aircraft crashed due to malfunctioning landing gear at the adjacent ANG base in November of 2018. There was no fire associated with the crash, and no emergency action was taken. The Airplane Crash Site has no suspected PFAS release (AECOM 2020).

3.3.6 New Castle Air National Guard Base

In 2017, an SI was conducted at the New Castle Air National Guard Base (NCANGB), which is located less than a mile east and cross-gradient of Duncan RC and AASF.

During the investigation, sampling (soil, surface water, and groundwater) was conducted to determine the presence/absence of PFAS at eight potential release locations and the facility boundary (AMEC Foster Wheeler 2019). The results of the surface and subsurface soil analysis indicated that PFAS was detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any soil samples. Analytical results from the groundwater samples indicated that two compounds (PFOA and PFOS) exceeded groundwater screening criteria.

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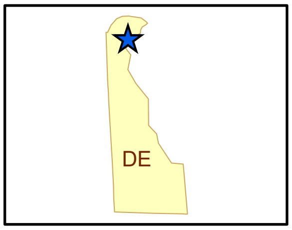
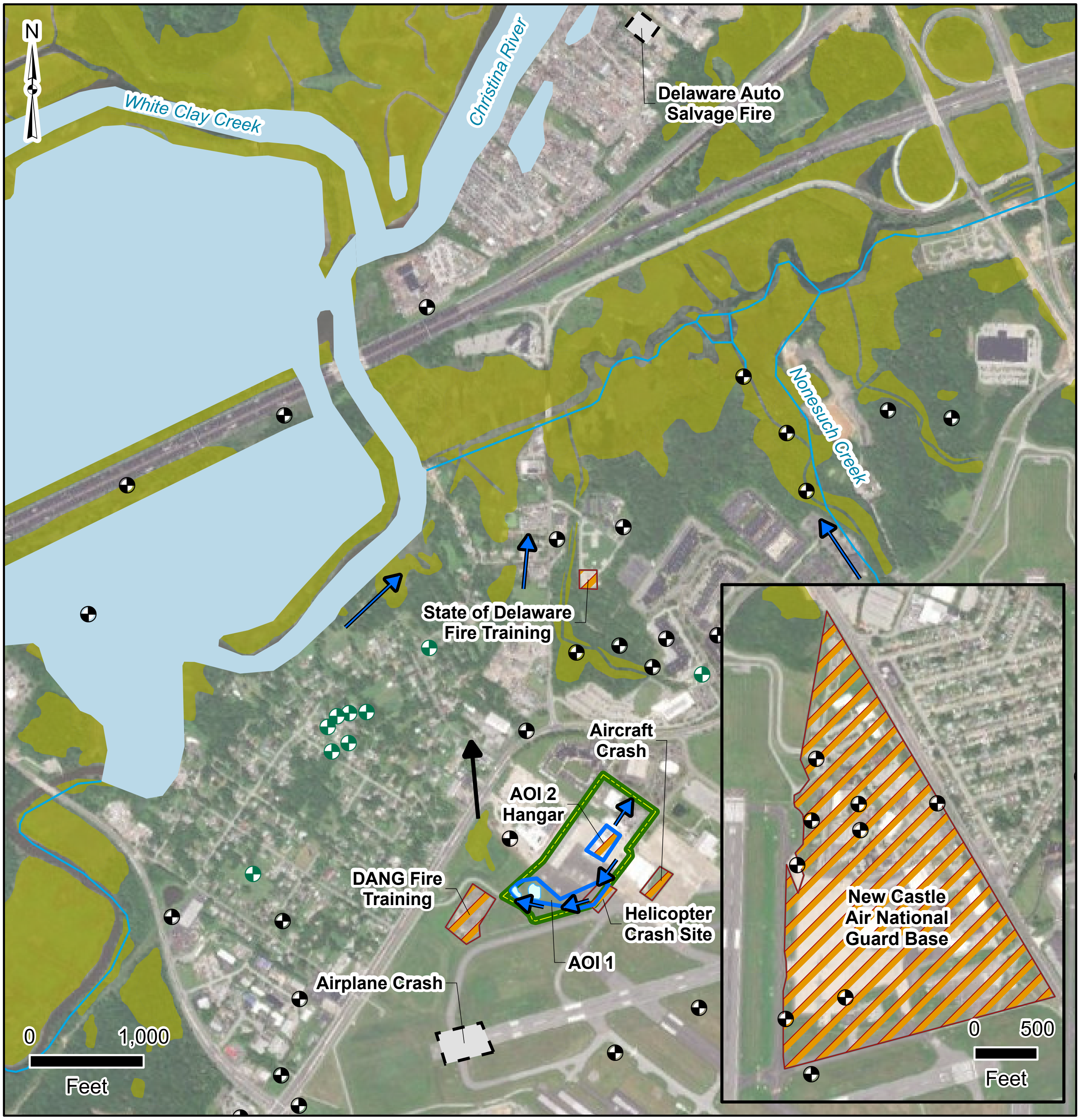
Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

Figure 3-1
Areas of Interest





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Facility Data

🟩 Facility Boundary
🟦 Area of Interest
▨ Potential PFAS Release
▭ No Suspected Release

Hydrology/Hydrogeology

● Domestic Well Location
● Monitoring Well Location
➔ Surface Water Flow Direction
➔ Inferred Shallow Groundwater Flow Direction

〰 Perennial Stream/Creek
⬭ Retention Pond
⬭ Waterbody
⬭ Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:.......................March 2022
Prepared By:.............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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4. PROJECT DATA QUALITY OBJECTIVES

Project Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support the project decision-making process. The specific DQOs established for the Duncan RC and AASF are described below. These DQOs were developed in accordance with the USEPA's seven-step iterative process (USEPA 2006).

4.1 PROBLEM STATEMENT

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

The DoD has adopted a policy to retain facilities in the CERCLA process based on exceedances of risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Deputy Assistant Secretary of Defense 2021). The ARNG program under which this SI was performed allows/follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the site will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. Additionally, USEPA issued drinking water lifetime HAs for PFOA and PFOS in May 2016 (USEPA 2016a, 2016b). The USEPA lifetime HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. This determination will be based on localized groundwater flow direction established during the SI. The SLs are presented in **Section 6.1** of this SI Report.

The following quotes from the U.S. Department of the Army (DA) policy documents form the basis for this project (DA 2016b, 2018):

- "The Army will research and identify locations where PFOS and/or PFOA containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider fire training areas, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In additions, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas."

- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination."

- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels." (USEPA 2016a, 2016b).

4.2 GOALS OF THE STUDY

The goals of the SI include the following:

- Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.

- Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.

- Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.

- Collect or develop data to evaluate the release.

- Collect data to better characterize the release for more effective and rapid initiation of an RI.

- If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).

4.3 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for the Duncan RC and AASF;

- Analytical data collected during other environmental sampling efforts at the Duncan RC and AASF;

- Groundwater, surface water, soil and/or sediment sample data collected in accordance with the Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) Addendum (EA 2021b); and

- Field data collected including groundwater elevation and water quality parameters measured using a multi-parameter water quality meter.

4.4 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the facility (**Figure 2-1**). Off-facility sampling was not included in the scope of this SI. If future offsite sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The scope of the SI was vertically bounded as follows: groundwater (25–40 ft bgs), soil from hand auger borings (0–2 ft bgs) and soil from direct-push technology (DPT) borings (30–40 ft bgs).

4.5 ANALYTICAL APPROACH

Samples were analyzed by Eurofins Lancaster Laboratories Env, LLC, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation No. 1.01) and approved by the Hazardous Substances Cleanup Act Program, per DNREC requirement. PFAS data underwent 100% Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019) 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 and decision rules as defined in the UFP-QAPP addendum (EA 2021b). Decision rules were developed for groundwater and soil. These rules governed response actions based on the results of the SI sampling effort.

The decision rules described in Worksheet #11 of the UFP-QAPP Addendum identify actions based on the following:

<u>Groundwater:</u>

1. Is there a human receptor within 4 miles of the facility?
2. What are the concentrations of PFOA, PFOS, and PFBS constituents at the potential source area?
3. What is the concentration of PFOA, PFOS, and PFBS constituents at the boundary?
4. What does the CSM suggest in terms of source, pathway, and receptor?

<u>Soil:</u>

1. What is the concentration of PFOA, PFOS, and PFBS constituents in shallow surface soil (0–2 ft bgs)?
2. What is the concentration of PFOA, PFOS, and PFBS constituents in soil (i.e., capillary fringe and bedrock interface) (2–39 ft bgs)?
3. What does the CSM suggest in terms of source, pathway, and receptor?

4.6 DATA USABILITY ASSESSMENT

The Data Usability Assessment 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.

Data Quality Indicators (DQIs) (precision, accuracy, representativeness, comparability, completeness, and sensitivity) are important components in assessing data usability. These DQIs are evaluated in the subsequent sections. The results of the evaluation demonstrate that the data presented in this SI report are of high quality overall. Although most of the SI data are considered reliable, a subset of the data was qualified to indicate increased uncertainty due to quality issues. Specific factors that contribute to uncertainty in the dataset are described below. The Data Validation Report (**Appendix A**) presents explanations for all qualified data in greater detail.

4.6.1 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPDs), and laboratory precision is measured with RPDs for laboratory duplicates, such as laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs and matrix spike (MS) and matrix spike duplicate (MSD) pairs.

LCS/LCSD pairs were prepared by addition of known concentrations of each analyte to a matrix-free media known to be free of target analytes. Results for LCS/LCSD pairs met the criterion of RPD≤30%, as specified in the QAPP Addendum (EA 2021b), demonstrating that the analytical system was in control during sample preparation and analysis.

MS/MSD pairs were prepared, analyzed, and reported for each preparation batch at a rate of 5%. MS/MSD results for PFAS met the criterion of RPD≤30%, as specified in the QAPP Addendum (EA 2021b), demonstrating good analytical precision for the matrix being tested. The MS/MSD pairs analyzed for TOC and laboratory duplicate analyzed for pH had RPDs of 4-5%.

Field duplicate samples were collected at a rate of 10% and analyzed for PFAS to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were within the project established precision limits presented in the UFP-QAPP Addendum (50% for solid samples, 30% for water samples) (EA 2021b) or differences were less than the average limit of quantitation (LOQ), indicating acceptable sampling and analytical precision.

No data were qualified due to issues with precision.

4.6.2 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in calibration verification samples, LCS/LCSD, and MS/MSD, and through extraction internal standards (EIS).

LCS/LCSD samples were prepared by addition of known concentrations of each analyte to a matrix-free media known to be free of target analytes. LCS/LCSD samples were analyzed for each analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis, with the following exceptions. Perfluorooctanesulfonamide (PFOSA) recoveries were high at 190% and 187% in the LCS and LCSD, respectively. Because the LCS/LCSD indicated positive bias and PFOSA was not detected in the 12 associated samples, no data qualifying action was required.

MS/MSDs were performed on soil samples AOI01-HA-04-1 (PFAS), DAASF-03-SB-14-15 (PFAS and TOC), A0101-01-SB-13.5-14 (TOC), and groundwater sample MW15-GW (PFAS). Analyte recoveries in MS/MSD samples demonstrated that the analytical system was in control for both soil and water. Three analytes were outside acceptance limits in the MS and/or MSD performed on sample MW15-GW; however, the concentrations of these analytes detected in the parent sample were greater than four times the spike concentration, and therefore no data qualifying action was required.

EIS for PFAS were added by the laboratory during sample extraction to measure relative responses of target analytes and used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. Several field samples displayed EIS area counts less than the lower quality control (QC) limit of 50%. Two positive field sample results were associated with EIS recoveries less than the QC limit, but greater than 20%, and were qualified "J+"; these qualified results are considered usable as estimated values with a positive bias. Eight non-detect field sample results associated with EIS recoveries less than the QC limit, but greater than 20%, were qualified "UJ"; these qualified results are also considered usable. The non-detect results for N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA) and N-ethylperfluorooctane sulfonamidoacetic acid (NEtFOSAA) in three soil samples were associated with EIS recoveries less than 20%, and were qualified "X" by the validator, indicating that these results needed further evaluation during the data usability assessment. The project team determined these qualified results were usable for project purposes, and these six NMeFOSAA and NEtFOSAA soil results were therefore UJ qualified.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. All calibration verifications were within the project established precision limits presented in the UFP-QAPP Addendum (EA 2021b).

4.6.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect site conditions. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15, including the specific preparation requirements (i.e., ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in table B-15 were monitored, standards that contained both branch and linear isomers when available were used, and isotopically labeled standards were used for quantitation. The laboratory also followed the required methods for analysis of pH (USEPA SW-846 Method 9045D) and TOC (USEPA SW-846 Method 9060A). The laboratory used approved standard methods in accordance with the UFP-QAPP Addendum (EA 2021b) for all analyses.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for analysis of PFAS and MS/MSD samples were collected at a rate of 5%. Appropriate preservation techniques were followed by the field staff, and maximum holding times for extraction and analysis were met by the laboratory.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. Instrument blanks and method blanks were non-detect for all target analytes.

The potable water that was used for decontamination of drilling equipment was analyzed at the laboratory for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 prior to field activities. This source water sample was non-detect for all target analytes. The laboratory results for the source water sample are provided in appendix F and the data validation report is provided in appendix A.

Equipment blanks (EBs) and field blanks (FBs) were also collected for groundwater and soil samples for analysis of PFAS. All FBs were non-detect for target analytes. PFOS was above the detection limit in an EB associated with eight groundwater samples. Three detections of PFOS in associated field samples were less than five times the concentration detected in the blank, but greater than the LOQ, and were qualified "J+." These qualified results are considered usable as estimated values with a positive bias. Two detections of PFOS in associated field samples that were less than the limit of detection were qualified as "U." These results are usable as qualified and treated as non-detects. PFOS detections in associated samples that were greater than five times the concentration detected in the blank were not qualified.

