FINAL
Site Inspection Report
1109th TASMG-Groton
Groton, Connecticut

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

July 2023

Prepared for:

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOI	Area of Interest
ARFF	Aircraft rescue and firefighting
ARNG	Army National Guard
bgs	below ground surface
CAA	Connecticut Airport Authority
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
CTARNG	Connecticut Army National Guard
CTDEEP	Connecticut Department of Energy and Environmental Protection
DA	Department of the Army
DoD	Department of Defense
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
gpm	gallons per minute
GPS	Global positioning system
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specification
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
NOAA	National Oceanic and Atmospheric Administration
OSD	Office of the Secretary of Defense
OWS	oil-water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid

PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TASMG	Theatre Aviation Sustainment Management Group
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WPCF	Water Pollution Control Facility

Executive Summary

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS). These compounds are collectively referred to as "relevant compounds" throughout the document, and the applicable screening levels (SLs) are provided in **Table ES-1**.

The PA identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the 1109th Theatre Aviation Sustainment Management Group (TASMG-Groton) in Groton, Connecticut and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1, AOI 2, and AOI 3. TASMG-Groton will also be referred to as the "facility" throughout this document.

The facility is located on the Groton-New London Airport property, which is situated on a peninsula between the Poquonnock River, Baker Cove, Birch Plain Creek, and the Long Island Sound. TASMG-Groton comprises several buildings, including multiple hangars, office spaces, material storage areas, and a flight test ramp. The facility provides testing, repairs, and maintenance for Connecticut Army National Guard equipment and aircrafts. The facility also provides services to aircraft at the Groton-New London Airport and services ARNG operations in 14 northeastern states and the District of Columbia.

The PA identified three AOIs for investigation during the SI phase. SI sampling results from the three AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation for AOI 1, AOI 2, and AOI 3.

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

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

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

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

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Building 320 – Main Hangar	◐	●	N/A	Proceed to RI
2	Building 323 – Engine Shop	◐	●	◐	Proceed to RI
3	Building 325 – State Equipment Storage Building	◐	●	N/A	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the 1109th Theatre Aviation Sustainment Management Group (TASMG-Groton) in Groton, Connecticut. TASMG-Groton will also be referred to as the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; United States [US] Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations.

1.2 SI Purpose

A PA was performed at TASMG-Groton (AECOM Technical Services, Inc. [AECOM], 2020) that identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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2. Facility Background

2.1 Facility Location and Description

TASMG-Groton is located in the city of Groton, in New London County, Connecticut (**Figure 2-1**). The facility is located on the Groton-New London Airport property, which is situated on a peninsula between the Poquonnock River, Baker Cove, Birch Plain Creek, and the Long Island Sound. TASMG-Groton comprises several buildings, including multiple hangars, office spaces, material storage areas, and a flight test ramp. The facility provides testing, repairs, and maintenance for Connecticut ARNG (CTARNG) equipment and aircrafts. The facility also provides services to aircraft at the Groton-New London Airport and services ARNG operations in 14 northeastern states and the District of Columbia.

TASMG-Groton is located on state-owned property. The CTARNG established its presence on the property in the 1950s. The facility transitioned from an Aviation Classification and Repair Depot to the TASMG-Groton in 2012 and expanded upon its mission capabilities. TASMG-Groton occupies approximately 16 acres of the northwest corner of the airport. There are two guarded entranceways for vehicle traffic to access the facility. A chain link fence provides security along the north, east, and south sides of the facility. The southwest corner is open to the Groton-New London Airport, which maintains its own security for the area (CTARNG, 2019).

Groton-New London Airport was established in 1929; it was designated as a major training center for pilots and aircrews during World War II and was later transferred for operation to the Navy. The State of Connecticut resumed airport ownership and operations in 1949. In 1984, the airport was approved to operate commercial air service. The Connecticut Airport Authority (CAA) maintains the Groton-New London Airport.

2.2 Facility Environmental Setting

TASMG-Groton and the larger Groton-New London Airport are located on a peninsula bordered by the Poquonnock River to the east, Baker Cove to the west, and Long Island Sound to the south. Bluff Point and Bushy Point Beach form a breakwater-like barrier, separating the facility and airport property from Long Island Sound. Topography across the facility is generally flat, and topography across the larger airport area generally slopes radially away on the edges of the peninsula towards the surrounding water bodies (**Figure 2-2**). The facility is zoned for industrial/commercial use and is surrounded by properties zoned for commercial, industrial, and residential use (CTARNG, 2019).

2.2.1 Geology

The facility and surrounding airport property are underlain by the Wisconsinan-aged Poquonnock River deposits, which were the result of sediment-dammed lakes. These deposits are ice-marginal, fluviodeltaic sediments within the Long Island Sound Basin and are composed of silt, sand, and gravel (Goldsmith, 1962; Stone et al., 2005). Glacial sediments in the area are measured at thicknesses between 50-100 feet (Stone et al., 2005; Thomas, 2008). The bedrock in the New London area comprises schists and gneisses. The bedrock is mostly light-gray to medium-gray metasedimentary and metaigneous aluminous, felsic intermediate, and mafic rocks of Proterozoic to Devonian age (Stone et al., 2005). The Proterozoic-age New London Gneiss directly underlies the facility (Rodgers, 1985). The bedrock geology is shown on **Figure 2-3**. Virtually all areas at the Groton-New London airport are underlain with artificial fill. Perimeter soils on the edge of the peninsula are tidal and inland wetlands (DeCarlo & Doll, Inc., 1996).

Borings completed as a part of this SI were drilled to depths between 10 and 15 feet below ground surface (bgs). The geological data collected from the boreholes indicate that the dominant lithology of the unconsolidated material underlying the facility is comprised of fine- to coarse-grained, well-graded sand. Boring logs showed varying percentages of fines (silt) and gravel. Fines in subsurface soil ranged from trace amounts to 45 percent (%). Gravel was also observed in borings varying from 5% to 45%. The soils observed at the facility have a relatively high hydraulic conductivity, with well-graded sands having the highest conductivity. No impermeable material layers were observed in SI borings. These site observations are consistent with the expected subsurface material conditions.

2.2.2 Hydrogeology

The majority of the Connecticut coastline, including the city of Groton, lies within the Long Island Sound Basin. This basin is principally drained by the Long Island Sound. In the southeastern coastal river basins of Connecticut, groundwater is sourced from three types of aquifers: stratified drift, till, and bedrock. At the facility, a surficial, coarse-grained stratified drift aquifer serves as the primary water-bearing unit (Thomas et al., 1968; Thomas, 2008). Coarse-grained stratified drift aquifers have the potential to yield large quantities of water (i.e., >100 gallons per minute [gpm]) and are the most productive of the three aquifer types. Groundwater in bedrock may occur beneath the facility in areas where the rock is heavily fractured. Domestic wells screened in bedrock in the southeastern coastal river basins have historically produced up to 150 gpm (Thomas et al., 1968). The bedrock is directly overlain by the stratified drift units; therefore, there is no confining unit between the two aquifers.

The groundwater underlying TASMG-Groton and the larger surrounding airport property is designated as “class GB” by the Connecticut Department of Energy and Environmental Protection (CTDEEP), which indicates that the area has a long history of urban or industrial activity. Class GB groundwater is assumed to be degraded due to likely pollution sources, and it is presumed not to be suitable for human consumption without treatment (CAA, 2013). Due to the groundwater designation as class GB, the airport property including TASMG-Groton is supplied water drinking water by the Groton Utilities Water Operations. Groton Utilities Water Operations sources its water from a variety of groundwater wells and surface water reservoirs, some of which are located within 4 miles north and upgradient of the facility. Groundwater features at the facility are shown on **Figure 2-3**. There are currently no potable water wells at the facility.

Depths to water measured in May 2022 during the SI ranged from 1.12 to 9.52 feet bgs. Groundwater was shallowest at temporary well location TMG-01 near a stormwater outlet pipe discharge point. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate groundwater flow direction is generally to the southwest.

2.2.3 Hydrology

There are no delineated surface water bodies on the TASMG-Groton property; however, there are several surface water bodies immediately surrounding the property, and the airport lies on a coastal peninsula (**Figure 2-5**). The airport is located within the Southeast Costal Drainage Basin (CAA, 2013) and falls within the 100-year floodplain of the town of Groton. The area is subject to occasional flooding events during hurricanes and major nor’easters. During these events, floodwaters may extend onto areas surrounding the southern end of the airport runway and taxiway edges. During heavy rainfall events, localized flooding may also occur on the airplane parking ramps (CAA, 2013). An off-facility freshwater pond and forested wetland are present approximately 0.1 miles northeast of the facility main gate (**Figure 2-5**) (US Fish and Wildlife Service [USFWS], 2019).

A small intermittent stream borders the northwest boundary of the CTARNG property and flows southwest into Birch Creek, which confluences with Birch Plain Creek before entering Baker Cove. TASMG-Groton generally drains via surface drainage from east to west. Stormwater runoff is also collected by catch basins throughout the facility. These catch basins channel flow west towards two main outlets near the northwestern portion of the facility that discharge into the small intermittent stream. Runoff entering the stream discharges to Birch Creek, then Baker Cove, and ultimately into the Long Island Sound, directly south of the Groton-New London Airport. Any runoff entering the stormwater drainage system or the intermittent stream has the potential of migrating to the Long Island Sound and wetlands associated with the intermittent stream (CTARNG, 2019).

Additionally, discharge from a stormwater outlet pipe located behind Building 322 flows across a stretch of grass prior to entering an area filled with cattails and other vegetation associated with wetlands. This area, located along the fence line behind the building, has not been delineated or identified by the USFWS as a wetland (CTARNG, 2019). Several oil-water separators (OWSs) are also positioned throughout the facility. The OWSs connect to the municipal sanitary sewer system, which ultimately discharges to the Groton Water Pollution Control Facility (WPCF). All OWSs are permitted with CTDEEP under the General Permit for the Discharge of Wastewaters Associated with Vehicle Maintenance activities #GVM-000179 (CTARNG, 2019). Trench drains located outside main hangar doors also discharge to the municipal sanitary sewer system.

2.2.4 Climate

Data from Groton-New London Airport, Connecticut, indicate that the annual average temperature between 1991 and 2020 in was 51.4 degrees Fahrenheit (ºF) (National Oceanic and Atmospheric Administration [NOAA], 2022). The warmest months are July and August, with normal daily average temperatures of 72.3 ºF and 71.5 ºF, respectively. January is the coldest month, with an average temperature of 30.8 ºF. Average annual precipitation at the airport measured from 1991 to 2020 was 39.31 inches. Average monthly precipitation ranges from 2.20 inches in February to 3.83 inches in September. The average annual snowfall is approximately 24 inches, with January and February usually experiencing the most snow (NOAA, 2022).

