FINAL
Site Inspection Report
Salisbury Army Aviation Support Facility #2, North Carolina

Perfluorooctanesulfonic Acid (PFOS) and
Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

May 2022

Prepared for:

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

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Acronyms and Abbreviations

%	percent
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
6:2 FTS	6:2 Fluorotelomer sulfonic acid
8:2 FTS	8:2 Fluorotelomer sulfonic acid
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
AOI	Area of Interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DL	detection limit
DQI	data quality indicator
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
HA	Health Advisory
HDPE	high-density polyethylene
IDW	investigation-derived waste
IIS	injection internal standards
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOQ	limit of quantitation
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NCARNG	North Carolina Army National Guard
NC HART	North Carolina Helicopter Aquatic Rescue Team
ND	not detected
NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
ng/L	nanograms per liter
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
ORP	oxidation-reduction potential

OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutyrate
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUdA	perfluoroundecanoic acid
PID	photoionization detector
PVC	poly-vinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	relative percent differences
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TCRA	Time Critical Removal Action
TOC	total organic carbon
TPP	Technical Project Planning
UCMR 3	Third Unregulated Contaminant Monitoring Rule
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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Executive Summary

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). An SI was completed at Salisbury Army Aviation Support Facility (AASF) #2 in Salisbury, North Carolina. Salisbury AASF #2 will also be referred to as the "facility" throughout this document.

Salisbury AASF #2 is on the western side of the runway at the Mid-Carolina Regional Airport (Rowan County Airport). The facility is in Rowan County, North Carolina, roughly 40 miles northeast of Charlotte, North Carolina. The facility includes hangar space, a parking apron, flight ramp, wash rack, firehouse, armory building, operations and maintenance support buildings, a fuel farm, and a taxiway connecting to the airport runway.

During the PA for PFAS, 15 potential PFAS release areas were identified (AECOM, 2020). PFAS-containing aqueous film forming foam (AFFF) may have been released during fire responses, fire training activities, AFFF storage/handling, and cleaning of fire response vehicles. The potential PFAS release areas were grouped into four AOIs, which were investigated during the SI. The SI field activities were conducted from 7 to 17 June 2021 and included the collection of soil and groundwater samples.

To fulfill the project Data Quality Objectives set forth in the approved SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 PFAS by liquid chromatography with tandem mass spectrometry compliant with Quality Systems Manual 5.3 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.7** of this Report. No reportable accidents, exposures or other health & safety issues occurred during the execution of the field work.

The Department of Defense (DoD) has adopted a policy to retain facilities in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum and there is a release identified that is likely attributed to ARNG activities, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

The SLs are presented on **Table ES-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

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

- At AOI 1, PFOS in groundwater at the potential release areas exceeded the SL of 40 nanograms per liter (ng/L) with a maximum concentration of 139 ng/L at location AOI01-04. PFOS in groundwater downgradient of AOI 1 also exceeded the USEPA HA SL of 70 ng/L. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.
- At AOI 2, PFOA and PFOS in groundwater at the potential release areas exceeded the SLs of 40 ng/L with maximum concentrations of 85.2 ng/L and 2,700 ng/L, respectively, at

location AOI02-MW-1 (existing Rowan County Monitoring Well). PFOA and PFOS in groundwater downgradient of AOI 2 also exceeded the individual and combined USEPA HA SL of 70 ng/L. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

- At AOI 3, PFOA in groundwater at the potential PFAS release areas exceeded the SL of 40 ng/L, with a concentration of 93.5 ng/L at location AOI03-03. Additionally, PFOS in groundwater at the potential PFAS release areas exceeded the SL of 40 ng/L, with a concentration of 50.5 ng/L at location PFOA in groundwater at the Ornamental Firetruck Parking Location also exceeded the USEPA HA SL of 70 ng/L. AOI03-02. Based on the results of the SI, further evaluation of AOI 3 is warranted in the RI.
- At AOI 4, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below SLs. Based on the results of the SI, no further evaluation of AOI 4 is warranted. If screening levels are revised in the future, further evaluation of AOI 4 may be required.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at all AOIs were below the SLs.