4.6.4 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures helps ensure comparability.

Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

4.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows and reflects the exclusion of "R" flagged data:

- PFAS in groundwater by LC/MS/MS compliant with QSM 5.3 Table B-15 at 100%;
- PFAS in soil by LC/MS/MS compliant with QSM 5.3 Table B-15 at 100%
- pH in soil by USEPA SW-846 Method 9045D at 100%; and
- Total organic carbon (TOC) in soil by USEPA SW-846 Method 9060A at 100%.

4.6.6 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a detection limit study, and calibration standards at the LOQ. In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the UFP-QAPP Addendum (EA 2021b). The laboratory provided applicable calibration standards at the LOQ and reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the detection limit were reported and qualified "J" as estimated values by the laboratory.

4.6.7 Data Usability Summary

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI and to complete the comparison to risk-based screening levels.

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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, Duncan Armory AASF, New Castle, Delaware*, dated June 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, Duncan Readiness Center and Army Aviation Support Facility, New Castle, Delaware* dated May 2021 (EA 2021b);

- *Final Programmatic Accident Prevention Plan* dated November 2020 (EA 2020b); and

- *Final Site Safety and Health Plan, Duncan Readiness Center and Army Aviation Support Facility, Delaware,* dated February 2021 (EA 2021a).

The SI field activities started on 27 May 2021 with a site visit with USACE, DEARNG, DNREC, and EA to review sample locations and perform utility clearance activities. The SI drilling, sampling, surveying, and site restoration activities were conducted from 2 to 3 June 2021 and included hand auger coring and surface soil sample collection, DPT boring and soil sample collection, temporary monitoring well installation, and grab groundwater sample collection. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021b), except as noted in **Section 5.8**.

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

- Six surface soil samples from six locations (hand auger locations);
- 21 soil samples from seven locations (soil boring direct-push locations);
- Seven grab groundwater samples from seven temporary well locations; and
- One grab groundwater sample from one existing monitoring well location.

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**. 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 USACE TPP Process, Engineer Manual (EM) 200-1-2 (DA 2016a) 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 quantitative and qualitative 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 March 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, DEARNG, USACE, DNREC, 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 2021b). A future TPP meeting will provide an opportunity to discuss SI results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

EA contacted Miss Utility of Delmarva to notify them of intrusive work at the facility. Utility clearance was performed at each of the proposed boring locations on 27 May 2021 with input from the EA field team and DEARNG. General locating services were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by EA's drilling subcontractor, GSI Mid Atlantic, using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be PFAS-free prior to the start of field activities. A sample from a deionization water source at the EA Ecotoxicological Laboratory was collected on 31 March 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. A discussion of the results is presented in **Section 4.6.3**.

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA 2021b). A Geoprobe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top 5 ft of the boring in compliance with utility clearance procedures.

Three discrete soil samples were planned to be collected for PFAS analysis from each soil boring: one surface soil sample (collected from 0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was to be collected approximately 1 ft above the groundwater table and one was to be 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 20 to 40 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 25 to 45 ft bgs. Additionally, six surface soil locations (AOI01-HA-01 through AOI01-HA-06) were completed to 2 ft bgs using a hand auger. One surface soil sample was taken from each hand auger boring. The soil borings are shown on **Figure 5-1**, and boring and 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 2021b).

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 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, photoionization detector 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 high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard chain-of-custody procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), TOC (USEPA SW-846 Method 9060A) and pH (USEPA SW-846 Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2021b).

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

DPT borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA 2021b). After removal of the casings, boreholes were abandoned using soil cuttings and bentonite chips. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces so no additional restoration services were required.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Seven temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth at locations AOI01-01, AOI01-02, AOI01-03, AOI02-01, DAASF-01, DAASF-02, and DAASF-03, a temporary well was constructed of a 5-ft section of 3/4-inch 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**.

Seven temporary wells and one existing permanent well were sampled as part of the field efforts in accordance with existing plans. Groundwater samples were collected using an inertial pump 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. 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**) after each grab sample was collected in a separate container. Samples were packaged on ice and transported via FedEx under standard chain-of-custody 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 2021b).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Two FBs were collected in accordance with the UFP-QAPP Addendum (EA 2021b). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

5.4 EXISTING MONITORING WELL GROUNDWATER GRAB SAMPLING

An existing facility monitoring well, MW-15, was sampled as part of the field efforts in accordance with the UFP-QAPP Addendum (EA 2021b). MW-15 has a 2-inch diameter and is screened from 15-25 ft bgs. The groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. The samples were collected in a laboratory-supplied PFAS-free HDPE bottle and labeled using a PFAS-free marker. The monitoring well was 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 during sample collection. Samples were packaged on ice and transported via FedEx under standard chain-of-custody 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 2021b).

5.5 SYNOPTIC WATER LEVEL MEASUREMENTS

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

5.6 SURVEYING

The northern side of each new temporary well casing, and the existing well, were surveyed by a state licensed surveyor from Merestone Consultants, Inc. Surveying was accomplished using a real-time kinematic differential global positioning system. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 3 June 2021 and are provided in **Appendix B3**.

5.7 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 2021b).

Soil IDW (i.e., soil cuttings) was placed back into the boring and liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities was containerized in one 55-gallon drum which was labeled and secured within the cold storage building. The soil and liquid IDW was not sampled prior to its release or containment and assumes the PFAS characteristics of the associated soil or groundwater samples collected from those source locations. Containerized liquid IDW will be treated with granular activated carbon (GAC) and discharged to the ground as outlined in the Letter Work Plan for Investigation-Derived Material Disposal (EA 2021c).

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

5.8 LABORATORY ANALYTICAL METHODS

Samples were analyzed for a subset of 24 PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Env, LLC, a DoD ELAP-certified laboratory. The 24 PFAS compounds analyzed as part of the ARNG SI program include the following:

- 4:2 Fluorotelomer sulfonate (4:2 FTS)
- 6:2 Fluorotelomer sulfonate (6:2 FTS)
- 8:2 Fluorotelomer sulfonate (8:2 FTS)
- N-ethylperfluorooctane sulfonamidoacetic acid (NEtFOSAA)
- N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutane sulfonate (PFBS)
- Perfluorobutanoic acid (PFBA)

- Perfluorodecane sulfonate (PFDS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptane sulfonate (PFHpS)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexane sulfonate (PFHxS)
- Perfluorohexanoic acid (PFHxA)
- Perfluorononane sulfonate (PFNS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanesulfonamide (PFOSA)
- Perfluorooctane sulfonate (PFOS)
- Perfluorooctanoic acid (PFOA)
- Perfluoropentane sulfonate (PFPS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUnA).

Soil samples were also analyzed for TOC using USEPA Method 9060A, pH by USEPA SW-846 Method 9045D and grain size by ASTM D422.

5.9 DEVIATIONS FROM UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on field conditions. These deviations were discussed between EA, ARNG, USACE, and DNREC. Four deviations from the UFP-QAPP Addendum are noted below:

- Two temporary well boring locations, AOI01-01 and DAASF-03, were advanced to 45 ft bgs due to the encountered depth of groundwater. This deviation from the UFP-QAPP Addendum was discussed with and approved of by ARNG, USACE, and DNREC.

- Temporary wells were constructed of ¾-inch Schedule 40 PVC as opposed to the 1-inch Schedule 40 PVC that was proposed in the UFP-QAPP Addendum.

- Due to depth of some of the temporary wells (greater than predicted by available data), a peristaltic pump could not generate enough lift to bring groundwater to the surface; therefore, groundwater samples were collected using a stainless-steel check valve inertial pump. When using the inertial pump, a minimum of five well volumes of water was removed from each temporary well prior to recording water quality parameters and collecting the sample.

- Field duplicate samples were not collected and analyzed for total organic carbon or pH. Total organic carbon and pH are not undergoing formal data validation. These analyses are receiving data verification only.

Table 5-1.
Samples by Medium
Duncan RC and AASF, New Castle, Delaware
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA SW-846 Method 9060A)	pH (USEPA SW-846 Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-1-2	06/02/2021	1-2	X			
AOI01-01-SB-13.5-14	06/02/2021	13.5-14	X	X	X	
AOI01-01-SB-34.5-35.5	06/02/2021	34.5-35.5	X			
AOI01-02-SB-1-2	06/02/2021	1-2	X			
AOI01-02-SB-14-15	06/02/2021	14-15	X			
AOI01-02-SB-19-20	06/02/2021	19-20	X			
AOI01-03-SB-1-2	06/02/2021	1-2	X			
AOI01-03-SB-14-15	06/02/2021	14-15	X			
AOI01-03-SB-22-23	06/02/2021	22-23	X			
AOI02-01-SB-1-2	06/02/2021	1-2	X			
AOI02-01-SB-14-15	06/02/2021	14-15	X			
AOI02-01-SB-21-22	06/02/2021	21-22	X			
DAASF-01-SB-1-2	06/02/2021	1-2	X			
DAASF-01-SB-14-15	06/02/2021	14-15	X			
DAASF-01-SB-31-32	06/02/2021	31-32	X			
DAASF-02-SB-1-2	06/02/2021	1-2	X			
DAASF-02-SB-14-15	06/02/2021	14-15	X			
DAASF-SB-FD1	06/02/2021	14-15	X			Field Duplicate
DAASF-02-SB-34-35	06/02/2021	34-35	X			
DAASF-03-SB-1-2	06/03/2021	1-2	X			
DAASF-SB-FD2	06/03/2021	1-2	X			Field Duplicate
DAASF-03-SB-14-15	06/03/2021	14-15	X	X	X	
DAASF-03-SB-36-37	06/03/2021	36-37	X			
AOI01-HA-01-1	06/02/2021	1	X			
DAASF-HA-FD1	06/02/2021	1	X			Field Duplicate
AOI01-HA-02-1	06/02/2021	1	X			
AOI01-HA-03-1	06/02/2021	1	X			
AOI01-HA-04-1	06/02/2021	1	X			
AOI01-HA-05-1	06/02/2021	1	X			
AOI01-HA-06-1	06/02/2021	1	X			
Groundwater Samples						
AOI01-01-GW	06/03/2021		X			
AOI01-02-GW	06/03/2021		X			
AOI01-03-GW	06/03/2021		X			
AOI02-01-GW	06/03/2021		X			
DAASF-01-GW	06/03/2021		X			
DAASF-GW-FD	06/03/2021		X			Field Duplicate
DAASF-02-GW	06/03/2021		X			
DAASF-03-GW	06/03/2021		X			
MW15-GW	06/03/2021		X			

Table 5-1.
Samples by Medium
Duncan RC and AASF, New Castle, Delaware
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA SW-846 Method 9060A)	pH (USEPA SW-846 Method 9045D)	Comments
Blank Samples						
DAASF-FB01	06/02/2021	-	X			Field Blank
DAASF-FB02	06/03/2021	-	X			Field Blank
DAASF-EB01	06/02/2021	-	X			Equipment Blank
DAASF-GW-EB1	06/03/2021	-	X			Equipment Blank
DAASF-SB-EB03	06/03/2021	-	X			Equipment Blank

Table 5-2.
Soil Boring Depths and Temporary Well Screen Intervals
Duncan RC and AASF, New Castle, Delaware
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
AOI 1	AOI01-01	45.0	40.0-45.0
	AOI01-02	25.0	20.0-25.0
	AOI01-03	29.0	24.0-29.0
	AOI01-HA-01	2.0	-
	AOI01-HA-02	2.0	-
	AOI01-HA-03	2.0	-
	AOI01-HA-04	2.0	-
	AOI01-HA-05	2.0	-
	AOI01-HA-06	2.0	-
AOI 2	AOI02-01	29.0	24.0-29.0
Duncan RC and AASF Boundary	DAASF-01	37.5	32.5-37.5
	DAASF-02	40.0	35.0-40.0
	DAASF-03	45.0	40.0-45.0

Table 5-3.
Groundwater Elevation
Duncan RC and AASF, New Castle, Delaware
Site Inspection Report

Monitoring Well Identification	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
AOI01-01	70.56	39.4	31.16
AOI01-02	51.42	20.8	30.62
AOI01-03	53.64	23.9	29.74
AOI02-01	50.08	22.16	27.92
DAASF-01	63.41	32.52	30.89
DAASF-02	68.54	35.65	32.89
DAASF-03	64.91	35.62	29.29
MW-15	37.88	12.0	25.88

Note:
btoc = Below top of casing.