2.2.5 Current and Future Land Use

TASMG-Groton currently supports ARNG operations, including aviation, across northeastern states and the District of Columbia, as well as the Groton-New London Airport. Future land use at TASMG-Groton and the surrounding airport property is anticipated to remain the same.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

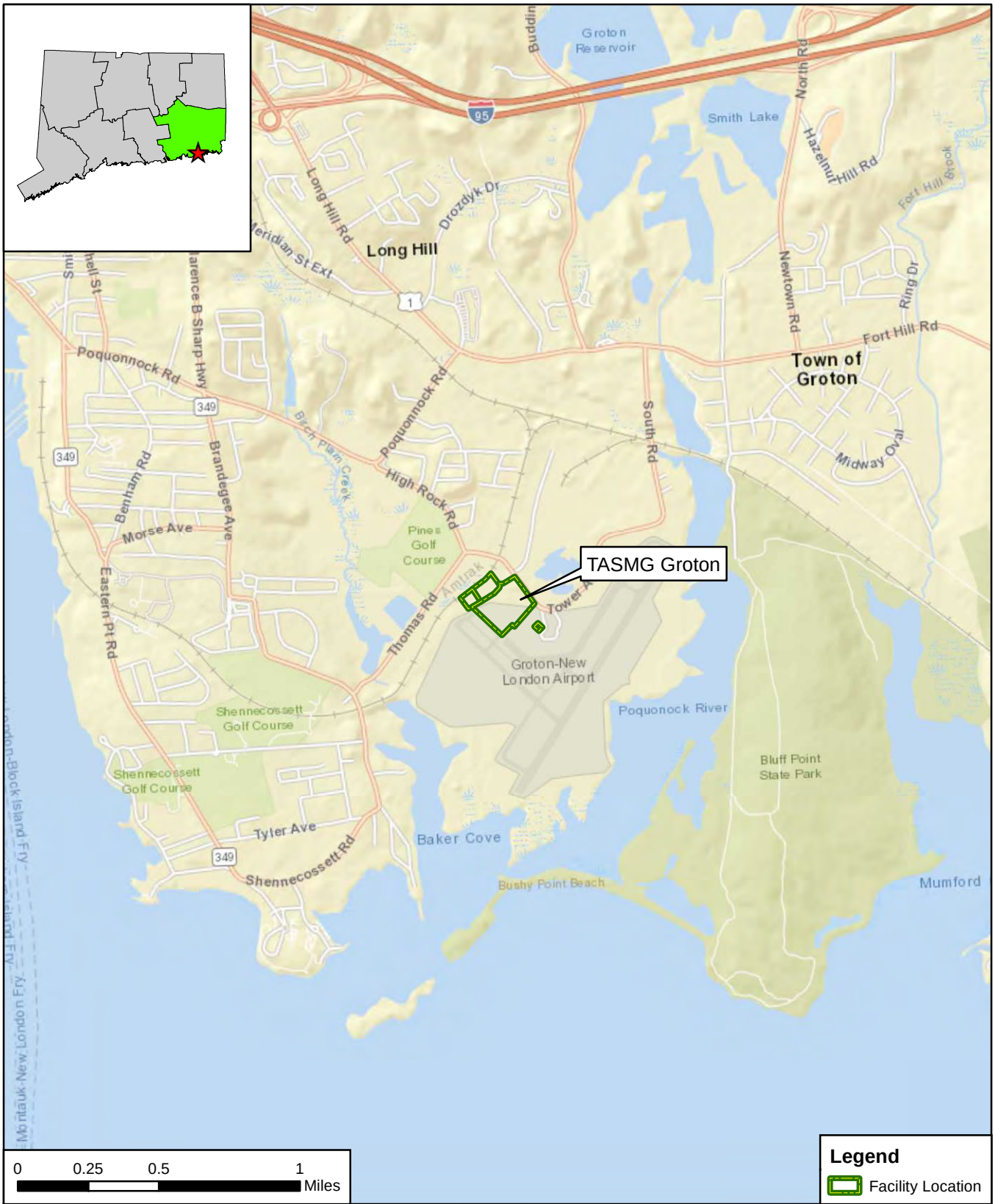
The following birds, insects, mammals, plants, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in New London County, Connecticut (USFWS, 2022).

- **Birds:** Roseate tern, *Sterna dougallii dougallii* (endangered); Red knot, *Calidris canutus rufa* (threatened); Piping Plover, *Charadrius melodus* (threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Tricolored bat, *Perimyotis subflavus* (proposed endangered); Little brown bat, *Myotis lucifugus* (under review); Northern long-eared bat, *Myotis septentrionalis* (threatened)

- **Flowering plants:** Small whorled pogonia, *Isotria medeoloides* (threatened)
- **Reptiles:** Hawksbill Sea turtle, *Eretmochelys imbricata* (endangered); Leatherback sea turtle, *Dermochelys coriacea* (endangered)

2.3 History of PFAS Use

Three potential release areas were identified at the TASMG-Groton facility during the PA where AFFF may have been used or released historically (AECOM, 2020). At TASMG-Groton, the Main Hangar (Building 320) and the Engine Shop (Building 323) both contain fire suppression systems that utilize AFFF and may have released AFFF to soil and groundwater via system maintenance and discharges. Additionally, the State Equipment and Storage Building (Building 325) serves as a temporary storage area for fire suppression system discharge water that may contain residual AFFF and as a result may have released AFFF constituents to the surrounding surface. The three buildings were identified as AOIs for this SI. Descriptions of the AOIs are presented in **Section 3**.



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Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	11/28/2022

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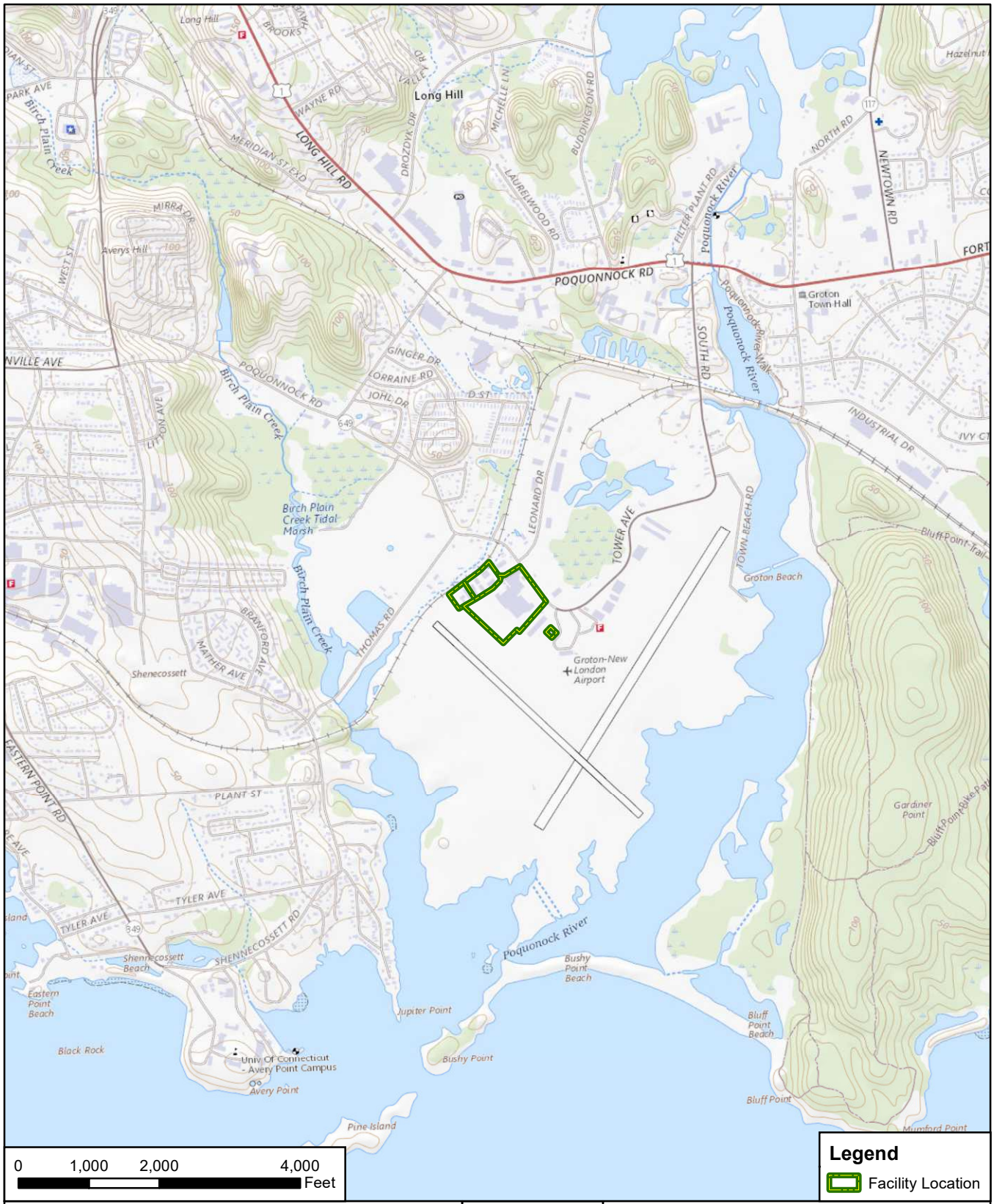
Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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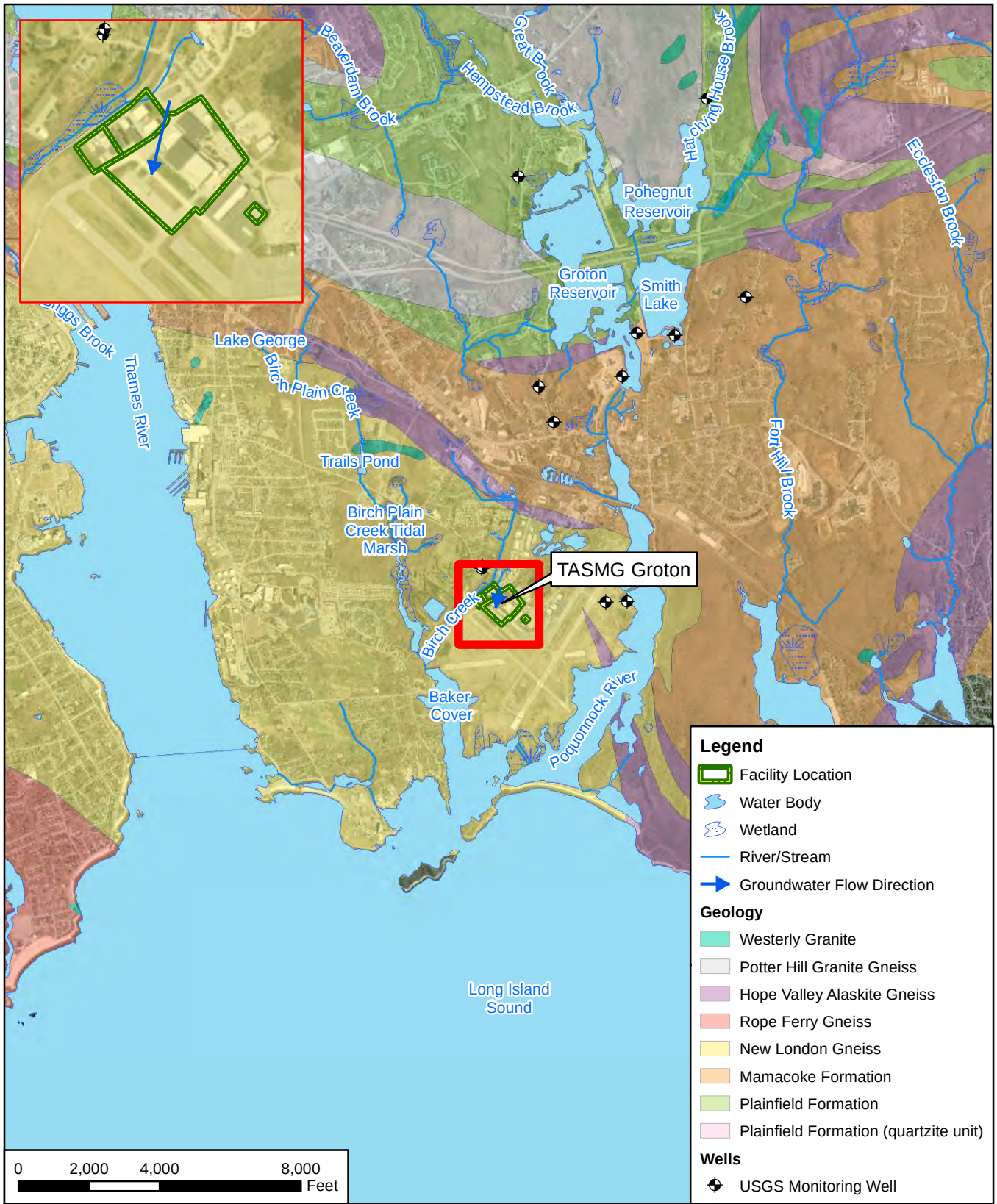
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	11/28/2022