Table ES-2 summarizes the SI results for soil and groundwater. Based on the conceptual site models (CSMs) developed and revised in light of the SI findings, there is potential for exposure to off-facility receptors caused by DoD activities at or adjacent to the facility.

Table ES-3 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo a Remedial Investigation (RI). Based on the results of this SI, further evaluation is warranted in the RI for AOI 1: Southern Portion of the facility, AOI 2: Central Portion of the facility, and AOI 3: Northern Portion of the facility.

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

Analyte	Residential (Soil) (µg/kg)[a,b] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a,b] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a,b]	USEPA HA (Groundwater representative of Drinking Water) (ng/L)[b,c]
PFOA	130	1,600	40	70
PFOS	130	1,600	40	70
PFBS	1,900	25,000	600	-

Notes:

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

b.) USEPA. 2016a. Drinking Water Health Advisory (HA) for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-005. May 2016. / USEPA. 2016b. Drinking Water HA for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-004. May 2016.

c.) USEPA HAs apply to the PFOA and PFOS concentrations individually or combined.

µg/kg= micrograms per kilogram

Table ES-2: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Southern Portion of Salisbury AASF #2 (Current Aircraft Apron FTA, Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse)	◐	●	●
2	Central Portion of Salisbury AASF #2 (Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale)	◐	●	●
3	Northern Portion of Salisbury AASF #2 (Former Firehouse #1, Firetruck Parking, Ornamental Firetruck Parking Location, Former Live Fire FTA	◐	●	◐
4	NC HART Training Area	◐	◐	◐

Legend:
N/A = not applicable
NC HART = North Carolina Helicopter Aquatic Rescue Team
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

Table ES-3: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Southern Portion of Salisbury AASF #2 (Current Aircraft Apron FTA, Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse)	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
2	Central Portion of Salisbury AASF #2 (Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale)	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
3	Northern Portion of Salisbury AASF #2 (Former Firehouse #1, Firetruck Parking, Ornamental Firetruck Parking Location, Former Live Fire FTA	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
4	NC HART Training Area	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action*

Notes:
* If screening levels are revised in the future, further evaluation of AOI 4 may be required.
NC HART = North Carolina Helicopter Aquatic Rescue Team

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites, ARNG Installations, Nationwide. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor, AECOM Technical Services, Inc. (AECOM), under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017. The ARNG performed this SI at Salisbury Army Aviation Support Facility (AASF) #2 in Salisbury, North Carolina. Salisbury AASF #2 is also referred to as the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 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 including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and polyfluoroalkyl substances (PFAS). The term PFAS is used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

1.2 SI Purpose

A PA was performed at Salisbury AASF #2 (AECOM, 2021) that identified 15 potential PFAS release areas at the facility, which were grouped into four Areas of Interest (AOIs). The objective of the SI is to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

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

1. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment;
2. Determine the potential need for a removal action;
3. Collect or develop data to evaluate potential release;
4. Collect data to better characterize the release for more effective and rapid initiation of a Remedial Investigation (RI), if determined necessary; and
5. Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

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

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2. Facility Background

2.1 Facility Location and Description

Salisbury AASF #2 is on the western side of the runway at the Mid-Carolina Regional Airport (Rowan County Airport) (**Figure 2-1**). The facility is in Rowan County, North Carolina, roughly 40 miles northeast of Charlotte, North Carolina. Rowan County is bordered by Cabarrus County to the south, Davidson County to the east, Davie County to the north, Iredell County to the west, and Stanly County to the southeast.

Salisbury AASF #2 was constructed in 1975. The facility includes hangar space, a parking apron, flight ramp, wash rack, firehouse, armory building, operations and maintenance support buildings, a fuel farm, and a taxiway connecting to the airport runway. The facility parking apron is 32,500 square yards and accommodates North Carolina ARNG (NCARNG) aircraft. Salisbury AASF #2 is primarily used for the performance of aircraft and equipment maintenance, aircraft refueling, hazardous material storage, aircraft painting, and vehicle and equipment refueling. The 430th Engineer Firefighting Team, stationed at the facility, provides fire service to the airport Monday through Friday (Talbert & Bright, 2011). Additionally, NCARNG has an informal mutual aid agreement for emergency response services with Rowan County, the City of Salisbury, and Locke Township, although the details of the agreement are unknown. The current property lease issues the facility property to the State of North Carolina from Rowan County for National Guard use from 2002 to 2099.