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Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

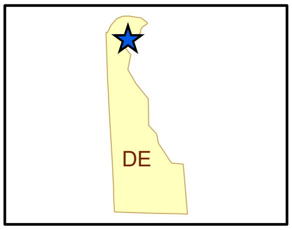
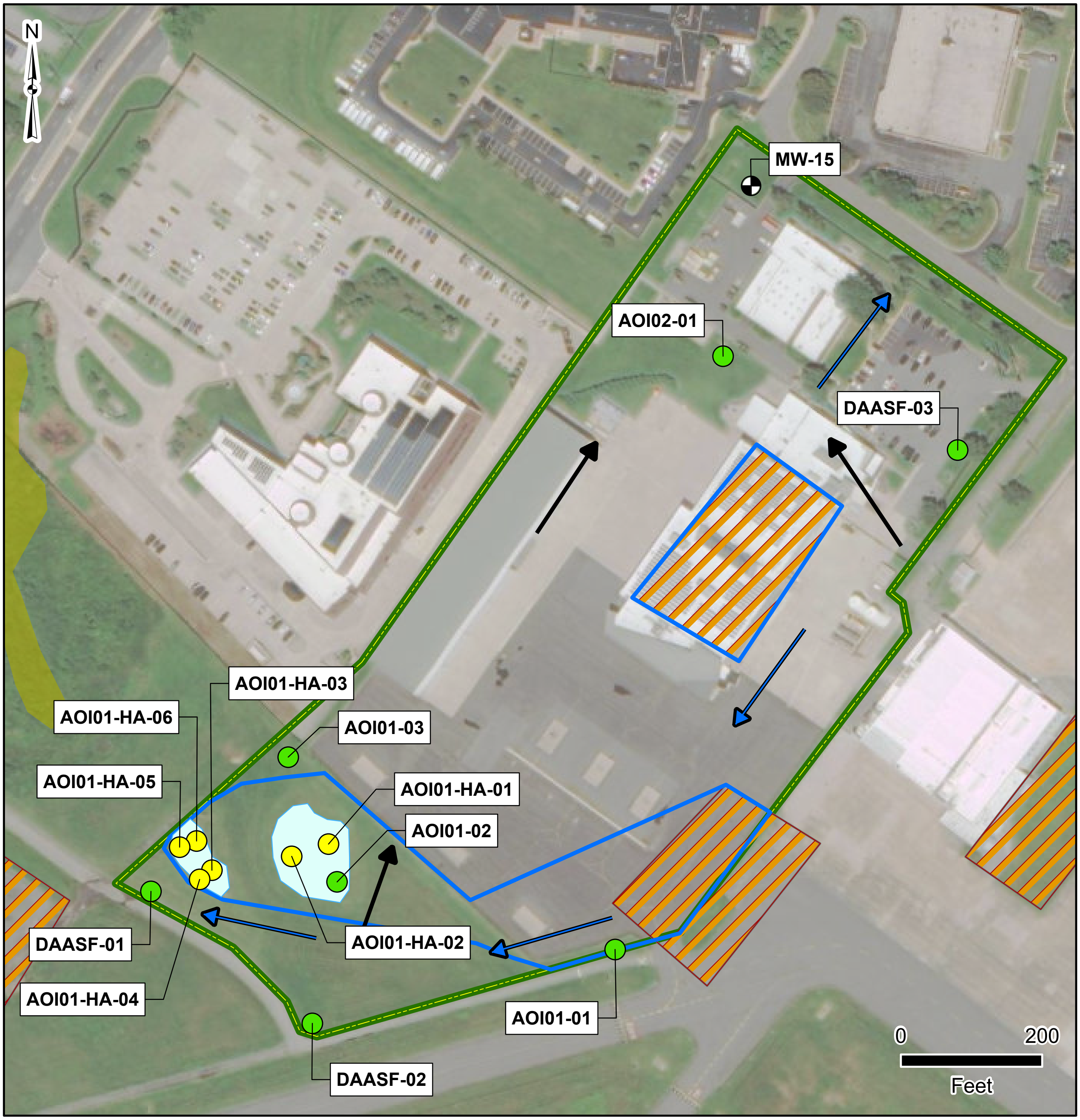


Figure 5-1
Site Inspection Sample Locations



Facility Data

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

Sample Locations

- ● DPT Boring/Temporary Well Location
- Existing Facility Well Location
- ● Hand Auger Soil Location

Hydrology/Hydrogeology

- → Surface Water Flow Direction
- → Groundwater Flow Direction
- Retention Pond
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2021
Prepared By:.............................EA
Prepared For:....................USACE
Projection:.......WGS 84 UTM 18N

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6. SITE INSPECTION RESULTS

This section presents the analytical results of the SI for each AOI. The analytical results are reported and evaluated in the subsequent sections. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** and **Section 6.4**. **Table 6-2** through **Table 6-4** present PFAS results for samples with detections in soil and groundwater; only constituents detected in one or more samples are included. 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 15 September 2021 (Deputy Assistant Secretary of Defense 2021). 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, and the exceedances be attributed to ARNG, the site will proceed to the next phase under CERCLA, which is an RI. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table 6-1**.

All other PFAS results presented in this report are considered informational in nature and serve as an indication as to whether soil, groundwater, sediment, and surface water contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	Residential (Soil) (µg/kg)[1]	Industrial / Commercial Composite Worker (Soil) (µg/kg)[1]	Tap Water (Groundwater) (ng/L)[1]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	1,900	25,000	600

Notes:
1. Deputy Assistant Secretary of Defense. 2021. Risk-Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using USEPA’s Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. 15 September 2021.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. 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 (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC 2018).

6.3 AOI 1 – HELICOPTER CRASH SITE

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes the Helicopter Crash Site. The detected compounds are summarized in **Table 6-2** through **Table 6-4**. **Figures 6-1** through **Figure 6-4** present detections for PFOS, PFBS and PFOA in soil and groundwater.

6.3.1 Soil Analytical Results

PFOA, PFOS, and PFBS concentrations in soil, when detected, did not exceed the soil SLs at AOI 1. **Tables 6-2** and **Table 6-3** summarize the detected compounds in soil. **Figure 6-1** and **Figure 6-2** present the ranges of detections for PFOS, PFBS and PFOA in soil.

Soil was sampled in nine boring locations associated with one potential release area at AOI 1. Soil was sampled from three intervals at locations AOI01-01, AOI01-02, and AOI01-03, and one surface interval at locations AOI01-HA-01 through AOI01-HA-06.

PFOS was detected in the surface interval (1–2 ft bgs) of all boring locations, at concentrations ranging from 0.32 J microgram per kilogram (µg/kg) (AOI01-HA-04) to 6.9 µg/kg (AOI01-HA-03), below the SL of 130 µg/kg. PFOA was detected in all surface interval soil samples, except for boring locations AOI01-HA-04 and AOI-01-HA-05. PFOA concentrations ranged from 0.30 J µg/kg (AOI01-HA-01) to 1.3 µg/kg (AOI01-01), well below the SL of 130 µg/kg. PFBS was not detected in any surface interval samples.

PFOS was detected in one subsurface soil interval (13.4–14.0 ft bgs) at location AOI01-01, at a concentration of 0.67 µg/kg, below the SL of 1,600 µg/kg. PFOA was detected in the subsurface soil samples taken from both intervals (14–15 ft bgs and 22–23 ft bgs) at location AOI01-03, at concentrations of 0.22 J µg/kg and 0.27 J µg/kg, respectively. PFOA detections are below the SL of 1,600 µg/kg. PFBS was not detected in any subsurface interval samples.

6.3.2 Groundwater Analytical Results

Groundwater samples were collected from three temporary wells associated with one potential release area at AOI 1. PFOS and PFOA were detected in groundwater at concentrations exceeding the SL of 40 ng/L. Location AOI01-01, immediately west of the crash site, had a PFOA concentration of 120 ng/L. PFOS and PFBS were also detected in groundwater at this location; however, the detections did not exceed their associated SLs. Location AOI01-02, located west of the crash site within a man-made stormwater detention pond, had a PFOS detection of 150 ng/L. PFOA and PFBS were also detected in groundwater at this location; however, the detections did not exceed their associated SLs. Location AOI01-03, located north of the detention pond and location AOI01-02, had a PFOS detection of 75 ng/L. PFOA and PFBS were also detected in groundwater at these locations; however, the detections did not exceed their respective SLs. PFBS detections in groundwater at the three locations ranged from 2.1 ng/L to 8.6 ng/L, well below the SL of 600 ng/L. PFOS detections in groundwater at the three locations ranged from 32 ng/L (AOI01-01) to 150 ng/L and PFOA detections ranged from 23 ng/L (AOI01-02) to 120 ng/L.

The detected compounds from groundwater are summarized in **Table 6-4**. **Figure 6-3** presents the ranges of detections for PFOS and PFOA.

6.3.3 Conclusions

Based on the results of the SI, PFBS was not detected in soil at AOI 1, and PFOS and PFOA were detected several orders of magnitude lower than the soil SLs. PFBS was detected in groundwater at concentrations below the SL at all locations. PFOS or PFOA were detected in groundwater at concentrations exceeding the individual SLs of 40 ng/L in all three temporary well locations associated with AOI 1. Based on the exceedances of the SL for PFOS and PFOA in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2 – HANGAR

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2, which includes the facility hangar. The detected compounds are summarized in **Table 6-2** through **Table 6-4**. **Figures 6-1** through **Figure 6-4** present detections for PFOS, PFBS, and PFOA in soil and groundwater.

6.4.1 Soil Analytical Results

PFOA, PFOS, and PFBS concentrations in soil, when detected, did not exceed the soil SLs at AOI 2. **Tables 6-2** and **Table 6-3** summarize the detected compounds in soil. **Figure 6-1** and **Figure 6-2** present the ranges of detections for PFOS and PFOA in soil.

Soil was sampled from three intervals in one boring location (AOI02-01) associated with one potential release area at AOI 2.

PFOS and PFOA were detected in the surface interval (1−2 ft bgs) with concentrations of 0.31 J µg/kg and 0.64 µg/kg, respectively, below the SL of 130 µg/kg. There were no detections of PFOS or PFOA in the subsurface soil sample intervals at this location. PFBS was not detected in any surface or subsurface interval samples.

6.4.2 Groundwater Analytical Results

Groundwater samples were collected from one temporary well associated with one potential release area at AOI 2, located north and hydraulically downgradient of the facility hangar as well as the 1970s Helicopter crash site. PFOA was detected in groundwater at a concentration of

230 ng/L, exceeding the SL of 40 ng/L. PFOS and PFBS were also detected at this location; however, the detections did not exceed their associated SLs (5.7 J+ ng/L and 3.5 ng/L, respectively).

The detected compounds from groundwater are summarized in **Table 6-4**. **Figure 6-3** presents the ranges of detections for PFOS and PFOA.

6.4.3 Conclusions

Based on the results of the SI, PFBS was not detected in soil at AOI 2, and PFOS and PFOA were detected several orders of magnitude lower than the soil SLs. PFBS and PFOS were detected in groundwater at concentrations below the SL. PFOA was detected in groundwater at a concentration exceeding the individual SL of 40 ng/L. Based on the exceedance of the SL for PFOA in groundwater, further evaluation at AOI 2 is warranted.

6.5 BOUNDARY SAMPLE LOCATIONS

This section presents the analytical results for soil and groundwater in comparison to SLs at the facility boundary. The detected compounds are summarized in **Table 6-2** through **Table 6-4**. **Figure 6-1** through **Figure 6-4** present the ranges of detections for PFOS and PFOA.

6.5.1 Soil Analytical Results

PFOA, PFOS, and PFBS concentrations in soil, when detected, did not exceed the soil SLs at the facility boundary. **Tables 6-2** and **Table 6-3** summarize the detected compounds in soil. **Figure 6-1** and **Figure 6-2** present the ranges of detections for PFOS and PFOA in soil.

Soil was sampled from three intervals in three boring locations along the facility boundary: one sample location at the southwestern corner of the facility (DAASF-01), adjacent to the DANG Fire Training area, and two locations along the eastern facility boundary (DAASF-02 and DAASF-03).

PFOS was detected in the surface interval (1–2 ft bgs) at these locations with concentrations ranging from 0.24 J µg/kg to 1.6 µg/kg, below the SL of 130 µg/kg. PFOA was detected within the surface interval at these locations with concentrations ranging from 0.52 J µg/kg to 1.2 µg/kg. PFOA was detected in the 14–15 ft bgs soil interval at locations DAASF-01 (0.77 µg/kg) and DAASF-03 (0.24 J µg/kg), below the SL of 130 µg/kg. PFBS was not detected in any surface or subsurface interval samples.

6.5.2 Groundwater Analytical Results

Groundwater samples were collected from three temporary well locations along the facility boundary (DAASF-01, DAASF-02, and DAASF-03) and one facility monitoring well (MW-15), located in the northernmost, downgradient corner of the facility. While PFOA and PFBS were detected in groundwater at location DAASF-01, there were no exceedances of the associated SLs. Additionally, PFOS was non-detect in groundwater at this location. PFOA was detected at levels which exceed the 40 ng/L SL in groundwater at locations DAASF-02 and DAASF-03, with concentrations of 150 ng/L and 280 ng/L, respectively. PFOA was detected in groundwater at location MW-15 with a concentration of 100 ng/L, exceeding the SL. PFBS and PFOS were detected in groundwater at all three locations, below their respective SLs.

The detected compounds from groundwater are summarized in **Table 6-4**. **Figure 6-3** present the ranges of detections for PFOS and PFOA.

6.5.3 Conclusions

Based on the results of the SI, PFBS was not detected in soil at the boundary, and PFOS and PFOA were detected several orders of magnitude lower than the soil SLs. PFBS was detected in groundwater at concentrations below the SL at all locations. PFOS was detected in groundwater at concentrations below the SL at all locations, except at location DAASF-01. DAASF-01 had no detection of PFOS. PFOA was detected in groundwater at concentrations exceeding the individual SLs of 40 ng/L in temporary well locations DAASF-02 and DAASF-03, as well as the facility monitoring well location (MW-15). Based on the exceedance of the SL for PFOA in groundwater, further evaluation is warranted.