N

Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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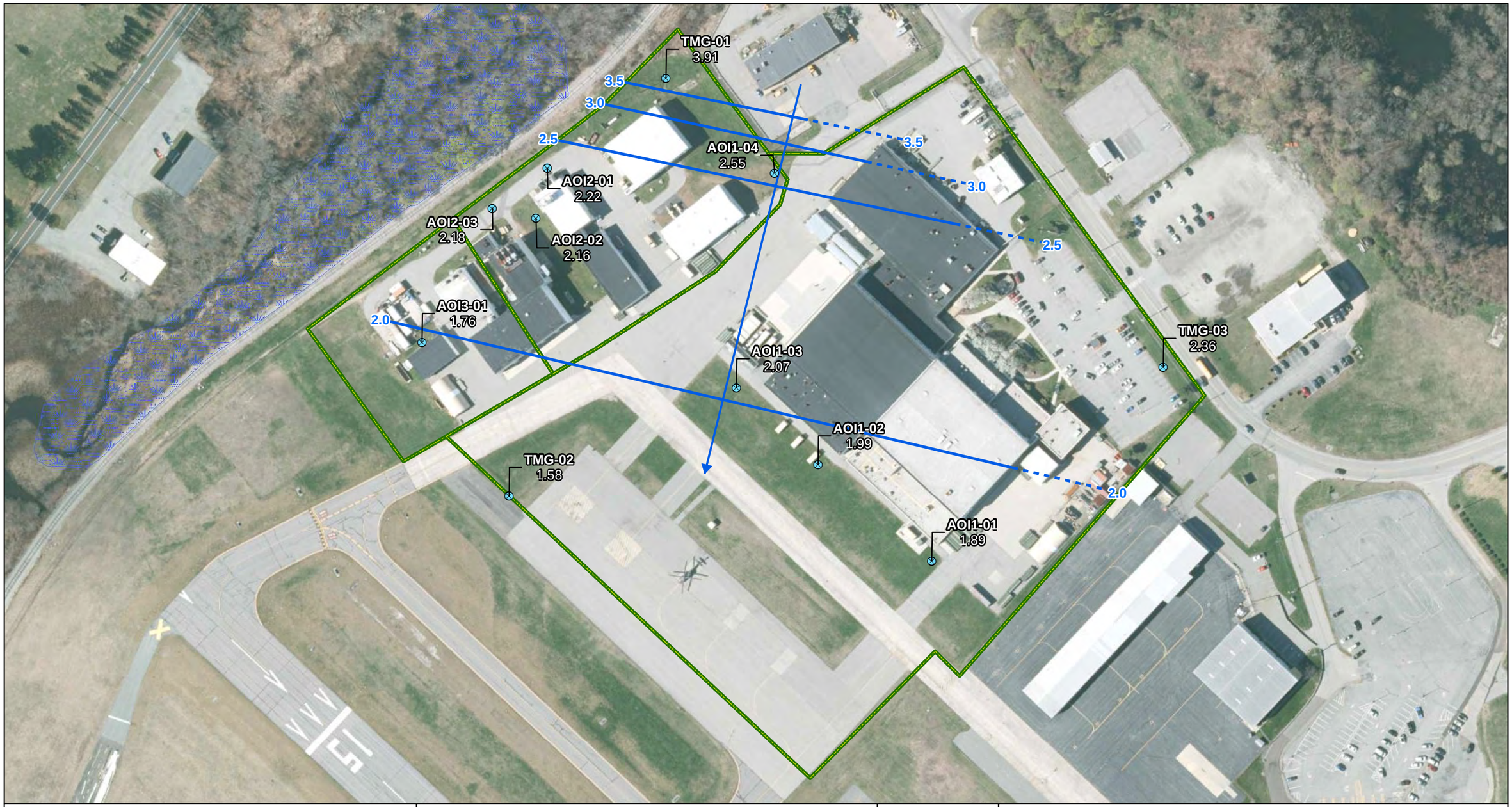
Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	11/29/2022

Soil Boring/Groundwater Location
Facility Location
Wetland
Groundwater Elevation Contour
Inferred Groundwater Elevation Contour
Groundwater Flow Direction

0 75 150 300 Feet

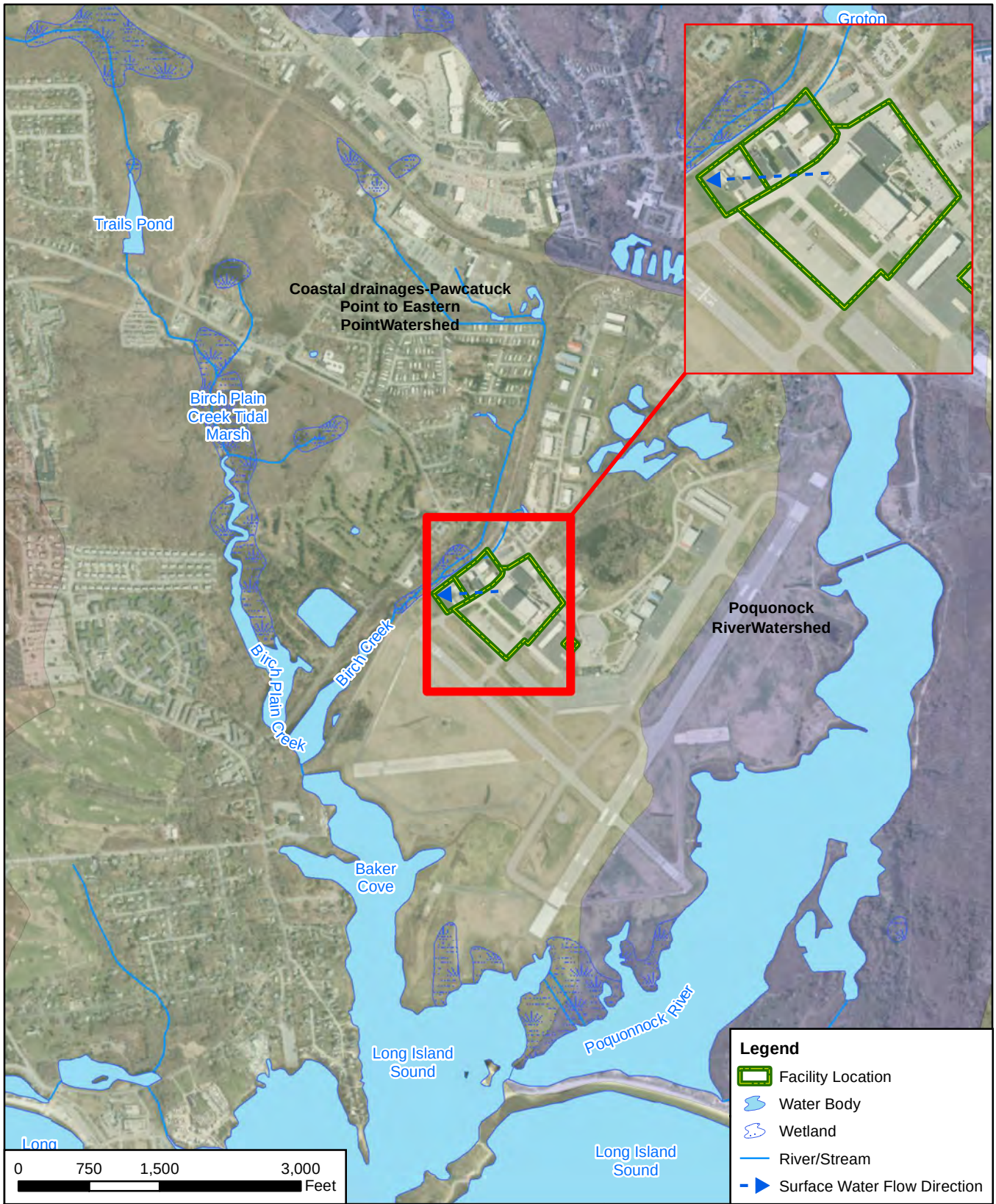
Groundwater elevations in ft NAVD88.

N

Groundwater Elevations, May 2022

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	2/21/2023

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Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, three potential release areas were identified at TASMG-Groton and grouped into three AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Building 320 – Main Hangar

AOI 1 consists of Building 320, the Main Hangar, and the immediate vicinity where potentially AFFF-laden water has been released. Releases are suspected to have occurred during the AFFF fire suppression system test events between 2008 and the present. System tests involved the discharge of water, which may contain residual AFFF, through test ports located on the exterior building perimeter.