2.2 Facility Environmental Setting

Salisbury AASF #2 is in the Piedmont Region of North Carolina, which is characterized by small rolling hills. The facility sits at 734 feet above mean sea level surrounded by wooded areas (Environmental Data Resources, Inc.™ [EDR™], 2019). Topography across the southern portion of the facility is generally flat but slopes downward to the south and southwest along the southern boundary. In the northern portion of the facility, topography slopes downward, towards the northwest.

Roughly 10 percent (%) of the greater airport property is impervious, as it is covered by buildings and paved areas such as runways, taxiways, aircraft parking aprons, roadways, and parking lots. Unpaved areas across Salisbury AASF #2 are covered by vegetative surfaces, primarily mowed grass (Talbert & Bright, 2011). There are no water bodies within the NCARNG property boundary. The topography of the facility is shown on **Figure 2-2**.

2.2.1 Geology

Metamorphic, igneous, and sedimentary rock are found in the Piedmont region of North Carolina, with metamorphic rock being the most prevalent (Daniel, 1989); they range in composition from felsic to ultramafic. The metamorphic rocks here have been folded and refolded during multiple metamorphic and orogenic events. The rocks have also been broken and displaced by numerous faults and shearing, which can reach up to miles in length. There are many joints where there are rock fractures without displacement; they tend to cluster in groups oriented about one or more preferred directions (Daniel, 1989).

Salisbury AASF #2 is on the Charlotte Belt geologic feature. The oldest rocks in this area commonly are mafic gneisses, amphibolites, metagabbros, and metavolcanic rocks (Horton and Zullo, 1991). These features contain largely plutonic rocks that range in age from Late Proterozoic to late Paleozoic. This plutonic complex contains enclaves of metasedimentary and metavolcanic rocks that are most abundant toward the flanks (Gair, J.E. et. al., 1986). The older plutonic

complex is intruded by middle Paleozoic plutons that range from gabbro and syenite to granite and granodiorite, and by late Paleozoic, plutons that are typically porphyritic granite (Gair, J.E. et. al, 1986) (**Figure 2-3**). The soil in this area is categorized as Cecil-Pacolet, gently sloping to steep, well-drained upland soils that have a loamy surface layer and a predominantly clayey subsoil (US Department of Agriculture [USDA], 1995).

Soil borings completed during the SI found abundant lean clay, sandy lean clay, and clayey sand as the dominant lithology of the unconsolidated sediments below Salisbury AASF #2. Samples for grain size analyses were collected at three locations, AOI01-01-SB-8-10, AOI02-01-SB-0-2, and AOI03-1-SB-15-20, and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of silt (44.64% to 63.33%) and clay (12.96% to 33.35%). Borings were completed at depths between 20 and 60 feet below ground surface (bgs). Isolated layers of sand and silty sand were observed, along with varying percentages of gravel in some logs. In some borings at AOIs 3 and 4, saprolite and weathered bedrock were observed at varying depths. These observations are consistent with the understood geology of this region, including weathered metamorphic and igneous bedrock underlying fine-grained surficial sediments. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

Based on groundwater sampling data from monitoring wells at the closed Rowan County Landfill, adjacent to the west of Salisbury AASF #2, groundwater depths in the vicinity of the facility range from approximately 4 to 24 feet bgs (Golder Associates NC, Inc., 2018). The nearest US Geological Survey (USGS) groundwater information site is an inactive well (USGS 353819080291701 RO-057) located approximately 2 miles southeast of the facility. Groundwater at this location was measured at 40 feet bgs in 1954 (USGS, 2020).

There are no drinking water wells at Rowan County Airport or Salisbury AASF #2; drinking water and wastewater are provided by Salisbury-Rowan Utilities. Salisbury-Rowan Utilities sources its water from intakes at the confluence of the South Yadkin River and the Yadkin River, located approximately 8 miles northeast of the facility (Salisbury-Rowan Utilities, 2019). The North Carolina Department of Environmental Quality maintains a database of registered wells in the area. The database is only for public water supply wells and does not necessarily include private wells. Multiple public water system wells were also indicated to lie in all directions within a 4-mile radius of the facility, as shown on **Figure 2-3**.