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Table 6-2 PFAS Detections in Surface Soil,
Site Inspection Report, Duncan RC and AASF

	Area of Interest	AOI01															
	Location ID	AOI01-01				AOI01-02				AOI01-03				AOI01-HA-01			
	Sample Name	AOI01-01-SB-1-2				AOI01-02-SB-1-2				AOI01-03-SB-1-2				AOI01-HA-01-1			
	Parent Sample ID																
	Depth	1 - 2 ft				1 - 2 ft				1 - 2 ft				1 ft			
	Sample Date	6/2/2021				6/2/2021				6/2/2021				6/2/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (EPA 537) (ng/g)																	
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.2	U	<	1.6	2.0	U	<	1.8	2.3	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.2	U	<	1.6	2.0	U	<	1.8	2.3	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.7	3.2	U	<	1.7	3.2	U	<	1.6	3.1	U	<	1.8	3.4	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.42	2.1	U	<	0.43	2.2	U	<	0.41	2.0	U	<	0.45	2.3	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.42	2.1	U	<	0.43	2.2	U	<	0.41	2.0	U	<	0.45	2.3	U
Perfluorobutanesulfonic acid (PFBS)	1,900 [2]	<	1.7	2.1	U	<	1.7	2.2	U	<	1.6	2.0	U	<	1.8	2.3	U
Perfluorobutanoic acid (PFBA)	-	0.94	1.7	2.1	J	<	1.7	2.2	U	<	1.6	2.0	U	<	1.8	2.3	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluorodecanoic acid (PFDA)	-	0.94	0.42	0.63		<	0.43	0.65	U	<	0.41	0.61	U	0.26	0.45	0.68	J
Perfluorododecanoic acid (PFDoA)	-	0.30	0.42	0.63	J	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluoroheptanoic acid (PFHpA)	-	0.60	0.42	0.63	J	<	0.43	0.65	U	0.27	0.41	0.61	J	<	0.45	0.68	U
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluorohexanoic acid (PFHxA)	-	0.60	0.42	0.63	J	<	0.43	0.65	U	0.22	0.41	0.61	J	0.23	0.45	0.68	J
Perfluorononanesulfonic acid (PFNS)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluorononanoic acid (PFNA)	-	1.5	0.42	0.63		0.31	0.43	0.65	J	0.37	0.41	0.61	J	0.32	0.45	0.68	J
Perfluorooctanesulfonamide (PFOSA)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluorooctanesulfonic acid (PFOS)	130 [3]	4.8	0.42	0.63		1.7	0.43	0.65		0.48	0.41	0.61	J	1.7	0.45	0.68	
Perfluorooctanoic acid (PFOA)	130 [3]	1.3	0.42	0.63		0.35	0.43	0.65	J	0.77	0.41	0.61		0.38	0.45	0.68	J
Perfluoropentanesulfonic acid (PFPS)	-	<	0.42	3.2	U	<	0.43	3.2	U	<	0.41	3.1	U	<	0.45	3.4	U
Perfluoropentanoic acid (PFPA)	-	0.94	0.42	0.63		<	0.43	0.65	U	0.28	0.41	0.61	J	<	0.45	0.68	U
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluorotridecanoic acid (PFTriDA)	-	<	0.42	0.63	U	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U
Perfluoroundecanoic acid (PFUnA)	-	0.46	0.42	0.63	J	<	0.43	0.65	U	<	0.41	0.61	U	<	0.45	0.68	U

	Area of Interest	AOI01															
	Location ID	AOI01-HA-01				AOI01-HA-02				AOI01-HA-03				AOI01-HA-04			
	Sample Name	DAASF-HA-FD1				AOI01-HA-02-1				AOI01-HA-03-1				AOI01-HA-04-1			
	Parent Sample ID	AOI01-HA-01-1-06022021															
	Depth	1 ft				1 ft				1 ft				1 ft			
	Sample Date	6/2/2021				6/2/2021				6/2/2021				6/2/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (EPA 537) (ng/g)																	
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.9	2.3	UJ	<	1.8	2.3	U	<	2.2	2.8	U	<	1.7	2.1	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.9	2.3	UJ	<	1.8	2.3	U	<	2.2	2.8	U	<	1.7	2.1	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.9	3.5	U	<	1.8	3.4	U	<	2.2	4.2	U	<	1.7	3.2	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.47	2.3	X	<	0.46	2.3	U	<	0.56	2.8	U	<	0.43	2.1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.47	2.3	X	<	0.46	2.3	U	<	0.56	2.8	U	<	0.43	2.1	U
Perfluorobutanesulfonic acid (PFBS)	1,900 [2]	<	1.9	2.3	U	<	1.8	2.3	U	<	2.2	2.8	U	<	1.7	2.1	U
Perfluorobutanoic acid (PFBA)	-	<	1.9	2.3	U	<	1.8	2.3	U	<	2.2	2.8	U	<	1.7	2.1	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.47	0.70	U	<	0.46	0.69	U	<	0.56	0.84	U	<	0.43	0.64	U
Perfluorodecanoic acid (PFDA)	-	0.25	0.47	0.70	J	0.33	0.46	0.69	J	2.0	0.56	0.84		0.24	0.43	0.64	J
Perfluorododecanoic acid (PFDoA)	-	<	0.47	0.70	U	0.30	0.46	0.69	J	2.2	0.56	0.84		1.6	0.43	0.64	
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.47	0.70	U	<	0.46	0.69	U	<	0.56	0.84	U	<	0.43	0.64	U
Perfluoroheptanoic acid (PFHpA)	-	<	0.47	0.70	U	0.23	0.46	0.69	J	0.37	0.56	0.84	J	<	0.43	0.64	U
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.47	0.70	U	<	0.46	0.69	U	1.1	0.56	0.84		<	0.43	0.64	U
Perfluorohexanoic acid (PFHxA)	-	<	0.47	0.70	U	<	0.46	0.69	U	0.40	0.56	0.84	J	<	0.43	0.64	U
Perfluorononanesulfonic acid (PFNS)	-	<	0.47	0.70	U	<	0.46	0.69	U	<	0.56	0.84	U	<	0.43	0.64	U
Perfluorononanoic acid (PFNA)	-	0.27	0.47	0.70	J	0.43	0.46	0.69	J	0.65	0.56	0.84	J	<	0.43	0.64	U
Perfluorooctanesulfonamide (PFOSA)	-	<	0.47	0.70	U	<	0.46	0.69	U	<	0.56	0.84	U	<	0.43	0.64	U
Perfluorooctanesulfonic acid (PFOS)	130 [3]	1.3	0.47	0.70		2.5	0.46	0.69		6.9	0.56	0.84		0.32	0.43	0.64	J
Perfluorooctanoic acid (PFOA)	130 [3]	0.30	0.47	0.70	J	0.32	0.46	0.69	J	0.74	0.56	0.84	J	<	0.43	0.64	U
Perfluoropentanesulfonic acid (PFPS)	-	<	0.47	3.5	U	<	0.46	3.4	U	<	0.56	4.2	U	<	0.43	3.2	U
Perfluoropentanoic acid (PFPA)	-	0.25	0.47	0.70	J+	<	0.46	0.69	U	0.75	0.56	0.84	J	<	0.43	0.64	U
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.47	0.70	U	<	0.46	0.69	U	0.84	0.56	0.84		1.1	0.43	0.64	
Perfluorotridecanoic acid (PFTriDA)	-	0.24	0.47	0.70	J	<	0.46	0.69	U	1.4	0.56	0.84		1.7	0.43	0.64	
Perfluoroundecanoic acid (PFUnA)	-	0.26	0.47	0.70	J	0.25	0.46	0.69	J	4.0	0.56	0.84		1.0	0.43	0.64	

	Area of Interest	AOI01								AOI02				DAASF			
	Location ID	AOI01-HA-05				AOI01-HA-06				AOI02-01				DAASF-01			
	Sample Name	AOI01-HA-05-1				AOI01-HA-06-1				AOI02-01-SB-1-2				DAASF-01-SB-1-2			
	Parent Sample ID																
	Depth	1 ft				1 ft				1 - 2 ft				1 - 2 ft			
	Sample Date	6/2/2021				6/2/2021				6/2/2021				6/2/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (EPA 537) (ng/g)																	
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.8	2.2	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.7	2.1	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.8	2.2	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.7	2.1	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.8	3.3	U	<	1.8	3.4	U	<	1.7	3.2	U	<	1.7	3.2	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.44	2.2	U	<	0.46	2.3	U	<	0.43	2.1	U	<	0.43	2.1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.44	2.2	U	<	0.46	2.3	U	<	0.43	2.1	U	<	0.43	2.1	U
Perfluorobutanesulfonic acid (PFBS)	1,900 [2]	<	1.8	2.2	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.7	2.1	U
Perfluorobutanoic acid (PFBA)	-	<	1.8	2.2	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.7	2.1	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	<	0.43	0.64	U
Perfluorodecanoic acid (PFDA)	-	0.76	0.44	0.66		0.67	0.46	0.68	J	<	0.43	0.64	U	<	0.43	0.64	U
Perfluorododecanoic acid (PFDoA)	-	1.1	0.44	0.66		1.3	0.46	0.68		<	0.43	0.64	U	<	0.43	0.64	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	<	0.43	0.64	U
Perfluoroheptanoic acid (PFHpA)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	0.42	0.43	0.64	J
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.44	0.66	U	0.51	0.46	0.68	J	<	0.43	0.64	U	1.7	0.43	0.64	
Perfluorohexanoic acid (PFHxA)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	0.50	0.43	0.64	J
Perfluorononanesulfonic acid (PFNS)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	<	0.43	0.64	U
Perfluorononanoic acid (PFNA)	-	<	0.44	0.66	U	0.26	0.46	0.68	J	<	0.43	0.64	U	0.25	0.43	0.64	J
Perfluorooctanesulfonamide (PFOSA)	-	<	0.44	0.66	U	<	0.46	0.68	U	<	0.43	0.64	U	<	0.43	0.64	U
Perfluorooctanesulfonic acid (PFOS)	130 [3]	0.56	0.44	0.66	J	2.5	0.46	0.68		0.31	0.43	0.64	J	0.84	0.43	0.64	
Perfluorooctanoic acid (PFOA)	130 [3]	<	0.44	0.66	U	0.32	0.46	0.68	J	0.64	0.43	0.64		1.0	0.43	0.64	
Perfluoropentanesulfonic acid (PFPS)	-	<	0.44	3.3	U	<	0.46	3.4	U	<	0.43	3.2	U	<	0.43	3.2	U
Perfluoropentanoic acid (PFPA)	-	<	0.44	0.66	U	0.29	0.46	0.68	J	0.30	0.43	0.64	J	0.37	0.43	0.64	J
Perfluorotetradecanoic acid (PFTeDA)	-	0.81	0.44	0.66		0.60	0.46	0.68	J	<	0.43	0.64	U	<	0.43	0.64	U
Perfluorotridecanoic acid (PFTriDA)	-	1.0	0.44	0.66		0.86	0.46	0.68		<	0.43	0.64	U	<	0.43	0.64	U
Perfluoroundecanoic acid (PFUnA)	-	1.4	0.44	0.66		1.6	0.46	0.68		<	0.43	0.64	U	0.34	0.43	0.64	J

	Area of Interest	DAASF											
	Location ID	DAASF-02				DAASF-03				DAASF-03			
	Sample Name	DAASF-02-SB-1-2				DAASF-03-SB-1-2				DAASF-SB-FD2			
	Parent Sample ID									DAASF-03-SB-1-2-06032021			
	Depth	1 - 2 ft				1 - 2 ft				1 - 2 ft			
	Sample Date	6/2/2021				6/3/2021				6/3/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (EPA 537) (ng/g)													
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.1	UJ	<	1.7	2.1	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.1	U	<	1.7	2.1	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.7	3.2	U	<	1.7	3.2	U	<	1.7	3.2	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.43	2.1	U	<	0.42	2.1	X	<	0.43	2.1	X
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.43	2.1	U	<	0.42	2.1	X	<	0.43	2.1	X
Perfluorobutanesulfonic acid (PFBS)	1,900 [2]	<	1.7	2.1	U	<	1.7	2.1	U	<	1.7	2.1	U
Perfluorobutanoic acid (PFBA)	-	<	1.7	2.1	U	<	1.7	2.1	U	<	1.7	2.1	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorodecanoic acid (PFDA)	-	0.42	0.43	0.64	J	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorododecanoic acid (PFDoA)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluoroheptanoic acid (PFHpA)	-	0.25	0.43	0.64	J	0.45	0.42	0.64	J	0.39	0.43	0.64	J
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorohexanoic acid (PFHxA)	-	0.26	0.43	0.64	J	0.37	0.42	0.64	J	0.38	0.43	0.64	J
Perfluorononanesulfonic acid (PFNS)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorononanoic acid (PFNA)	-	0.53	0.43	0.64	J	0.35	0.42	0.64	J	0.52	0.43	0.64	J
Perfluorooctanesulfonamide (PFOSA)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorooctanesulfonic acid (PFOS)	130 [3]	1.6	0.43	0.64		<	0.42	0.64	U	0.24	0.43	0.64	J
Perfluorooctanoic acid (PFOA)	130 [3]	0.52	0.43	0.64	J	1.2	0.42	0.64		0.99	0.43	0.64	
Perfluoropentanesulfonic acid (PFPS)	-	<	0.43	3.2	U	<	0.42	3.2	U	<	0.43	3.2	U
Perfluoropentanoic acid (PFPA)	-	0.40	0.43	0.64	J	0.61	0.42	0.64	J	0.64	0.43	0.64	
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluorotridecanoic acid (PFTriDA)	-	<	0.43	0.64	U	<	0.42	0.64	U	<	0.43	0.64	U
Perfluoroundecanoic acid (PFUnA)	-	0.28	0.43	0.64	J	<	0.42	0.64	U	<	0.43	0.64	U

Notes

J = Estimated concentration

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

X = Not validated

ng/g = Nanogram per gram

(1) The SL for soil is based on incidental ingestion of soil residential 0-2 ft.

(2) USEPA. 2021. Regional Screening Levels for Chemical Contaminants at Superfund Sites. On-Line Calculator. USEPA Office of Superfund. Https://www.epa.gov/risk/regional-screening-levels-rsls. Accessed 9 April.

(3) Deputy Assistant Secretary of Defense. 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in soil using USEPA's RSL Calculator with HQ=0.1 (Deputy Assistant Secretary of Defense 2019).