Potentially AFFF-laden water released from the test ports is collected in barrels that are transported and stored adjacent to Building 325, pending disposal off-site. It is also possible that water could be spilled during the many test events in the immediate vicinity of the test ports. Test ports are located over paved surfaces, but trench drains and catch basins are located near the test ports. The trench drains connect to the municipal sanitary sewer system and ultimately discharge to the WPCF, but the catch basins channel flow west to an outlet located in a wetland area that is associated with a small intermittent stream (Birch Creek) that flows to Baker Cove, which ultimately flows to the Long Island Sound. Additionally, surface runoff at the facility generally drains from east to west, towards the wetland and intermittent stream. Although surface water catch basins are not located directly beneath the building test ports, some are very close to the test ports, and it is possible that AFFF-laden water could have entered the catch basins during testing. Runoff entering stormwater catch basins could have potentially been transported into the surface water bodies described.

Landscaped areas exist adjacent to Building 320. Surface soil in the landscaped areas near Building 320 may have received surface water runoff containing AFFF constituents as a result of spillage at the test ports during system testing. AFFF releases at AOI 1 may also have infiltrated subsurface soil via cracks in pavement, joints between areas that are paved with different materials, and the nearby landscaped areas.

3.2 AOI 2 Building 323 – Engine Shop

AOI 2 consists of Building 323, the Engine Shop, and the area between its garage door and the perimeter fence, where known AFFF releases have occurred. Releases to the environment occurred during the AFFF fire suppression system discharges circa 2010-2012 and 2014. During the events, AFFF would have drained to the interior building floor drains that connect to an OWS and subsequently discharge to the municipal sanitary sewer system. Additionally, AFFF could have escaped the building through the garage door if left open or beneath entryway doors. During the PA site visit, the entryway doors appeared to have space between the floor and the bottom of the doors even when closed.

AFFF that was contained within the building during the releases drained via floor drains to an OWS. Although the OWS was emptied by a contractor following the releases, it is possible that AFFF migrated from the OWS to the municipal sanitary sewer system that eventually discharges to the WPCF. Surface runoff from the building potentially drained towards a wetland located approximately 180 feet northeast (along the northwestern border of the facility) or west towards Birch Creek. Birch Creek drains to Baker Cove and eventually the Long Island Sound.

Landscaped and wooded areas exist adjacent to Building 323. Surface soil in these areas may have received AFFF that flowed outwardly from the building or surface water runoff that contained AFFF as a result of the releases. AFFF releases at AOI 2 may also have infiltrated subsurface soil via cracks in pavement, joints between areas that are paved with different materials, and in the landscaped and wooded areas.

3.3 AOI 3 Building 325 – State Equipment Storage Building

AOI 3 consists of Building 325 and its adjacent storage area where potentially AFFF-laden water generated from the test ports at Building 320 is temporarily stored in barrels prior to disposal by a private contractor. Although the disposal of AFFF-laden water is performed in a controlled manner, it is possible that spillage may occur. Additionally, the storage area is unsheltered, and barrels are subject to corrosion due to the elements. The disposal contractor reportedly pumps the water from the barrels into a tanker truck; therefore, spillage to the nearby ground surface is possible during these activities.

According to the facility Spill Prevention, Control, and Countermeasure Plan, the barrels are stored on spill control pallets, and any liquid spilled is collected in the pallets. If any spills occur outside of the pallets, liquid will flow to the surrounding impervious surfaces. Surface runoff may flow southeast or northwest, depending on the location of the spill. Grassy surfaces surround the storage area to the south, west, and north, and precipitation may facilitate runoff of any spills to those areas. Surface runoff to the northwest may have traveled west towards Birch Creek. It is not expected that runoff travels to the wetland to the northeast (along the northwestern border of the facility).

Surface soil surrounding AOI 3 may have received surface water runoff containing residual AFFF. Releases at AOI 3 may have infiltrated subsurface soil through surface soil or via cracks in pavement and joints between areas that are paved with different materials.

3.4 Adjacent Sources

Numerous potential off-facility sources adjacent to the facility, not under the control of the CTARNG, have been identified. Descriptions of the potential adjacent sources are presented below, and the potential adjacent sources are shown on **Figure 3-1**.

3.4.1 Groton-New London Airport

The Groton-New London Airport Fire Department responds to emergencies across the airport property. According to Groton-New London Fire Department staff, several areas of the airport have been used for fire training and nozzle checks by the fire department. One area near the north end of Runway 5/23, and one area near the south end of Runway 5/23, have been used for Federal Aviation Administration-required annual fire training that involved the discharge of AFFF. The events occurred circa 2011 and 2017 and involved the discharge of approximately 100-150 gallons of 3% AFFF solution. Other annual training events used only water. These releases are side-gradient of the TASMG-Groton facility.

Nozzle check testing that involves the release of AFFF has also occurred at the parking apron located west of Runway 15/33 and at the former shooting range colloquially referred to as the “Gun Butt”. Nozzle check testing occurs on various runway areas as well but usually involves the discharge of only water. The water is sprayed through the same equipment used to spray AFFF; therefore, it is possible that this water contains residual AFFF. Both nozzle check testing areas are considered downgradient of the TASMG-Groton facility.

Fire department staff also stated that the airport terminal is used for the storage of extra AFFF in 5-gallon buckets and 55-gallon drums. The total volume stored at the terminal fluctuates, but approximately 500 gallons were stored at the terminal during PA interviews. The airport terminal is considered side-gradient of the TASMG-Groton facility.

3.4.2 Groton-New London Airport Fire Department

The Groton-New London Airport Fire Department is located adjacent to the TASMG-Groton facility to the northwest. Aircraft rescue and firefighting (ARFF) training is required under the current lease with the CTARNG, according to the airport Master Plan (CAA, 2013).

The fire department occupied another building within the airport property until the previous facility was damaged in a structure fire in 2011. The former fire department was located adjacent to the private aviation hangars next to Runway 5/23, approximately 1,000 feet east of TASMG-Groton. During the 2011 structure fire, the AFFF tank on a 1998 E One Titan 4x4 ARFF truck stored at the station was damaged and resulted in the release of 250 gallons of 3% AFFF concentrate. As a result, the former fire station location is considered a potential release area. The former fire station was repaired and is currently used for the storage of materials, including AFFF in 5-gallon buckets and in 55-gallon drums.

The fire department currently stores two firefighting vehicles, one 2010 Ford Crash Rescue Equipment Services Renegade and one 1995 T-1500 Oshkosh ARFF Truck. The former stores 40 gallons of AFFF 3% concentrate, which produces 1,200 gallons of foam solution, and the latter stores 208 gallons of 3% AFFF concentrate, which produces 6,000 gallons of foam solution. The two vehicles are typically kept at the current fire department location. The fire department also formerly stored the aforementioned 1998 E One Titan 4x4 ARFF truck, which stored 250 gallons of AFFF concentrate, and a 1990 Oshkosh T-300 ARFF Truck, which went out of service prior to 2013 and stored 360 gallons of AFFF concentrate.

Nozzle check testing and fire training are performed by the fire department on airport property, but staff also confirmed that nozzle check testing is performed at the current fire station. Runoff from the fire station connects to sanitary sewers, which connects to the Groton WPCF. It is possible that residual AFFF has been released as a result of nozzle check testing at the current fire station. The current fire department location is considered a potential release area side-gradient of the TASMG-Groton facility.

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CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/6/2022	GIS BY	MS	12/6/2022
SCALE	1:12,000	CHK BY	JW	12/6/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/6/2022

Legend

- Area of Interest
- Potential Release Area
- Facility Location
- Water Body
- Wetland
- River/Stream
- Surface Water Flow Direction
- Groundwater Flow Direction

N

Areas of Interest

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

- The PA for TASMG-Groton, Connecticut (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the non-winter seasons. Spring was the earliest available time field resources were available and weather conditions allowed for completion of the study.

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a).

4.5 Data Usability Assessment

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess

whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the SI QAPP Addendum (AECOM, 2021a).

5. Site Inspection Activities

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

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, 1109th TASMG-Groton, Groton, Connecticut* dated June 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, 1109th TASMG-Groton, Groton, Connecticut* dated September 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan, 1109th TASMG-Groton, Groton, Connecticut* dated May 2021 (AECOM, 2021b).

The SI field activities were conducted from 12 to 19 May 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation and subsequent abandonment, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

The following samples were collected during the SI and analyzed for a subset of 18 compounds by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15 to fulfill the project DQOs:

- Thirty-three (33) soil samples from 11 boring locations;
- Eleven (11) grab groundwater samples from 11 temporary well locations;
- Nineteen (19) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, land survey data are provided in **Appendix B3**, and investigation-derived waste (IDW) polygons are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 28 June 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, CTARNG, USACE, and CTDEEP. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021a).

A TPP Meeting 3 will be held after the field event to discuss the results of the SI. Meeting minutes for TPP 3 will be included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM placed a ticket with the "Call Before You Dig" Connecticut utility clearance provider to notify them of intrusive work on 25 April 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 12 May 2022 with input from the AECOM field team and TASMG-Groton facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

A potable water source at TASMG-Groton was sampled on 28 October 2021 to assess usability for decontamination of drilling equipment. Results of the samples collected from the spigot in Building 324 (TMG-PW-01 and TMG-PW-02) confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. A third sample was collected from the drillers tote tank used to contain the potable water from the decontamination water sources (TMG-DECON-03). The results of the decontamination water sample collected from the drillers tote tank confirmed the tote to be acceptable for use in the investigation as well. The samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the wash rack spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021a). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Borings were installed in grass areas where possible, to avoid disturbing concrete or asphalt surfaces; however, soil boring locations AOI02-01 and AOI02-03 were installed in paved areas to avoid overhead utilities. Soil samples were collected via direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2021a). 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 five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and depths are provided **Table 5-1**. Several boring locations were adjusted within a 50-feet offset to allow for utility avoidance.

Three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table.

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

Soil borings completed during the SI were drilled to depths between 10 and 15 feet bgs and indicate that the dominant lithology of the unconsolidated material underlying the facility is comprised of fine- to coarse-grained, well-graded sand. Boring logs showed varying percentages of fines (silt) and gravel. Fines in subsurface soil ranged from trace amounts to 45%. Gravel was also observed in borings varying from 5% to 45%. The soils observed at the facility have a relatively high hydraulic conductivity, with well-graded sands having the highest conductivity. No impermeable material layers were observed in SI borings. These site observations are consistent with the expected subsurface material conditions.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2021a).

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

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a).

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® 7822DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-foot section of 2-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

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

collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

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

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 19 May 2022. Groundwater elevation measurements were collected from the 11 new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by Connecticut-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 19 May 2022 in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 (WGS84) datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B3**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of IDW is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2019a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were left in place at the point of the source. The soil cuttings were distributed on the ground surface on the downgradient side of the boring. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were discharged directly to the ground at the source. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location.