The Unregulated Contaminant Monitoring Rule (UCMR) sampling program was an addition to the 1996 Safe Drinking Water Act, which requires that the USEPA to issue a new list, every 5 years, of no more than 30 unregulated contaminants to be monitored by public water systems. PFAS were added as part of the Third UCMR (UCMR 3) list. The UCMR 3 dataset indicated that no PFAS were detected in a public water system above the Health Advisory (HA) within 20 miles of Salisbury AASF #2 (USEPA, 2017a). The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2016 had method detection limits (MDLs) that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

Depths to water measured in June 2021 during the SI ranged from 4.85 feet bgs in AOI03-02 to 27.71 feet bgs in AOI04-03. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate that groundwater at the facility flows generally to the northwest. Groundwater contours were drawn using limited available data, and half of the wells were not developed prior to gauging.

2.2.3 Hydrology

The Yadkin River is the major water body that flows through Rowan County and makes up the border between Rowan, Davie, and Davidson Counties. The river flows in a northwest to southeast direction passing to the north and east of the facility. The river is dammed 12 miles east of the facility and forms High Rock Lake.

The Rowan County Airport has multiple drainage outfalls. Outfalls that receive runoff from areas where industrial activities have direct discharges to the stormwater system require visual inspection and qualitative monitoring by the Airport. There are three such outfalls and they all discharge to a channel east of the airfield and Airport Loop Road. This channel flows northward feeding into Grants Creek which eventually discharges to Yadkin River (Talbert & Bright, 2011). The Yadkin River is the main source of drinking water to the facility.

Salisbury AASF #2 is within the Upper Grants Creek watershed. Regional watersheds and surface drainage features within the vicinity of Salisbury AASF #2 are presented in **Figure 2-5**.

There are no surface water bodies located within the Salisbury AASF #2 property, but two concrete drainage structures, running south to north and east to west, are located within the facility property and receive drainage from paved areas north of the aircraft apron. The concrete drainage structures lead into a wooded drainage swale that flows north before presumably connecting with a tributary of Grants Creek or infiltrating into the ground. Another small stream/drainage swale flows west, away from the runway adjacent to the south of the facility, and discharges to Grants Creek, which is a tributary of the Yadkin River (US Fish and Wildlife Service [USFWS], 2020). The small stream/drainage swale receives drainage from the facility's aircraft apron and the western side of the runway.

2.2.4 Climate

The climate of Salisbury, North Carolina is humid subtropical characterized by cool to mild winters and hot humid summers, with evenly distributed precipitation throughout the year. July is the warmest month, with an average max daily temperature of 89.4 degrees Fahrenheit (°F) and an average daily low of 68.8 °F. January is the coldest month with an average daily max temperature of 50.4°F and an average daily low of 27.7 °F. Salisbury receives an annual precipitation amount of 42.03 inches. June is the wettest month and accumulates 4.19 inches, while November is the driest month and accumulates 3.07 inches. On average, Salisbury, North Carolina receives 9.9 inches of snowfall per year. Only one season, 2011-2012, had no measurable snowfall (National Oceanic and Atmospheric Administration, 2020).

2.2.5 Current and Future Land Use

Salisbury AASF #2 is currently a controlled access facility and is adjacent to the Mid-Carolina Regional Airport, also referred to as Rowan County Airport. The facility supports rotary aircraft operations for the NCARNG, and it is currently leased by the state of North Carolina from the Rowan County Airport for the duration of 2002 to 2099. The airport is owned and operated by Rowan County and provides commercial and general air service to the Carolinas. It is the intent of the airport and the NCARNG to expand the size and operations of the facility; however, reasonably anticipated future land use is not expected to change from the current land use described here.