Values exceeding the Screening Level are shaded gray

AOI = Area of Interest

ft = Feet

LOD = Limit of Detection

LOQ = Limit of Quantitation

Qual = Qualifier

< = analyte not detected above the LOD

Table 6-3 - PFAS Detections in Subsurface Soil,
Site Inspection Report, Duncan RC and AASF

Area of Interest																					
Location ID		AOI01-01				AOI01-01				AOI01-02				AOI01-02				AOI01-03			
Sample Name		AOI01-01-SB-13.5-14				AOI01-01-SB-34.5-35.5				AOI01-02-SB-14-15				AOI01-02-SB-19-20				AOI01-03-SB-14-15			
Parent Sample ID																					
Depth		13.5 - 14 ft				34.5 - 35.5 ft				14 - 15 ft				19 - 20 ft				14 - 15 ft			
Sample Date		6/2/2021				6/2/2021				6/2/2021				6/2/2021				6/2/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
PFAS (ng/g)																					
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.7	3.2	U	<	1.8	3.4	U	<	1.7	3.1	U	<	1.8	3.4	U	<	1.7	3.2	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.43	2.1	U	<	0.45	2.3	U	<	0.41	2.1	U	<	0.46	2.3	U	<	0.42	2.1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.43	2.1	U	<	0.45	2.3	U	<	0.41	2.1	U	<	0.46	2.3	U	<	0.42	2.1	U
Perfluorobutanesulfonic acid (PFBS)	25,000 [2]	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U
Perfluorobutanoic acid (PFBA)	-	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U	<	1.8	2.3	U	<	1.7	2.1	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorodecanoic acid (PFDA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorododecanoic acid (PFDoA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluoroheptanoic acid (PFHpA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorohexanoic acid (PFHxA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorononanesulfonic acid (PFNS)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorononanoic acid (PFNA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorooctanesulfonamide (PFOSA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorooctanesulfonic acid (PFOS)	1,600 [3]	0.67	0.43	0.64		<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorooctanoic acid (PFOA)	1,600 [3]	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	0.22	0.42	0.63	J
Perfluoropentanesulfonic acid (PFPS)	-	<	0.43	3.2	U	<	0.45	3.4	U	<	0.41	3.1	U	<	0.46	3.4	U	<	0.42	3.2	U
Perfluoropentanoic acid (PFPA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluorotridecanoic acid (PFTriDA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U
Perfluoroundecanoic acid (PFUnA)	-	<	0.43	0.64	U	<	0.45	0.68	U	<	0.41	0.62	U	<	0.46	0.69	U	<	0.42	0.63	U

Area of Interest																					
Location ID		AOI01-03				AOI02-01				AOI02-01				DAASF-01				DAASF-01			
Sample Name		AOI01-03-SB-22-23				AOI02-01-SB-14-15				AOI02-01-SB-21-22				DAASF-01-SB-14-15				DAASF-01-SB-31-32			
Parent Sample ID																					
Depth		22 - 23 ft				14 - 15 ft				21 - 22 ft				14 - 15 ft				31 - 32 ft			
Sample Date		6/2/2021				6/2/2021				6/2/2021				6/2/2021				6/2/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
PFAS (ng/g)																					
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.7	2.1	U	<	1.9	2.3	U	<	1.8	2.2	U	<	1.7	2.1	U	<	1.9	2.3	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.7	2.1	U	<	1.9	2.3	U	<	1.8	2.2	U	<	1.7	2.1	U	<	1.9	2.3	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.7	3.2	U	<	1.9	3.5	U	<	1.8	3.4	U	<	1.7	3.1	U	<	1.9	3.5	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.42	2.1	U	<	0.47	2.3	U	<	0.45	2.2	U	<	0.42	2.1	U	<	0.46	2.3	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.42	2.1	U	<	0.47	2.3	U	<	0.45	2.2	U	<	0.42	2.1	U	<	0.46	2.3	U
Perfluorobutanesulfonic acid (PFBS)	25,000 [2]	<	1.7	2.1	U	<	1.9	2.3	U	<	1.8	2.2	U	<	1.7	2.1	U	<	1.9	2.3	U
Perfluorobutanoic acid (PFBA)	-	<	1.7	2.1	U	<	1.9	2.3	U	<	1.8	2.2	U	<	1.7	2.1	U	<	1.9	2.3	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorodecanoic acid (PFDA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorododecanoic acid (PFDoA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluoroheptanoic acid (PFHpA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	0.21	0.42	0.63	J	<	0.46	0.70	U
Perfluorohexanoic acid (PFHxA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorononanesulfonic acid (PFNS)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorononanoic acid (PFNA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorooctanesulfonamide (PFOSA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorooctanesulfonic acid (PFOS)	1,600 [3]	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorooctanoic acid (PFOA)	1,600 [3]	0.27	0.42	0.64	J	<	0.47	0.70	U	<	0.45	0.67	U	0.77	0.42	0.63		<	0.46	0.70	U
Perfluoropentanesulfonic acid (PFPS)	-	<	0.42	3.2	U	<	0.47	3.5	U	<	0.45	3.4	U	<	0.42	3.1	U	<	0.46	3.5	U
Perfluoropentanoic acid (PFPA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluorotridecanoic acid (PFTriDA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U
Perfluoroundecanoic acid (PFUnA)	-	<	0.42	0.64	U	<	0.47	0.70	U	<	0.45	0.67	U	<	0.42	0.63	U	<	0.46	0.70	U

Area of Interest																					
Location ID		DAASF-02				DAASF-02				DAASF-02				DAASF-03				DAASF-03			
Sample Name		DAASF-02-SB-14-15				DAASF-02-SB-34-35				DAASF-SB-FD1				DAASF-03-SB-14-15				DAASF-03-SB-36-37			
Parent Sample ID										DAASF-02-SB-14-15-06022021											
Depth		14 - 15 ft				34 - 35 ft				14 - 15 ft				14 - 15 ft				36 - 37 ft			
Sample Date		6/2/2021				6/2/2021				6/2/2021				6/3/2021				6/3/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
PFAS (ng/g)																					
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.1	U	<	1.8	2.2	U	<	1.8	2.2	U	<	1.7	2.1	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	1.7	2.1	U	<	1.7	2.1	U	<	1.8	2.2	U	2.5	1.8	2.2		<	1.7	2.1	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	1.7	3.2	U	<	1.7	3.1	U	<	1.8	3.3	U	<	1.8	3.3	U	<	1.7	3.1	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	0.42	2.1	U	<	0.42	2.1	U	<	0.44	2.2	UJ	<	0.45	2.2	U	<	0.42	2.1	UJ
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	0.42	2.1	U	<	0.42	2.1	U	<	0.44	2.2	UJ	<	0.45	2.2	UJ	<	0.42	2.1	UJ
Perfluorobutanesulfonic acid (PFBS)	25,000 [2]	<	1.7	2.1	U	<	1.7	2.1	U	<	1.8	2.2	U	<	1.8	2.2	U	<	1.7	2.1	U
Perfluorobutanoic acid (PFBA)	-	<	1.7	2.1	U	<	1.7	2.1	U	<	1.8	2.2	U	<	1.8	2.2	U	<	1.7	2.1	U
Perfluorodecanesulfonic acid (PFDS)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorodecanoic acid (PFDA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorododecanoic acid (PFDoA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluoroheptanesulfonic acid (PFHpS)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluoroheptanoic acid (PFHpA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorohexanesulfonic acid (PFHxS)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorohexanoic acid (PFHxA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	0.28	0.45	0.67	J	<	0.42	0.63	U
Perfluorononanesulfonic acid (PFNS)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorononanoic acid (PFNA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorooctanesulfonamide (PFOSA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorooctanesulfonic acid (PFOS)	1,600 [3]	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorooctanoic acid (PFOA)	1,600 [3]	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	0.24	0.45	0.67	J	<	0.42	0.63	U
Perfluoropentanesulfonic acid (PFPS)	-	<	0.42	3.2	U	<	0.42	3.1	U	<	0.44	3.3	U	<	0.45	3.3	U	<	0.42	3.1	U
Perfluoropentanoic acid (PFPA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	0.43	0.45	0.67	J	<	0.42	0.63	U
Perfluorotetradecanoic acid (PFTeDA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluorotridecanoic acid (PFTriDA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U
Perfluoroundecanoic acid (PFUnA)	-	<	0.42	0.63	U	<	0.42	0.63	U	<	0.44	0.66	U	<	0.45	0.67	U	<	0.42	0.63	U

Perfluoroundecanoic acid (PFUnA)

Notes

J = Estimated concentration

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

ng/g = Nanogram per gram

(1) The SL for soil is based on incidental ingestion of soil industrial/commercial worker >2 ft.

(2) USEPA. 2021. Regional Screening Levels for Chemical Contaminants at Superfund Sites. On-Line Calculator. USEPA Office of Superfund. Https://www.epa.gov/risk/regional-screening-levels-rsls. Accessed 9 April.

(3) Deputy Assistant Secretary of Defense. 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in soil using USEPA's RSL Calculator with HQ=0.1 (Deputy Assistant Secretary of Defense 2019).

Values exceeding the Screening Level are shaded gray

AOI = Area of Interest

ft = Feet

LOD = Limit of Detection

LOQ = Limit of Quantitation

Qual = Qualifier

< = analyte not detected above the LOD

Cells exceeding the standard in Column B are shaded gray

Table 6-4 - PFAS Detections in Groundwater
Duncan Readiness Center and Army Aviation Support Facility, Delaware

Location ID		AOI01-01				AOI01-02				AOI01-03				AOI02-01				DAASF-01				DAASF-01				DAASF-02			
Sample Name		AOI01-01-GW				AOI01-02-GW				AOI01-03-GW				AOI02-01-GW				DAASF-01-GW				DAASF-GW-FD				DAASF-02-GW			
Parent Sample ID																						DAASF-01-GW-06032021							
Sample Date		6/3/2021				6/3/2021				6/3/2021				6/3/2021				6/3/2021				6/3/2021				6/3/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
PFAS (ng/L)																													
4:2 Fluorotelomer sulfonate (4:2 FTS)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
6:2 Fluorotelomer sulfonate (6:2 FTS)	-	<	4.3	5.4	U	<	3.8	4.8	U	<	4.0	5.0	U	2.9	4.6	5.8	J	<	4.1	5.1	U	<	3.9	4.9	U	<	4.0	5.0	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	-	<	2.1	3.2	U	<	1.9	2.9	U	<	2.0	3.0	U	<	2.3	3.5	U	<	2.0	3.1	U	<	1.9	2.9	U	<	2.0	3.0	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	-	<	1.1	3.2	U	<	0.95	2.9	U	<	1.0	3.0	U	<	1.2	3.5	U	<	1.0	3.1	U	<	0.97	2.9	U	<	1.0	3.0	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	-	<	1.3	2.1	U	<	1.1	1.9	U	<	1.2	2.0	U	<	1.4	2.3	U	<	1.2	2.0	U	<	1.2	1.9	U	<	1.2	2.0	U
Perfluorobutanesulfonic acid (PFBS)	600	8.0	1.1	2.1		2.1	0.95	1.9		8.6	1.0	2.0		3.5	1.2	2.3		1.2	1.0	2.0	J	1.2	0.97	1.9	J	29	1.0	2.0	
Perfluorobutanoic acid (PFBA)	-	96	4.3	5.4		18	3.8	4.8		29	4.0	5.0		140	4.6	5.8		40	4.1	5.1		39	3.9	4.9		120	4.0	5.0	
Perfluorodecanesulfonic acid (PFDS)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluorodecanoic acid (PFDA)	-	0.87	1.1	2.1	J	7.9	0.95	1.9		<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluorododecanoic acid (PFDoA)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluoroheptanesulfonic acid (PFHpS)	-	1.7	1.1	2.1	J	1.6	0.95	1.9	J	1.5	1.0	2.0	J	0.98	1.2	2.3	J	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluoroheptanoic acid (PFHpA)	-	87	1.1	2.1		15	0.95	1.9		27	1.0	2.0		190	1.2	2.3		19	1.0	2.0		19	0.97	1.9		89	1.0	2.0	
Perfluorohexanesulfonic acid (PFHxS)	-	170	1.1	2.1		25	0.95	1.9		89	1.0	2.0		14	1.2	2.3		11	1.0	2.0		11	0.97	1.9		320	1.0	2.0	
Perfluorohexanoic acid (PFHxA)	-	98	1.1	2.1		22	0.95	1.9		38	1.0	2.0		280	1.2	2.3		36	1.0	2.0		34	0.97	1.9		140	1.0	2.0	
Perfluorononanesulfonic acid (PFNS)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluorononanoic acid (PFNA)	-	16	1.1	2.1		35	0.95	1.9		8.0	1.0	2.0		5.4	1.2	2.3		0.57	1.0	2.0	J	0.54	0.97	1.9	J	<	1.0	2.0	U
Perfluorooctanesulfonamide (PFOSA)	-	1.0	1.1	2.1	J	1.9	0.95	1.9	J+	2.4	1.0	2.0		<	1.2	2.3	U	<	1.0	2.0	U	2.3	0.97	1.9		<	1.0	2.0	U
Perfluorooctanesulfonic acid (PFOS)	40	32	1.1	2.1		150	0.95	1.9		75	1.0	2.0		5.7	1.2	2.3	J+	<	1.0	2.0	U	<	0.97	1.9	U	2.4	1.0	2.0	J+
Perfluorooctanoic acid (PFOA)	40	120	1.1	2.1		23	0.95	1.9		36	1.0	2.0		230	1.2	2.3		29	1.0	2.0		27	0.97	1.9		150	1.0	2.0	
Perfluoropentanesulfonic acid (PFPS)	-	9.6	1.1	2.1		1.9	0.95	1.9		15	1.0	2.0		1.1	1.2	2.3	J	0.80	1.0	2.0	J	0.82	0.97	1.9	J	42	1.0	2.0	
Perfluoropentanoic acid (PFPA)	-	97	1.1	2.1		18	0.95	1.9		28	1.0	2.0		290	1.2	2.3		31	1.0	2.0		30	0.97	1.9		130	1.0	2.0	
Perfluorotetradecanoic acid (PFTeDA)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluorotridecanoic acid (PFTriDA)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U
Perfluoroundecanoic acid (PFUnA)	-	<	1.1	2.1	U	<	0.95	1.9	U	<	1.0	2.0	U	<	1.2	2.3	U	<	1.0	2.0	U	<	0.97	1.9	U	<	1.0	2.0	U