Geographic coordinates were collected using a global positioning system (GPS) around each location where IDW was placed (i.e., an IDW polygon). The IDW polygons are displayed on the figure in **Appendix B4**.

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

5.7 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 Deviations from SI QAPP Addendum

No deviations from the SI QAPP Addendum were identified during SI field work or review of the field documentation.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, TASMG-Groton, Connecticut

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI01-01-SB-00-02	5/16/2022 10:45	0 - 2	x	x	x	
AOI01-01-SB-03-04	5/16/2022 12:00	3 - 4	x			
AOI01-01-SB-04-06	5/16/2022 12:15	4 - 6	x			
AOI01-02-SB-00-02	5/16/2022 14:00	0 - 2	x			
AOI01-02-SB-04-05	5/16/2022 14:45	4 - 5	x			
AOI01-02-SB-08-09	5/16/2022 14:55	8 - 9	x			
AOI01-03-SB-00-02	5/17/2022 8:15	0 - 2	x			
AOI01-03-SB-00-02-D	5/17/2022 8:15	0 - 2	x			FD
AOI01-03-SB-03-05	5/17/2022 8:20	3 - 5	x			
AOI01-03-SB-05-07	5/17/2022 8:50	5 - 7	x			
AOI01-04-SB-00-02	5/19/2022 9:15	0 - 2	x			
AOI01-04-SB-00-02-MS	5/19/2022 9:15	0 - 2	x			MS
AOI01-04-SB-00-02-MSD	5/19/2022 9:15	0 - 2	x			MSD
AOI01-04-SB-03-05	5/19/2022 9:20	3 - 5	x			
AOI01-04-SB-03-05-D	5/19/2022 9:20	3 - 5	x			FD
AOI01-04-SB-07-08	5/19/2022 9:30	7 - 8	x			
AOI02-01-SB-00-02	5/18/2022 11:30	0 - 2	x			
AOI02-01-SB-04-05	5/18/2022 11:40	4 - 5	x			
AOI02-01-SB-05-06.5	5/18/2022 12:30	5 - 6.5	x			
AOI02-01-SB-05-06.5-D	5/18/2022 12:30	5 - 6.5	x			FD
AOI02-02-SB-00-02	5/17/2022 14:30	0 - 2	x	x	x	
AOI02-02-SB-00-02-D	5/17/2022 14:30	0 - 2		x	x	FD
AOI02-02-SB-03-05	5/18/2022 8:05	3 - 5	x			
AOI02-02-SB-05-07	5/18/2022 8:10	5 - 7	x			
AOI02-03-SB-00-02	5/18/2022 9:40	0 - 2	x			
AOI02-03-SB-04-06	5/18/2022 10:40	4 - 6	x			
AOI02-03-SB-06-07	5/18/2022 10:45	6 - 7	x			
AOI03-01-SB-00-02	5/17/2022 11:50	0 - 2	x	x	x	
AOI03-01-SB-00-02-MS	5/17/2022 11:50	0 - 2		x	x	MS
AOI03-01-SB-00-02-MSD	5/17/2022 11:50	0 - 2		x	x	MSD
AOI03-01-SB-03-05	5/17/2022 12:00	3 - 5	x			
AOI03-01-SB-05-07	5/17/2022 12:50	5 - 7	x	x	x	
TMG-01-SB-00-02	5/18/2022 14:15	0 - 2	x	x	x	
TMG-01-SB-02-04	5/18/2022 14:20	2 - 4	x			
TMG-01-SB-04-05	5/18/2022 14:25	4 - 5	x			
TMG-02-SB-00-02	5/17/2022 10:15	0 - 2	x			
TMG-02-SB-00-02-MS	5/17/2022 10:15	0 - 2	x			MS
TMG-02-SB-00-02-MSD	5/17/2022 10:15	0 - 2	x			MSD
TMG-02-SB-02-04	5/17/2022 10:20	2 - 4	x			
TMG-02-SB-05-07	5/17/2022 10:30	5 - 7	x			
TMG-03-SB-00-02	5/16/2022 9:10	0 - 2	x			
TMG-03-SB-00-02-D	5/16/2022 9:15	0 - 2	x			FD
TMG-03-SB-03-04	5/16/2022 9:45	3 - 4	x			
TMG-03-SB-06-07	5/16/2022 9:50	6 - 7	x			

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, TASMG-Groton, Connecticut

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Groundwater Samples						
AOI01-01-GW	5/17/2022 10:50	NA	x			
AOI01-01-GW-D	5/17/2022 10:55	NA	x			FD
AOI01-02-GW	5/17/2022 11:55	NA	x			
AOI01-03-GW	5/17/2022 13:50	NA	x			
AOI01-03-GW-MS	5/17/2022 13:50	NA	x			MS
AOI01-03-GW-MSD	5/17/2022 13:50	NA	x			MSD
AOI01-04-GW	5/19/2022 12:30	NA	x			
AOI02-01-GW	5/19/2022 9:40	NA	x			
AOI02-02-GW	5/18/2022 11:00	NA	x			
AOI02-02-GW-D	5/18/2022 11:05	NA	x			FD
AOI02-03-GW	5/18/2022 12:25	NA	x			
AOI03-01-GW	5/18/2022 8:50	NA	x			
TMG-01-GW	5/19/2022 11:30	NA	x			
TMG-02-GW	5/17/2022 15:45	NA	x			
TMG-03-GW	5/17/2022 9:25	NA	x			
Quality Control Samples						
TMG-ERB-01	5/17/2022 15:30	NA	x			DPT shoe
TMG-ERB-02	5/18/2022 13:30	NA	x			Hand auger
TMG-ERB-03	5/19/2022 10:30	NA	x			Hand auger
TMG-FRB-01	5/19/2022 11:00	NA	x			NA
TMG-PW-01	10/28/2021 8:35	NA	x			Spigot
TMG-PW-02	10/28/2021 8:30	NA	x			Spigot
TMG-DECON-03	5/19/2022 11:30	NA	x			Water tank

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

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, TASMG-Groton, Connecticut

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	15	7 - 12[1]	13.9	11.02	12.01	9.13	1.89
	AOI01-02	15	9 - 14[1]	12.08	10.44	10.09	8.45	1.99
	AOI01-03	15	7 - 12[1]	13.37	10.50	11.3	8.43	2.07
	AOI01-04	15	8 - 13[1]	13.73	12.07	11.18	9.52	2.55
	TMG-03	15	7 - 12[1]	11.13	9.71	8.77	7.35	2.36
2	AOI02-01	15	7 - 12[1]	11.83	10.41	9.61	8.19	2.22
	AOI02-02	15	7 - 12[1]	12.01	10.20	9.85	8.04	2.16
	AOI02-03	15	7 - 12[1]	11.11	10.28	8.93	8.10	2.18
	TMG-01	10	5 - 10	5.8	5.03	1.89	1.12	3.91
	TMG-02	15	7 - 12[1]	10.81	9.17	9.23	7.59	1.58
3	AOI03-01	15	8 - 13[1]	12.9	10.53	11.14	8.77	1.76

Notes:

[1] Temporary well screen set above total depth to capture groundwater interface

bgs = below ground surface

btoc = below top of casing

NA = not applicable

NAVD88 = North American Vertical Datum 1988

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CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/6/2022	GIS BY	MS	12/6/2022
SCALE	1:1,800	CHK BY	JW	12/6/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/6/2022

Legend

- Soil Boring/Groundwater Location
- Area of Interest
- Facility Location
- Wetland
- River/Stream
- Surface Water Flow Direction
- Groundwater Flow Direction

N

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.5**. **Table 6-2** through **Table 6-4** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

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

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

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

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

6.2 Soil Physicochemical Analyses

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy, 2006; Guelfo and Higgins, 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC, 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Building 320 (Main Hangar). The soil and groundwater results are summarized on **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

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

Soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (3 to 9 feet bgs) from boring locations AOI01-01 through AOI01-04. PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in soil at concentrations below their respective SLs. All detected concentrations in surface soil were equal to or less than 0.596 J (estimated concentration) micrograms per kilogram (µg/kg).

PFOA, PFOS, PFBS, PFHxS, and PFNA were also detected in shallow subsurface soil at AOI 1. All constituents were detected at concentrations equal to or less than 0.180 J µg/kg. No analytes exceeded SLs in subsurface soil.

Soil was also sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (3 to 7 feet bgs) at side-gradient location TMG-03. PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in surface soil below the SLs, and PFOA, PFOS, and PFNA were detected below the SLs in shallow subsurface soil. PFBS and PFHxS were not detected in shallow subsurface soil at TMG-03.

6.3.2 AOI 1 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring wells AOI01-01 through AOI01-04. The following exceedances of the SLs were measured:

- PFOA was detected above the SL of 6 nanograms per liter (ng/L) in one of the four wells, with a concentration of 8.20 ng/L at AOI01-04.

- PFOS was detected above the SL of 4 ng/L at three of the four wells, with concentrations ranging from of 6.96 ng/L to 53.8 ng/L.
- PFNA was detected above the SL of 6 ng/L at one of the four wells, with a concentration of 6.89 ng/L at AOI01-04.

PFBS and PFHxS were detected below their SLs in all four wells, with their highest concentrations occurring at AOI01-04.

Groundwater was also sampled from side-gradient location TMG-03. PFOS exceeded the SL, with a concentration of 9.91 ng/L. PFOA, PFBS, PFHxS, and PFNA were detected below their SLs at TMG-03.

6.3.3 AOI 1 Conclusions

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

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Building 323 (Engine Shop). The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

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

Soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (3 to 7 feet bgs) from boring locations AOI02-01 through AOI02-03. PFOA, PFOS, PFBS, and PFNA were detected in surface soil, at concentrations equal to or less than 1.25 µg/kg and below their SLs; PFHxS was not detected. PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in shallow subsurface soil, at concentrations equal to or less than 0.835 J µg/kg. All detected concentrations in shallow subsurface soil were below the respective SLs.

Soil was also sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (2 to 7 feet bgs) at the potentially upgradient location TMG-01 and downgradient location TMG-02. PFOS and PFNA were detected in surface soil, below their SLs, at each location. PFOA, PFBS, and PFHxS were not detected in surface soil at TMG-01 or TMG-02. PFOA, PFOS, PFHxS, and PFNA were detected below their SLs in shallow subsurface soil at TMG-01, and PFOA, PFOS, and PFNA were detected below their SLs in shallow subsurface soil at TMG-02. PFHxS was not detected in shallow subsurface soil at TMG-02, and PFBS was not detected in shallow subsurface soil at either location.