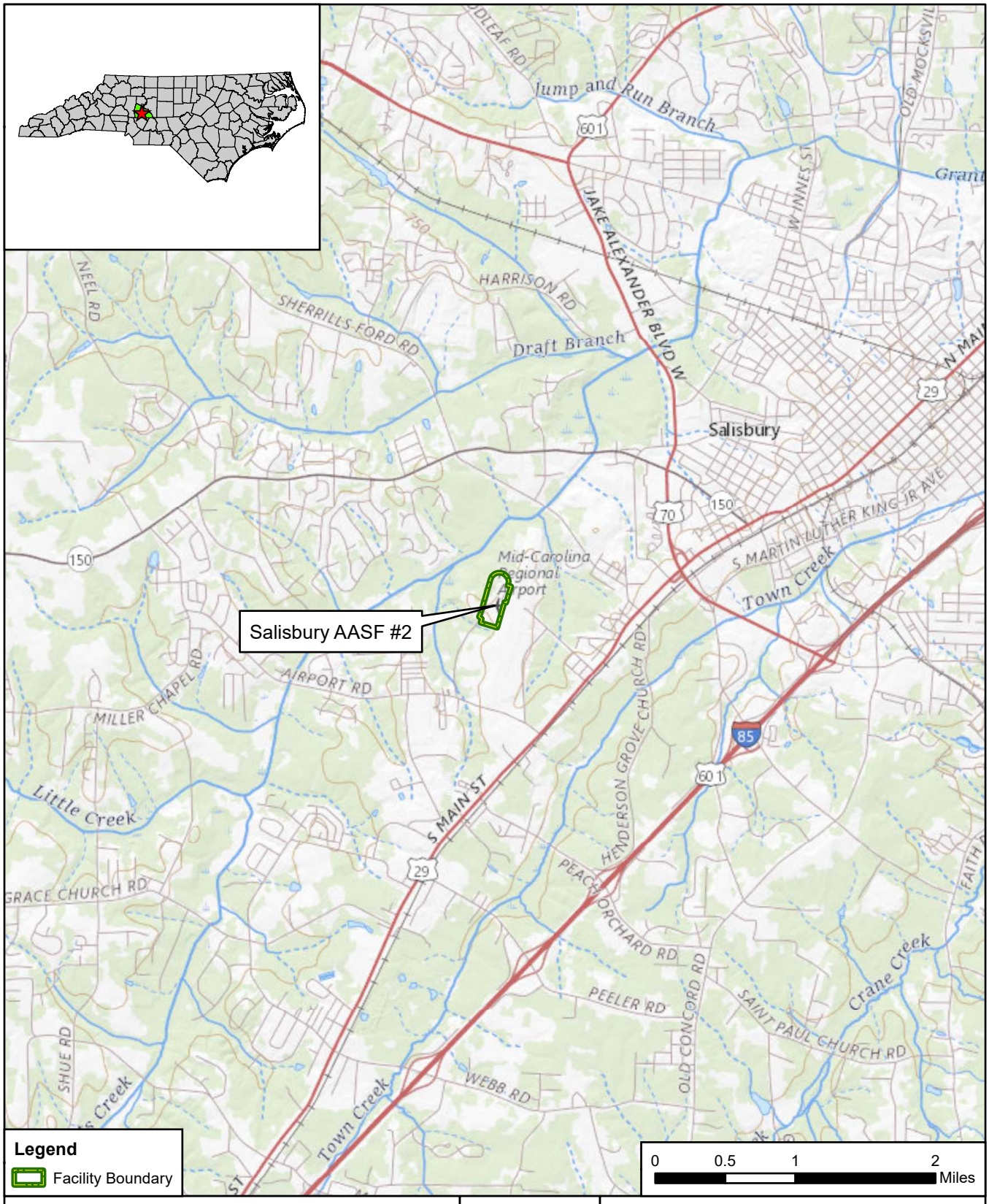
2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Rowan County, North Carolina (USFWS, 2021).

- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate).
- **Flowering plants:** Schweinitz' sunflower, *Helianthus schweinitzii* (endangered); Georgia aster, *Symphyotrichum georgianum* (resolved taxon).

2.3 History of PFAS Use

Fifteen (15) potential PFAS release areas where aqueous film forming foam (AFFF) may have been used or released historically were identified at Salisbury AASF #2 during the PA (AECOM, 2020). PFAS were potentially released within the boundary of Salisbury AASF #2 during fire training exercises, fire emergency responses, AFFF storage/handling activities, and secondary release areas. The potential PFAS release areas were grouped into four AOIs based on proximity to one another and presumed groundwater flow. A description of each AOI is presented in **Section 3**.