Notes
J = Estimated concentration
J+ = Estimated concentration, bias high.
U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)
ng/L = Nanogram(s) per liter
(1) Deputy Assistant Secretary of Defense. 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater using USEPA’s RSL Calculator with HQ=0.1 (Deputy Assistant Secretary of Defense, 2021).
Values exceeding the Screening Level are shaded gray
LOD = Limit of Detection
LOQ = Limit of Quantitation
Qual = Qualifier
< = analyte not detected above the LOD
- = No screening level

Table 6-4 - PFAS Detections in Groundwater
Duncan Readiness Center and Army Aviation Support Facility, Delaware

Location ID		DAASF-03				MW15-GW			
Sample Name		DAASF-03-GW				MW15-GW			
Parent Sample ID									
Sample Date		6/3/2021				6/3/2021			
Analyte	**Screening Level[1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
4:2 Fluorotelomer sulfonate	-	55	1.0	2.0		12	0.88	1.8	
6:2 Fluorotelomer sulfonate	-	1100	40	50		310	35	44	
8:2 Fluorotelomer sulfonate	-	<	2.0	3.0	U	<	1.8	2.6	U
N-ethyl perfluorooctanesulfonamidoacetic acid	-	<	1.0	3.0	U	<	0.88	2.6	U
N-methyl perfluorooctanesulfonamidoacetic acid	-	<	1.2	2.0	U	<	1.1	1.8	U
Perfluorobutanesulfonic acid (PFBS)	600	7.0	1.0	2.0		3.5	0.88	1.8	
Perfluorobutanoic acid	-	190	4.0	5.0		130	3.5	4.4	
Perfluorodecanesulfonic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluorodecanoic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluorododecanoic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluoroheptanesulfonic acid	-	5.4	1.0	2.0		3.3	0.88	1.8	
Perfluoroheptanoic acid	-	180	1.0	2.0		110	0.88	1.8	
Perfluorohexanesulfonic acid	-	130	1.0	2.0		43	0.88	1.8	
Perfluorohexanoic acid	-	400	1.0	2.0		230	0.88	1.8	
Perfluorononanesulfonic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluorononanoic acid	-	4.6	1.0	2.0		4.1	0.88	1.8	
Perfluorooctanesulfonamide (PFOSA)	-	1.4	1.0	2.0	J	<	0.88	1.8	U
Perfluorooctanesulfonic acid (PFOS)	40	12	1.0	2.0	J+	37	0.88	1.8	
Perfluorooctanoic acid (PFOA)	40	280	1.0	2.0		100	0.88	1.8	
Perfluoropentanesulfonic acid	-	6.0	1.0	2.0		3.6	0.88	1.8	
Perfluoropentanoic acid	-	520	10	20		250	0.88	1.8	
Perfluorotetradecanoic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluorotridecanoic acid	-	<	1.0	2.0	U	<	0.88	1.8	U
Perfluoroundecanoic acid	-	<	1.0	2.0	U	<	0.88	1.8	U

Notes

J = Estimated concentration

J+ = Estimated concentration, bias high.

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

ng/L = Nanogram(s) per liter

(1) Deputy Assistant Secretary of Defense. 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater using USEPA's RSL Calculator with HQ=0.1 (Deputy Assistant Secretary of Defense, 2021).

Values exceeding the Screening Level are shaded gray

LOD = Limit of Detection

LOQ = Limit of Quantitation

Qual = Qualifier

< = analyte not detected above the LOD

- = No screening level

Army National Guard Site Inspections
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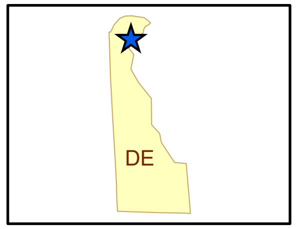
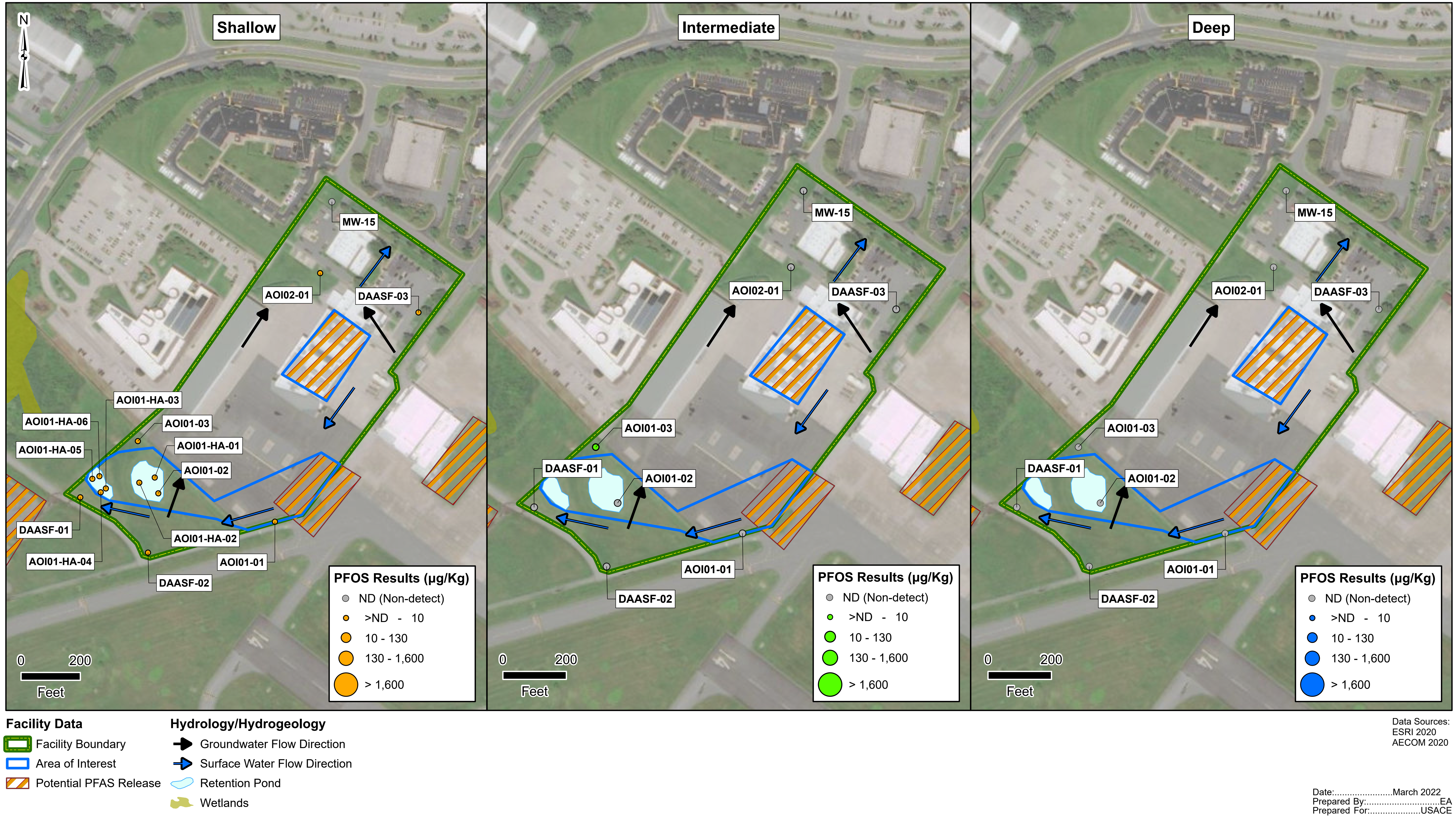


Figure 6-1
PFOS Detections in Soil (AOI 1 and AOI 2)



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Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
Prepared By:..............................EA
Prepared For:...................USACE
Projection:.......WGS 84 UTM 18N

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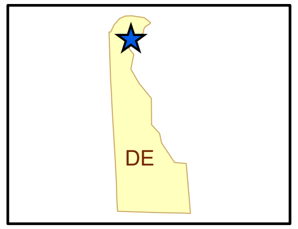
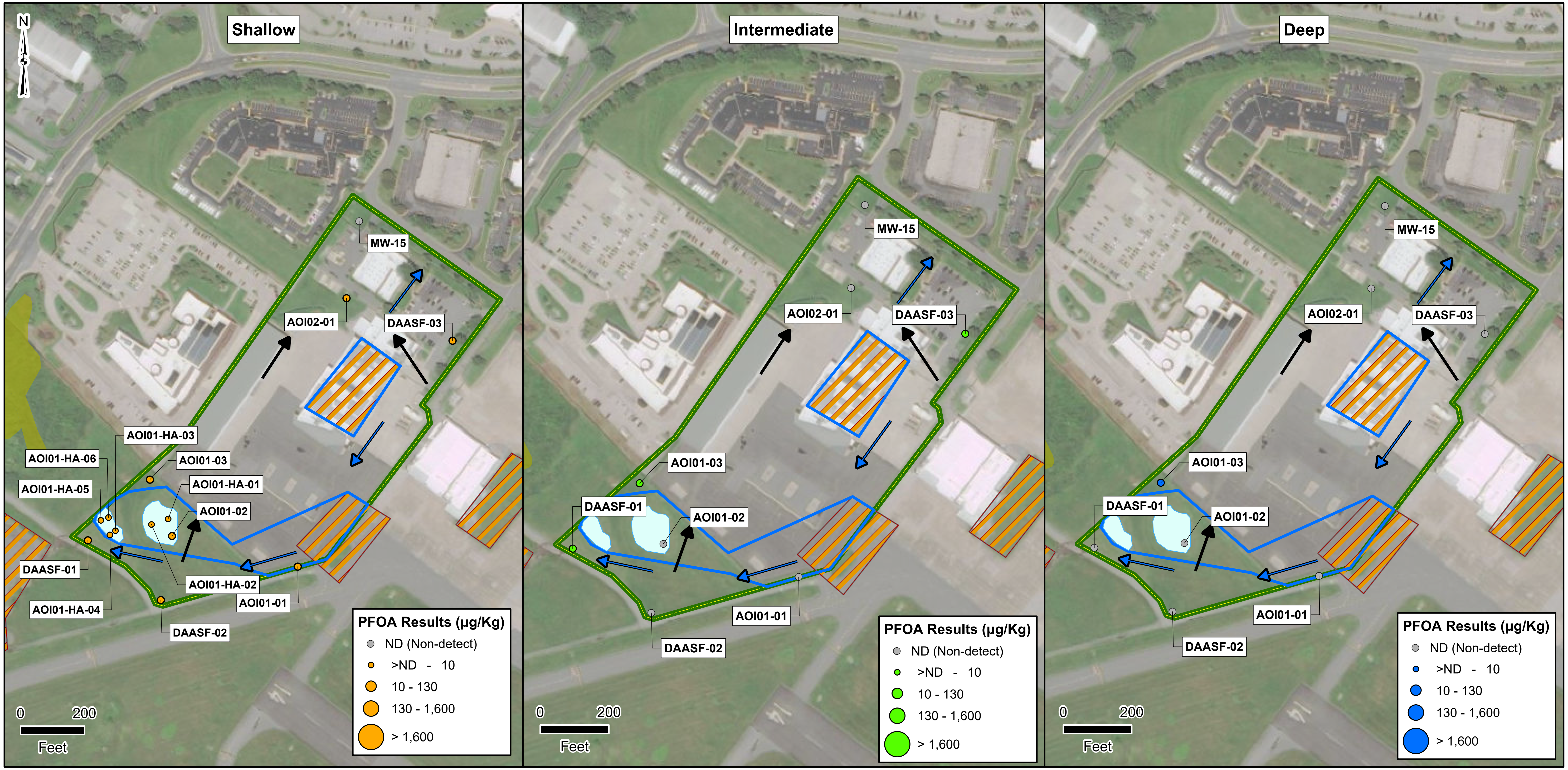


Figure 6-2
PFOA Detections in Soil (AOI 1 and AOI 2)



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Facility Data
🟩 Facility Boundary
▭ Area of Interest
▨ Potential PFAS Release