6.4.2 AOI 2 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring wells AOI02-01 through AOI02-03. The following exceedances of the SLs were measured:

- PFOA was detected above the SL of 6 ng/L in all three wells, with concentrations ranging from 6.82 ng/L to 143 ng/L.
- PFOS was detected above the SL of 4 ng/L at two of the three wells, with concentrations ranging from of 4.63 ng/L at AOI02-02 to 11.8 ng/L at AOI02-03.
- PFNA was detected above the SL of 6 ng/L at two of the three wells, with concentrations ranging from of 8.57 ng/L at AOI02-03 to 18.5 ng/L at AOI02-02.

PFBS and PFHxS were detected below their SLs in all three wells.

Groundwater was also sampled from the potentially upgradient location TMG-01 and downgradient location TMG-02. PFOA, PFOS, PFBS, PFHxS, and PFNA were detected below their SLs at TMG-01. PFOA and PFOS were detected above their SLs at TMG-02, with concentrations of 10.8 ng/L and 15.0 ng/L, respectively. PFBS, PFHxS, and PFNA were detected below their SLs at TMG-02.

6.4.3 AOI 2 Conclusions

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

6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 3: Building 325 (State Equipment Storage Building). The results in soil and groundwater are presented in **Table 6-2** through **Table 6-4**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.5.1 AOI 3 Soil Analytical Results

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

Soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (3 to 7 feet bgs) from boring location AOI03-01. PFOS and PFNA were detected below their SLs in surface and shallow subsurface soil, and no other relevant compounds were detected in soil at AOI03-01.

6.5.2 AOI 3 Groundwater Analytical Results

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

Groundwater was sampled from temporary monitoring well AOI03-01. PFOS was detected above the SL of 4 ng/L, with a concentration of 9.89 ng/L. PFOA, PFBS, PFHxS, and PFNA were detected in groundwater, below their SLs, at concentrations equal to or less than 3.74 J ng/L.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOS and PFNA were detected in soil below their respective SLs. PFOS was detected in groundwater, at a concentration above its SL. Based on the exceedance of the PFOS SLs in groundwater, further evaluation at AOI 3 is warranted.

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

Area of Interest		AOI01														AOI02					
Sample ID		AOI01-01-SB-00-02		AOI01-02-SB-00-02		AOI01-03-SB-00-02		AOI01-03-SB-00-02-D		AOI01-04-SB-00-02		TMG-03-SB-00-02		TMG-03-SB-00-02-D		AOI02-01-SB-00-02		AOI02-02-SB-00-02		AOI02-03-SB-00-02	
Sample Date		05/16/2022		05/16/2022		05/17/2022		05/17/2022		05/19/2022		05/16/2022		05/16/2022		05/18/2022		05/18/2022		05/18/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	1900	ND	U	ND	U	ND	U	ND	U	0.032	J	0.030	J	0.030	J	0.024	J	0.044	J	0.020	J
PFHxS	130	0.051	J	ND	U	ND	UJ	0.033	J	0.048	J	0.038	J	0.045	J	ND	U	ND	U	ND	U
PFNA	19	0.041	J	0.047	J	0.064	J	0.076	J	0.229	J	0.102	J	0.089	J	0.022	J	1.17		ND	U
PFOA	19	0.168	J	0.209	J	ND	UJ	0.096	J	0.140	J	0.224	J	0.218	J	ND	U	1.25		ND	U
PFOS	13	0.186	J	0.234	J	0.182	J	0.228	J	0.596	J	0.453	J	0.411	J	0.100	J	0.462	J	0.077	J

Notes:

ND = Analyte not detected above the LOD

LOD values are presented in Appendix F

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest		AOI02				AOI03	
Sample ID		TMG-01-SB-00-02		TMG-02-SB-00-02		AOI03-01-SB-00-02	
Sample Date		05/18/2022		05/17/2022		05/17/2022	
Depth		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)							
PFBS	1900	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U
PFNA	19	0.121	J	0.031	J	0.027	J
PFOA	19	ND	U	ND	U	ND	U
PFOS	13	0.422	J	0.086	J	0.245	J

Notes:

ND = Analyte not detected above the LOD

LOD values are presented in Appendix F

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, TASMG-Groton

Area of Interest		AOI01																			
Sample ID		AOI01-01-SB-03-04		AOI01-01-SB-04-06		AOI01-02-SB-04-05		AOI01-02-SB-08-09		AOI01-03-SB-03-05		AOI01-03-SB-05-07		AOI01-04-SB-03-05		AOI01-04-SB-03-05-D		AOI01-04-SB-07-08		TMG-03-SB-03-04	
Sample Date		05/16/2022		05/16/2022		05/16/2022		05/16/2022		05/17/2022		05/17/2022		05/19/2022		05/19/2022		05/19/2022		05/16/2022	
Depth		3-4 ft		4-6 ft		4-5 ft		8-9 ft		3-5 ft		5-7 ft		3-5 ft		3-5 ft		7-8 ft		3-4 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	25000	ND	U	ND	U	0.046	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.030	J	ND	UJ	ND	U	ND	U
PFNA	250	0.025	J	ND	U	0.026	J	ND	U	0.035	J	ND	U	0.073	J	0.074	J	ND	U	0.029	J
PFOA	250	0.091	J	ND	U	ND	U	ND	U	ND	U	ND	U	0.138	J	0.128	J	ND	U	0.164	J
PFOS	160	0.103	J	ND	U	0.137	J	ND	U	0.086	J	ND	U	0.180	J	0.176	J	ND	U	0.116	J

Notes:

ND = Analyte not detected above the LOD

LOD values are presented in Appendix F

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, TASMG-Groton

Area of Interest		AOI01		AOI02																	
Sample ID		TMG-03-SB-06-07		AOI02-01-SB-04-05		AOI02-01-SB-05-06.5		AOI02-01-SB-05-06.5-D		AOI02-02-SB-03-05		AOI02-02-SB-05-07		AOI02-03-SB-04-06		AOI02-03-SB-06-07		TMG-01-SB-02-04		TMG-01-SB-04-05	
Sample Date		05/16/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022		05/18/2022	
Depth		6-7 ft		4-5 ft		5-6.5 ft		5-6.5 ft		3-5 ft		5-7 ft		4-6 ft		6-7 ft		2-4 ft		4-5 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBS	25000	ND	U	ND	U	ND	U	ND	U	0.032	J	0.036	J	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	0.373	J	0.117	J	0.152	J	ND	U	ND	U	ND	U	ND	U	0.058	J	0.060	J
PFNA	250	ND	U	0.029	J	ND	U	ND	U	0.488	J	0.430	J	0.089	J	0.069	J	0.208	J	0.162	J
PFOA	250	ND	U	0.666	J	ND	U	ND	U	0.835	J	0.422	J	ND	U	0.141	J	0.180	J	0.176	J
PFOS	160	ND	U	0.097	J	ND	U	ND	U	0.370	J	0.329	J	0.206	J	0.068	J	0.783	J	0.653	J

Notes:

ND = Analyte not detected above the LOD

LOD values are presented in Appendix F

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, TASMG-Groton

Area of Interest		AOI02				AOI03			
Sample ID		TMG-02-SB-02-04		TMG-02-SB-05-07		AOI03-01-SB-03-05		AOI03-01-SB-05-07	
Sample Date		05/17/2022		05/17/2022		05/17/2022		05/17/2022	
Depth		2-4 ft		5-7 ft		3-5 ft		5-7 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)									
PFBS	25000	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U
PFNA	250	0.025	J	ND	U	0.052	J	0.158	J
PFOA	250	0.121	J	ND	U	ND	U	ND	U
PFOS	160	0.059	J	ND	U	0.579	J	0.472	J

Notes:

ND = Analyte not detected above the LOD

LOD values are presented in Appendix F

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, TASMG-Groton

Area of Interest		AOI01										AOI02							
Sample ID		AOI01-01-GW		AOI01-01-GW-D		AOI01-02-GW		AOI01-03-GW		AOI01-04-GW		AOI02-01-GW		AOI02-02-GW		AOI02-02-GW-D		AOI02-03-GW	
Sample Date		05/17/2022		05/17/2022		05/17/2022		05/17/2022		05/19/2022		05/19/2022		05/18/2022		05/18/2022		05/18/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																			
PFBS	601	0.813	J	0.974	J	1.52	J	7.68		8.29		7.76		20.2	J	28.6	J	90.2	
PFHxS	39	1.55	J	1.78	J	3.42	J	19.5		31.0		9.48		6.48		9.83		3.23	J
PFNA	6	3.07	J	3.61	J	2.37	J	1.15	J	6.89		3.76	J	13.9		18.5		8.57	
PFOA	6	1.46	J	1.63	J	3.83	J	4.88		8.20		143		58.3	J	82.9	J	6.82	
PFOS	4	1.99	J	2.44	J	6.96		21.5		53.8		1.60	J	4.63		6.57		11.8	

Notes:
ND = Analyte not detected above the LOD
LOD values are presented in Appendix F
Grey Fill — Detected concentration exceeded OSD Screening Levels

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

Interpreted Qualifiers
J = Estimated concentration

Chemical Abbreviations

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

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
GW	groundwater
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
TASMG	Theater Aviation Support Maintenance Group
TMG	TASMG-Groton
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, TASMG-Groton

	Area of Interest	AOI03		Sitewide					
	Sample ID	AOI03-01-GW		TMG-01-GW		TMG-02-GW		TMG-03-GW	
	Sample Date	05/18/2022		05/19/2022		05/17/2022		05/17/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)									
PFBS	601	1.37	J	4.10		8.65		0.895	J
PFHxS	39	2.63	J	7.27		16.1		3.89	J
PFNA	6	3.70	J	1.64	J	5.45		3.56	J
PFOA	6	3.74	J	3.48	J	10.8		1.22	J
PFOS	4	9.89		3.29	J	15.0		9.91	

Notes:
ND = Analyte not detected above the LOD
LOD values are presented in Appendix F
Grey Fill — Detected concentration exceeded OSD Screening Levels

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

Interpreted Qualifiers
J = Estimated concentration

Chemical Abbreviations

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

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
GW	groundwater
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
TASMG	Theater Aviation Support Maintenance Group
TMG	TASMG-Groton
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

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CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream

0 150 300 600 Feet

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

N

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1

CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream

0 150 300 600 Feet

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

N

PFOS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2

CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream

0 150 300 600 Feet

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

N

PFBS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-3

CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream

0 150 300 600 Feet

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

N

PFHxS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4

CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream

0 150 300 600 Feet

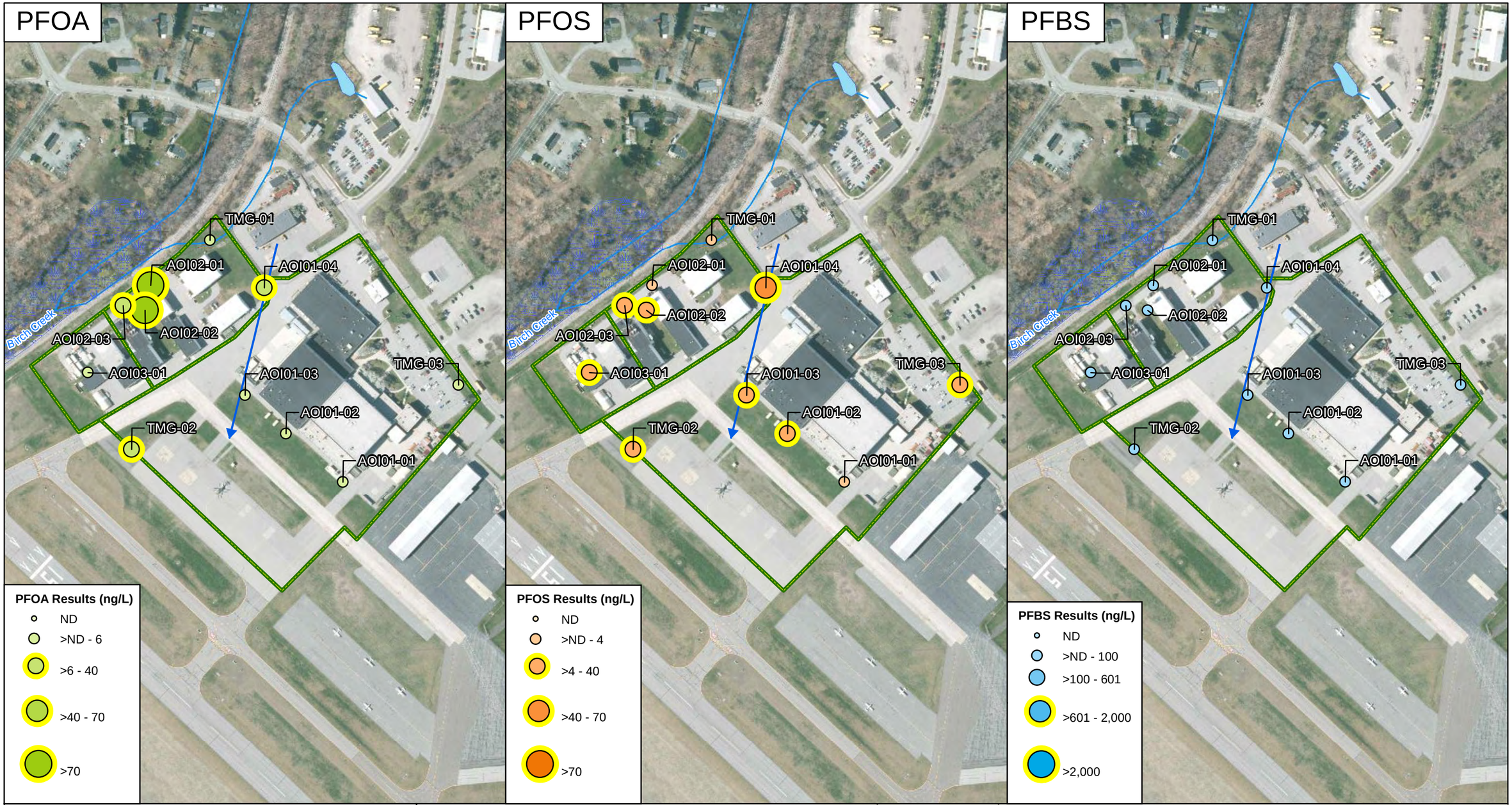
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location

N

PFNA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-5



CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	12/15/2022	GIS BY	MS	12/15/2022
SCALE	1:3,600	CHK BY	JW	12/15/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	12/15/2022

Facility Location
Water Body
Wetland
River/Stream
Groundwater Flow Direction

0 150 300 600 Feet

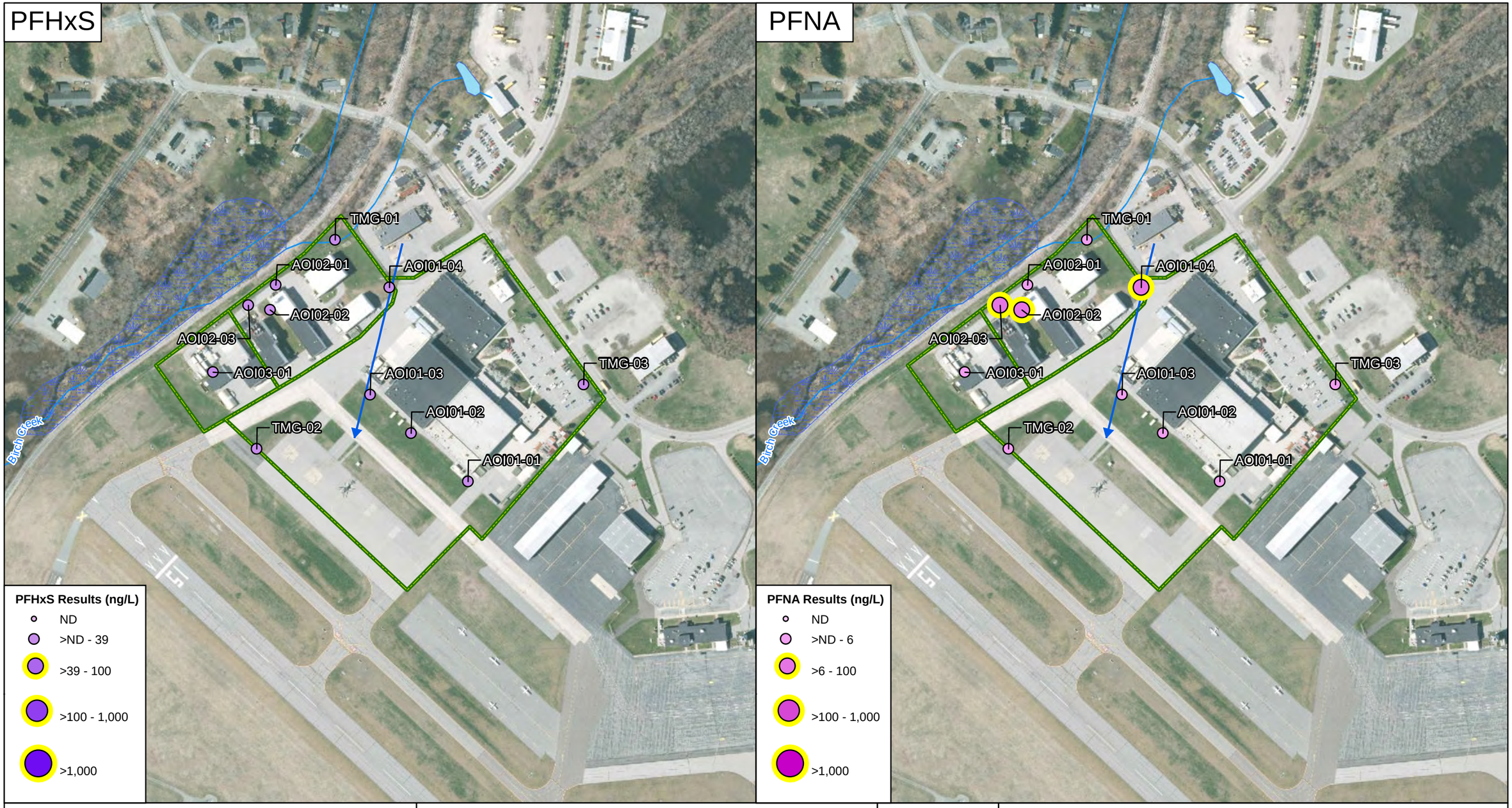
Exceedances of the OSD SL are depicted with a yellow halo.

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-6



CLIENT	ARNG			
PROJECT	Site Inspection at TASMG Groton, CT			
REVISED	2/23/2023	GIS BY	MS	2/23/2023
SCALE	1:3,600	CHK BY	JW	2/23/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	2/23/2023

Facility Location
Water Body
Wetland
River/Stream
Groundwater Flow Direction

0 150 300 600 Feet

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

N

PFHxS and PFNA Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-7

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7. Exposure Pathways

The CSM for each AOI, revised based on the SI findings, is presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

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

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1, AOI 2, and AOI 3 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is Building 320, the Main Hangar at TASMG-Groton where AFFF-laden water may have been released to the building perimeter during the AFFF fire suppression system test events between 2008 and the present. Landscaped areas exist adjacent to Building 320. Surface soil in the landscaped areas near Building 320 may have received surface water runoff containing AFFF constituents as a result of spillage at the test ports during system testing.

PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in surface soil at AOI 1 as well as the side-gradient sample location TMG-03 below their respective SLs. Site workers, future construction workers, and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. There was no active construction occurring at the time of the SI. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. Residential areas exist within 0.5 miles of the facility to the north, west, and southwest of the facility; therefore, the exposure pathway for off-facility residents via inhalation of dust is also considered potentially complete. PFOA, PFOS, PFBS, PFHxS, and PFNA were also detected in subsurface soil at AOI 1 below their respective SLs. Potential future construction workers could contact constituents in subsurface soil via incidental ingestion; therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is Building 323, the Engine Shop, where AFFF releases occurred during fire suppression system discharges circa 2010-2012 and 2014. During the events, AFFF drained to the interior building floor drains that connect to an OWS but could have also escaped the building through the garage door or beneath entryway doors. Landscaped and wooded areas exist adjacent to Building 323. Surface soil in these may have received AFFF flowing outwardly from the building or surface water runoff containing AFFF as a result of the releases.

PFOA, PFOS, PFBS, and PFNA were detected in surface soil at AOI 2 below their respective SLs. PFOS and PFNA were also detected in surface soil at the potentially upgradient location TMG-01 and downgradient location TMG-02 below their respective SLs. Location TMG-01 is upgradient of groundwater flow from AOI 2; however, it may be downgradient of surface runoff from the AOI. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers, and trespassers are potentially complete. The exposure pathway for off-facility residents via inhalation of dust is also considered potentially complete, as described in **Section 7.1.1**. PFOA, PFOS, PFBS, PFHxS, and PFNA were also detected in shallow subsurface soil at AOI 2. Additionally, PFOA, PFOS, PFHxS, and PFNA were detected in shallow subsurface soil between TMG-01 and TMG-02. All detected concentrations were below the respective SLs. Potential future construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.1.3 AOI 3

AOI 3 consists of Building 325 and its adjacent storage area where potentially AFFF-laden water generated from the test ports at Building 320 is temporarily stored in barrels prior to disposal. The storage area is unsheltered, and barrels are subject to corrosion due to the elements. It is also possible that spillage may occur to the nearby grassy and paved surfaces.