Hydrology/Hydrogeology
➔ Surface Water Flow Direction
➔ Groundwater Flow Direction
Retention Pond
Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:........................March 2022
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Prepared For:...................USACE
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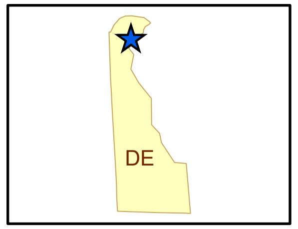
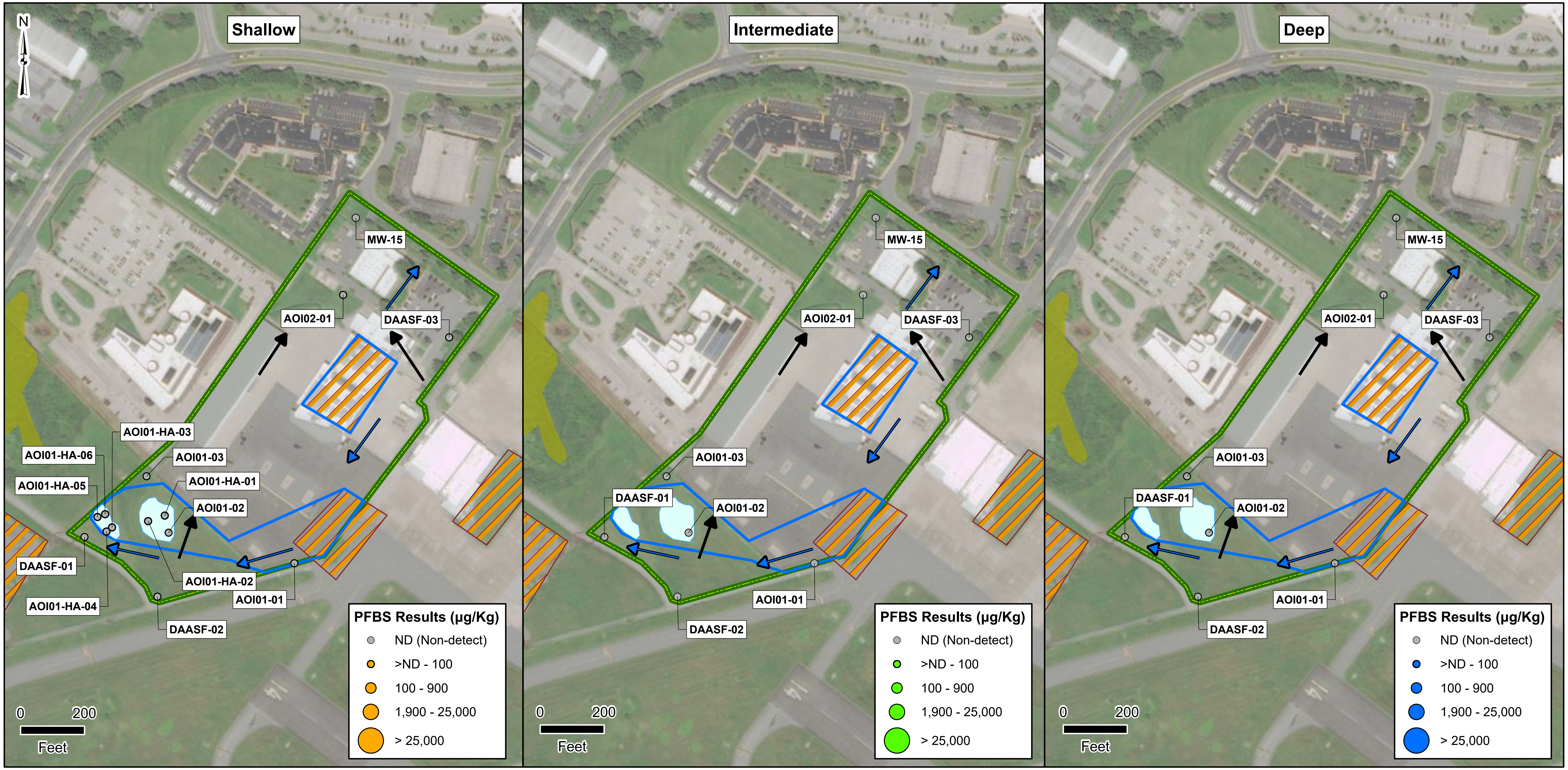
Army National Guard Site Inspections
Site Inspection Report
Duncan RC and AASF, Delaware

Figure 6-3
PFBS Detections in Soil (AOI 1 and AOI 2)





Facility Data

▭ Facility Boundary
▭ Area of Interest
▨ Potential PFAS Release

Hydrology/Hydrogeology

➔ Surface Water Flow Direction
➔ Groundwater Flow Direction
⬭ Retention Pond
▨ Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:.......................March 2022
Prepared By:............................EA
Prepared For:...................USACE
Projection:.......WGS 84 UTM 18N

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Site Inspection Report
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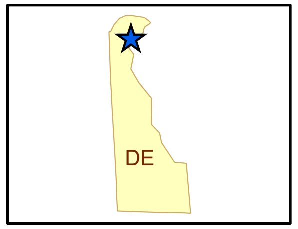
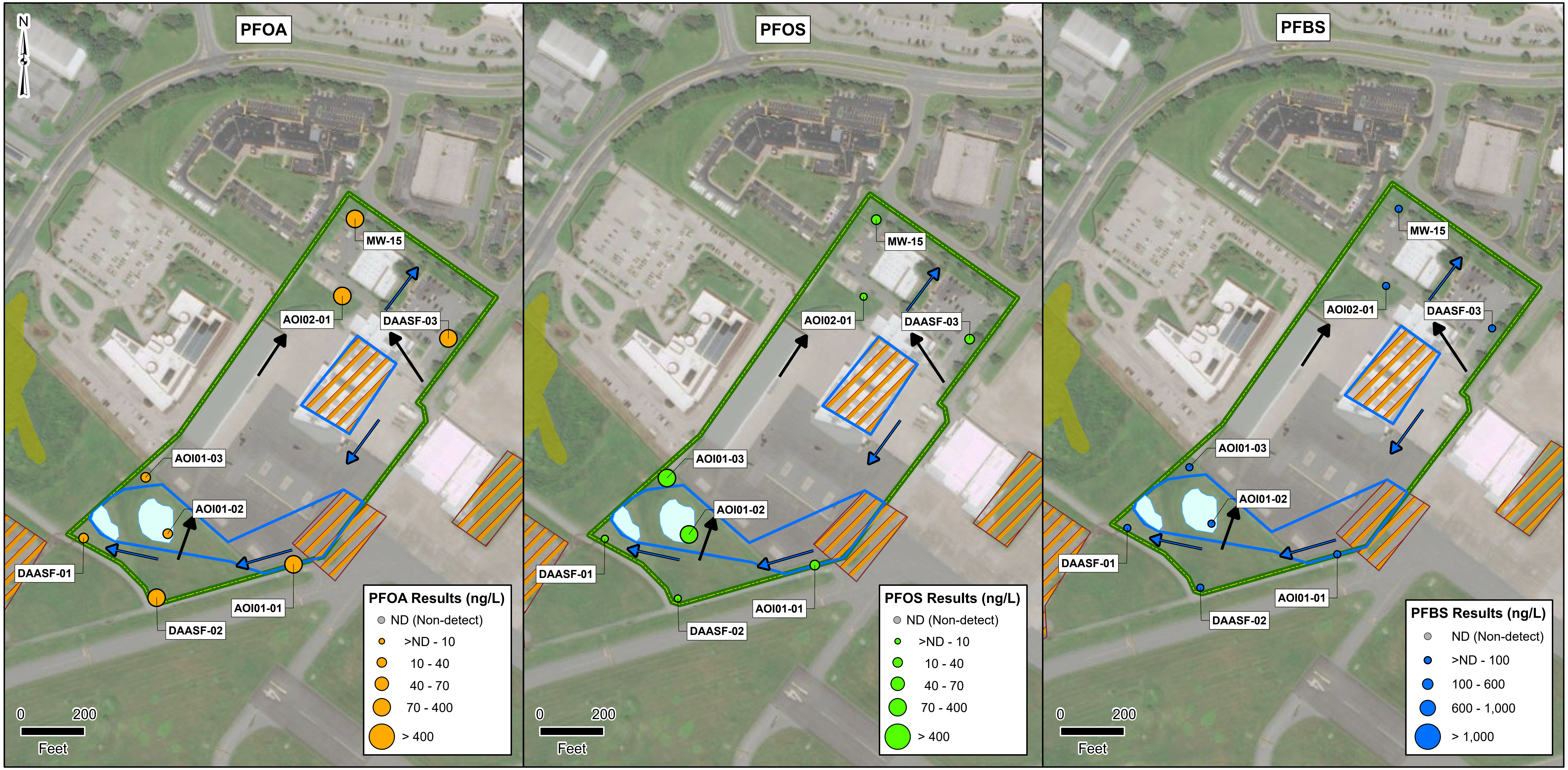


Figure 6-4
PFOA, PFOS and PFBS Detections in Groundwater (AOI 1 and AOI 2)



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

Hydrology/Hydrogeology
- ➔ Surface Water Flow Direction
- ➔ Groundwater Flow Direction
- Retention Pond
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:......................March 2022
Prepared By:............................EA
Prepared For:...................USACE
Projection:.......WGS 84 UTM 18N

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7. EXPOSURE PATHWAYS

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1**. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if PFOA, PFOS, or PFBS 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 PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation.

In general, the potential PFAS exposure pathways 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 PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, off-facility residents, and trespassers (though unlikely due to restricted access). The CSM for AOIs 1 and 2, revised based on the SI findings, are presented on **Figure 7-1** and **Figure 7-2**.

7.1 SOIL EXPOSURE PATHWAY

The SI results for PFOA, PFOS, and PFBS in 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 – Helicopter Crash Site

AFFF was potentially released in one area associated with AOI 1 when an ARNG helicopter crashed on the boundary between the facility and the New Castle Airport property. PFOA and PFOS were detected in soil at low levels at nine boring locations completed at AOI 1, confirming a potential release of PFAS to soil at AOI 1. Based on the results of the SI in AOI 1, ground-disturbing activities to surface soil could result in site worker, construction worker, and trespasser exposure to PFOA and PFOS via inhalation of dust and ingestion of surface soil. Ground-disturbing activities to subsurface soil could result in construction worker exposure to

PFOS via ingestion. Therefore, the exposure pathways for inhalation and ingestion are potentially complete for these receptors. The CSM is presented in **Figure 7-1**.

7.1.2 AOI 2 – Hangar

AOI 2 encompasses the facility hangar. The hangar fire suppression system currently contains a Jet-X 2% high expansion foam concentrate system, the contents of which are not disclosed. While there is no known release at this location, firsthand interviewee knowledge only extends back to 1991. PFOA and PFOS were detected in one boring location at AOI 2 at low levels within the surface and shallow subsurface soil, confirming a potential release of PFAS to soil at AOI 2. Based on the results of the SI in AOI 2, ground-disturbing activities to surface soil could result in site worker and construction worker exposure to PFOA and PFOS via inhalation of dust. Therefore, the exposure pathways for inhalation and ingestion are potentially complete for these receptors. The CSM is presented in **Figure 7-2**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1 – Helicopter Crash Site

PFOA, PFOS and PFBS were detected in groundwater from all three temporary wells. PFOA exceeded the SL at one temporary well location (AOI01-01) and PFOS exceeded the SL at two temporary well locations (AOI01-02 and AOI01-03). Domestic, private wells are located less than 1 mile downgradient of the facility, the closest of which is located approximately 1,500 ft north of the facility boundary; however, the depth of the well and source aquifer are unknown. Based on this information, the ingestion exposure pathway is potentially complete for off-facility residents. The ingestion exposure pathway for construction workers was deemed incomplete due to the depth of groundwater underlying the facility (up to 35 ft bgs), and the likelihood that trenching activities would not reach those depths. The CSM is presented in **Figure 7-1**.

7.2.2 AOI 2 – Hangar

PFOA, PFOS, and PFBS were detected in groundwater from the temporary well associated with AOI 2, with the PFOA concentration exceeding the SL. Domestic, private wells are located less than 1 mile downgradient of the facility, the closest of which is located approximately 1,500 ft north of the facility boundary; however, the depth of the well and source aquifer are unknown. Based on this information, the ingestion exposure pathway is potentially complete for off-facility residents. The ingestion exposure pathway for construction workers was deemed incomplete due to the depth of groundwater underlying the facility (up to 35 ft bgs), and the likelihood that trenching activities would not reach those depths. The CSM is presented in **Figure 7-2**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

The ingestion exposure pathways for surface water and sediment are potentially complete for site workers, construction workers, and trespassers based on the surface soil concentrations found in the facility detention ponds. PFAS are water soluble and can migrate readily from soil to surface water through migration of sediment via storm flow. Additionally, regional shallow groundwater flow within the area is inferred to flow towards the Christina River. Therefore, the ingestion exposure pathways for surface water and sediment are also potentially complete for recreational users of the Christina River. 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 PFOS, PFOA, and PFBS in soil and groundwater within the facility boundary.