PFOS and PFNA were detected in surface soil at AOI 3 below their respective SLs. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, construction workers, and trespassers are potentially complete. The exposure pathway for off-facility residents via inhalation of dust is also considered potentially complete, as described in **Section 7.1.1**. PFOS and PFNA were detected in subsurface soil at AOI 3 below their respective SLs. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 3 is presented on **Figure 7-1**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1

PFOA, PFOS, and PFNA were detected above their SLs in groundwater samples collected at AOI 1, and PFOS was detected above its SL at the side-gradient location TMG-03. The groundwater underlying TASMG-Groton and the larger surrounding airport area is designated as “class GB” by the CTDEEP, which indicates the groundwater is assumed to be degraded due to likely pollution sources, and it is not suitable for human consumption without treatment (CAA, 2013). Due to the groundwater designation as class GB, the pathway for exposure to off-facility residents via ingestion of groundwater is considered incomplete. The facility is supplied drinking water by the Groton Utilities Water Operations, and there are no potable water wells at the facility. Depths to water measured at AOI 1 in May 2022 during the SI ranged from 7.35 to 9.52 feet bgs. Therefore, the ingestion exposure pathway for future construction workers is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA, PFOS, and PFNA were detected above their SLs in groundwater samples collected at AOI 2; and PFOA and PFOS were detected above their SLs in groundwater samples collected at the downgradient location TMG-02. No relevant compounds were detected above their SLs in groundwater at the upgradient location TMG-01. The pathway for exposure to off-facility residents and site workers via ingestion of groundwater is considered incomplete for the reasons described in **Section 7.2.1**. Depths to water measured in May 2022 during the SI ranged from 1.12 to 8.19 feet bgs. Therefore, the ingestion exposure pathway for future construction workers is considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.2.3 AOI 3

PFOS was detected above its SL in the groundwater sample collected at AOI 3. The pathway for exposure to off-facility residents and site workers via ingestion of groundwater is considered incomplete for the reasons described in **Section 7.2.1**. Depth to water measured in May 2022 during the SI at AOI 3 was 8.77 feet bgs. Therefore, the ingestion exposure pathway for future construction workers is considered potentially complete. The CSM for AOI 3 is presented on **Figure 7-1**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors. No surface water or sediment samples were collected during the SI.

7.3.1 AOI 1

Catch basins located near Building 320 channel surface runoff west to a wetland area that is associated with Birch Creek, which flows to Baker Cove and the Long Island Sound. In general, surface runoff at the facility drains west towards the Birch Creek. It is possible that AFFF-laden water could have entered the catch basins during fire suppression system testing at AOI 1. Additionally, a stormwater outlet pipe also conveys runoff to an area on the northwestern border

of the facility filled with cattails and other vegetation associated with wetlands. PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off.

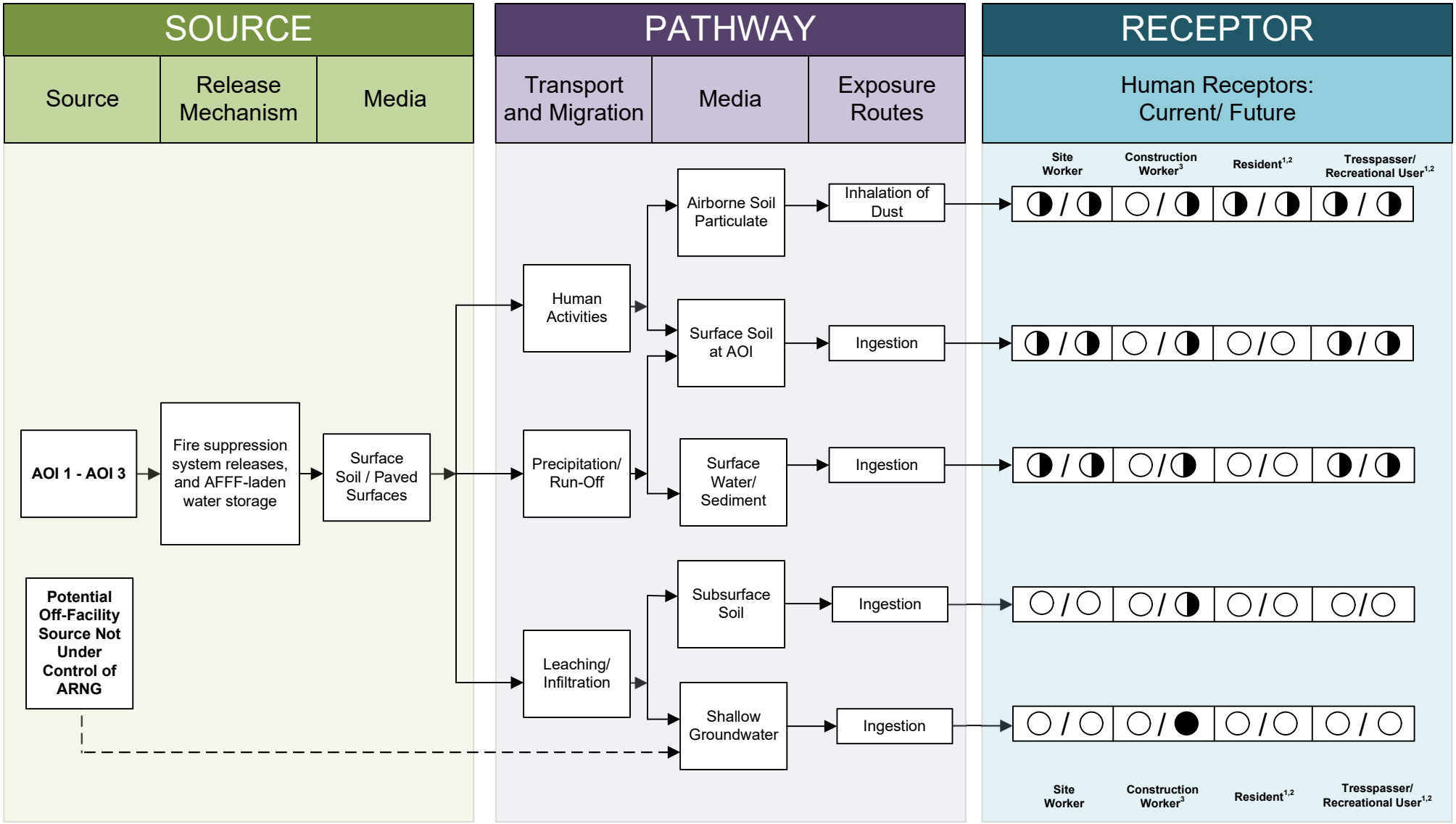
Because PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in soil and groundwater at AOI 1, it is possible that those compounds may have migrated via runoff from soil and groundwater to the wetland on the northwestern facility border and to the wetlands west of the facility. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The surface water and sediment ingestion exposure pathway is also considered potentially complete for recreational users of the surface water bodies downgradient from AOI 1, such as Birch Creek and Baker Cove. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

During fire suppression system releases at AOI 2, AFFF could have migrated from the building towards the non-delineated wetland area located approximately 180 feet northeast (at the northwestern border of the facility) or west towards Birch Creek. Because PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in soil and groundwater at AOI 2 and associated locations TMG-01 and TMG-02, it is possible that those compounds may have migrated via runoff from soil and groundwater to the wetland on the northwestern facility border and to the wetlands west of the facility. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The surface water and sediment ingestion exposure pathway is also considered potentially complete for recreational users of the surface water bodies downgradient from AOI 2. The CSM for AOI 2 is presented on **Figure 7-1**.

7.3.3 AOI 3

Surface runoff at AOI 3 may flow southeast or northwest if spillage occurs, and runoff to the northwest could reach Birch Creek or the wetland on the northwest border of the facility. Because PFOS and PFNA were detected in soil, and PFOA, PFOS, PFBS, PFHxS, and PFNA were detected in groundwater at AOI 3, it is possible that those compounds may have migrated via runoff from soil and groundwater to the wetland on the northwestern facility border and to the wetlands west of the facility. Therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, or trespassers is considered potentially complete. The surface water and sediment ingestion exposure pathway is also considered potentially complete for recreational users of the surface water bodies downgradient from AOI 3. The CSM is presented on **Figure 7-1**.



LEGEND

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

Notes:

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

Figure 7-1
Conceptual Site Model, AOI 1 – AOI 3
TASMG-Groton, CT

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8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted from 12 to 19 May 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation and subsequent abandonment, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- Thirty-three (33) soil samples from 11 boring locations;
- Eleven (11) grab groundwater samples from 11 temporary well locations;
- Nineteen (19) quality assurance QA/QC samples.

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

8.2 Outcome

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1, AOI 2, and AOI 3. Based on the CSM developed and revised in light of the SI findings, there is no potential for exposure to drinking water receptors, aside from potential future construction workers, due to historical DoD activities at the facility. Sample analytical concentrations collected during the SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - The detected concentrations of PFOA, PFOS, PFBS, PFHxS, and PFNA in soil at AOI 1 and TMG-03 were below their SLs.
    - PFOA, PFOS, and PFNA in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 8.20 ng/L at location AOI01-04. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 53.8 ng/L at location AOI01-04. PFNA exceeded the SL of 6 ng/L, with a maximum concentration of 6.89 ng/L at location AOI01-04. Additionally, PFOS exceeded its SL at side-gradient location TMG-03, with a concentration of 9.91 ng/L. Based on the exceedances of SLs, further evaluation of AOI 1 is warranted in an RI.

- At AOI 2:
    - The detected concentrations of PFOA, PFOS, PFBS, PFHxS, and PFNA in soil at AOI 2, TMG-01 and TMG-02, were below their SLs.
    - PFOA, PFOS, and PFNA in groundwater exceeded their SLs. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 143 ng/L at location AOI02-01. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 11.8 ng/L at location AOI02-03. PFNA exceeded the SL of 6 ng/L, with a maximum concentration of 18.5 ng/L at location AOI02-02. Additionally, PFOA and PFOS exceeded their SLs at downgradient location TMG-02, with concentrations of 10.58 ng/L and 15.0 ng/L, respectively. No analytes exceeded SLs at upgradient location TMG-01. Based on the exceedances of SLs, further evaluation of AOI 2 is warranted in an RI.
- At AOI 3:
    - The detected concentrations of PFOS and PFNA in soil at AOI 3 were below their SLs.
    - PFOS in groundwater exceeded the SL of 4 ng/L, with a concentration of 9.89 ng/L at AOI03-01. Based on the exceedance of SLs, further evaluation of AOI 3 is warranted in an RI.

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Building 320 – Main Hangar	◐	●	N/A	Proceed to RI
2	Building 323 – Engine Shop	◐	●	◐	Proceed to RI
3	Building 325 – State Equipment Storage Building	◐	●	N/A	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

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