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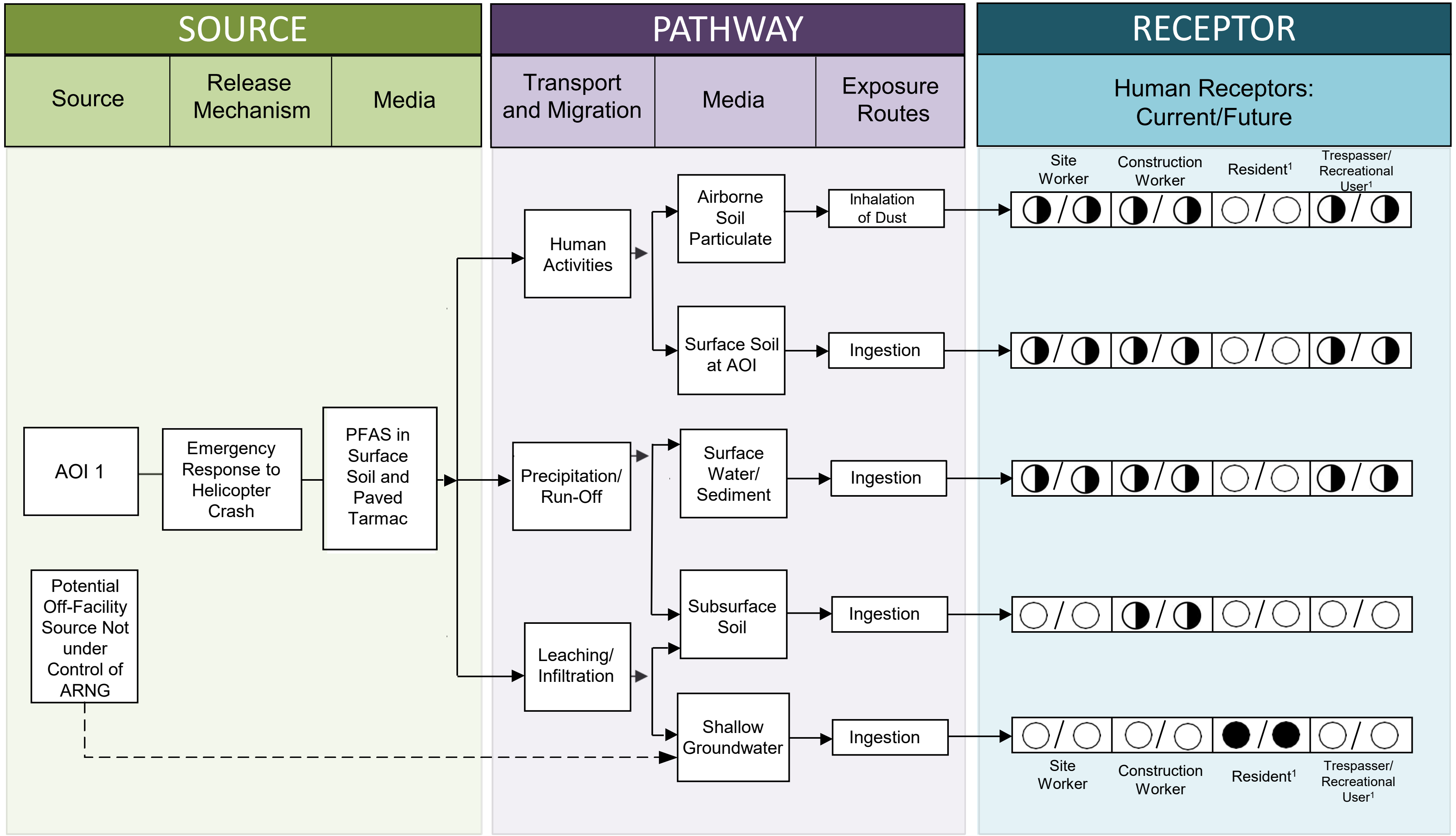

LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

○ Incomplete Pathway

◐ Potentially Complete Pathway

● Potentially Complete Pathway with Exceedance of Screening Level

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model
AOI 1 Duncan RC and AASF

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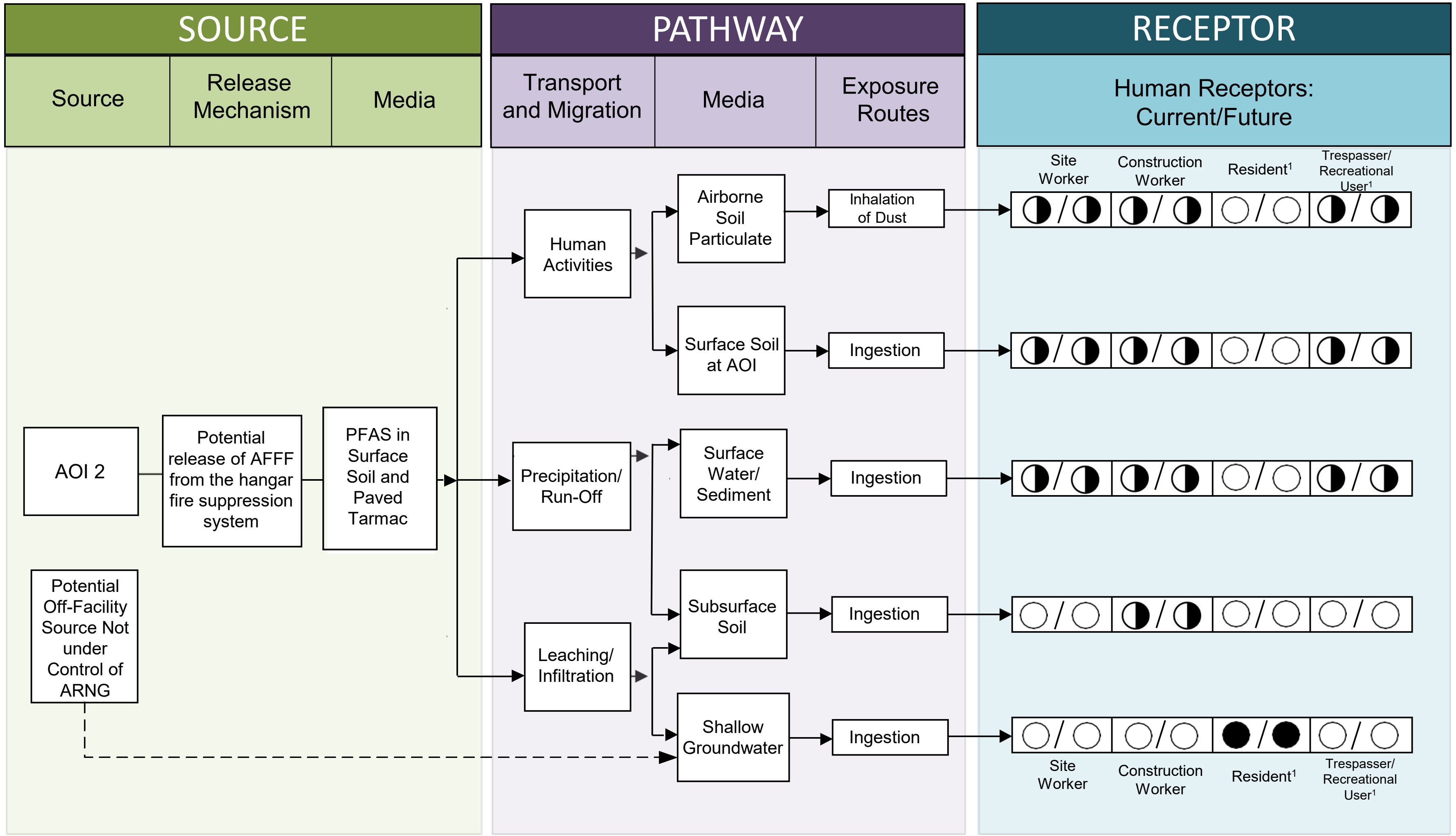

SOURCE			PATHWAY			RECEPTOR
Source	Release Mechanism	Media	Transport and Migration	Media	Exposure Routes	Human Receptors: Current/Future

AOI 2 → Potential release of AFFF from the hangar fire suppression system → PFAS in Surface Soil and Paved Tarmac

PFAS in Surface Soil and Paved Tarmac → Human Activities → Airborne Soil Particulate → Inhalation of Dust

Human Activities → Surface Soil at AOI → Ingestion

PFAS in Surface Soil and Paved Tarmac → Precipitation/ Run-Off → Surface Water/ Sediment → Ingestion

Precipitation/ Run-Off → Subsurface Soil → Ingestion

PFAS in Surface Soil and Paved Tarmac → Leaching/ Infiltration → Subsurface Soil

Leaching/ Infiltration → Shallow Groundwater → Ingestion

Potential Off-Facility Source Not under Control of ARNG - - → Shallow Groundwater

Media	Exposure Routes	Site Worker	Construction Worker	Resident[1]	Trespasser/ Recreational User[1]
Airborne Soil Particulate	Inhalation of Dust	◐/◐	◐/◐	○/○	◐/◐
Surface Soil at AOI	Ingestion	◐/◐	◐/◐	○/○	◐/◐
Surface Water/ Sediment	Ingestion	◐/◐	◐/◐	○/○	◐/◐
Subsurface Soil	Ingestion	○/○	◐/◐	○/○	○/○
Shallow Groundwater	Ingestion	○/○	○/○	●/●	○/○

LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

○ Incomplete Pathway

◐ Potentially Complete Pathway

● Potentially Complete Pathway with Exceedance of Screening Level

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-2
Conceptual Site Model
AOI 2 Duncan RC and AASF

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8. SUMMARY AND OUTCOME

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

8.1 SI ACTIVITIES SUMMARY

The SI field activities at the facility were conducted on 23 May and on 2 and 3 June 2021. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021b), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA 2021b), samples were collected and analyzed for a subset of 24 PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 as follows. The 24 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.7** of this SI Report. The following sampling was conducted:

- 30 soil grab samples collected from 13 boring locations (seven soil borings and six surface soil hand auger locations);

- Eight grab groundwater samples from seven temporary well locations and one existing facility monitoring well;

The information gathered during this investigation was used to determine PFOA, PFOS, and PFBS were present at or above SLs. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure to PFOA, PFOS, and PFBS at the AOIs, which are described in **Chapter 7**.

8.2 SI GOALS EVALUATION

As described in **Section 4.2**, the SI activities were designed to achieve six main goals or DQOs. This section describes the SI goals and the conclusions that can be made for each based on the data collected during this investigation.

1. *Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs at the facility.*

   PFOA, PFOS, and PFBS were detected at the facility in groundwater, whereas PFOA and PFOS were detected in soil. PFOA, PFOS, and PFBS were detected both at source areas as well as near the facility boundary between the source areas and the potential drinking water receptors. Detections in groundwater exceeded the SLs for PFOA and PFOS.

2. *Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.*

   PFOA, PFOS, and PFBS were detected in groundwater samples associated with both AOIs. All four of the groundwater samples collected during the SI exceeded the SLs. Therefore, none of the release areas have been eliminated from further consideration.

3. *Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.*

   Based on the data collected during this SI, no need for a removal action was identified.

4. *Collect or develop data to evaluate the release.*

   Out of the six surface soil (hand auger) borings and two soil borings samples collected across the preferential surface flow pathway leaving the Helicopter Crash Site (AOI 1), PFOS or PFOA were detected in all surface interval samples. Though these detections were low, this may indicate that AFFF migrated along this pathway, collecting in the stormwater detention ponds. Similarly, AOI02-01 had detections of PFOS and PFOA in the surface interval samples. This may suggest that AFFF was released from the facility Hangar fire suppression system or within the surrounding area. Additionally, PFOS or PFOA were detected at low levels in the surface interval samples taken along the boundary, which may suggest that AFFF was released outside of the Duncan RC and AASF property.

5. *Collect data to better characterize the release for more effective and rapid initiation of an RI (if determined necessary).*

   The collected geological data indicate a highly permeable and conductive environment with soils dominated by sand and silt, with some interbedded, thin clay lenses. The depth to groundwater observed during the SI ranged from approximately 25.9 to 32.9 ft bgs. Localized groundwater flow direction under the site is to the northwest. These geologic and hydrogeologic observations can be used in development of technical approach for the RI.

6. *If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).*

   Based upon the qualitative evaluation of soil results in combination with quantitative groundwater results and groundwater flow direction analysis, the source of detected PFOA, PFOS, and PFBS at AOI 1 is likely the result of AFFF expended by the municipal fire department in response to the 1970s helicopter crash; however, PFOA, PFOS, and

PFBS were detected in temporary wells installed upgradient of AOIs 1 and 2, one of which exceeded the SLs in groundwater, suggesting an off-facility source may also be impacting the facility. Additionally, PFOA exceeded the SL in the sample taken from the temporary well location along the northeastern facility boundary.

8.3 OUTCOME

Based on the CSMs developed and revised based on the SI findings, there is potential for exposure to residential drinking water receptors from potential releases of AFFF at the Duncan RC and AASF, and potentially from off-facility sources.

Sample chemical analytical concentrations collected during this SI were compared against the project SLs for PFOA, PFOS, and PFBS in soil and groundwater, as described in **Table 6-1**. The following bullets summarize the SI results:

- AOI 1 – PFOS or PFOA were detected in groundwater at concentrations exceeding the individual SLs of 40 nanograms per liter (ng/L) in all temporary well locations associated with AOI 1, with maximum concentrations of PFOS at 150 ng/L and PFOA at 120 ng/L at locations AOI01-02 and AOI01-01, respectively. PFBS was detected in groundwater at AOI 1, but did not exceed the SL.

- AOI 2 – PFOA, PFOS, and PFBS were detected in groundwater at AOI 2. PFOA exceeded the SL in groundwater with a concentration of 230 ng/L at AOI02-01. PFOS and PFBS did not exceed the SLs.

- AOI 1 and 2 – PFOA and PFOS were detected in soil at both AOI 1 and 2 at low concentrations, several orders of magnitude below the SLs. There were no detections of PFBS at either AOI.

- Upgradient Boundary Samples – PFOA, PFOS, and PFBS were detected in groundwater upgradient of AOI 1 and AOI 2 in samples taken from locations DAASF-01 and DAASF-02. The sample taken from location DAASF-02 exceeded the PFOA SL with a concentration of 150 ng/L, but there were no exceedances in the sample taken from location DAASF-01. The sample taken from location DAASF-03, located along the northeastern facility boundary, also exceeded the SL for PFOA with a concentration of 280 ng/L.

- Downgradient Boundary Samples - PFOA was detected in groundwater at downgradient location MW-15 with a concentration of 100 ng/L, exceeding the SL. PFBS and PFOS were detected at this location below their respective SLs.

- Recommendations – Based on the results of the SI, further evaluation of AOIs 1 and 2 are warranted in a Remedial Investigation.

Table 8-1 summarizes the SI results for soil and groundwater. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to residential drinking water receptors caused by potential DoD activities at the facility as well as potential and known off-facility adjacent sources.

Table 8-2 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOIs 1 and 2: Helicopter Crash Site and Hangar.

Table 8-1. Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Helicopter Crash Site	◐	●	●
2	Hangar	◐	●	●

Legend:
● = Detected; exceedance of screening levels.
◐ = Detected; no exceedance of screening levels.
○ = Not detected.

Table 8-2. Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Helicopter Crash Site	Exceedances of the SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI
2	Hangar	Exceedances of SLs in groundwater at source area. No exceedances of SLs in soil.	Proceed to RI

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