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Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

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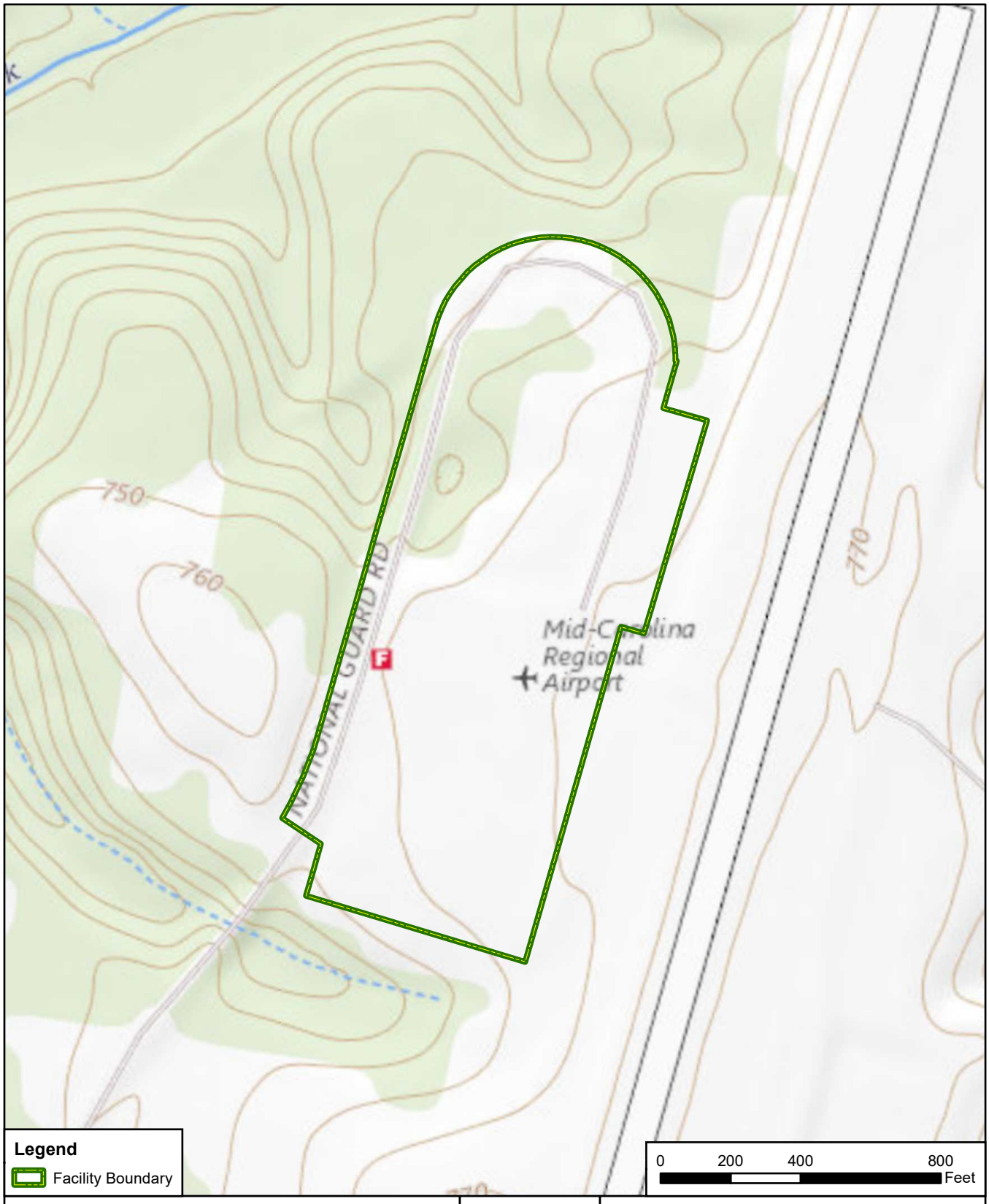

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Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2

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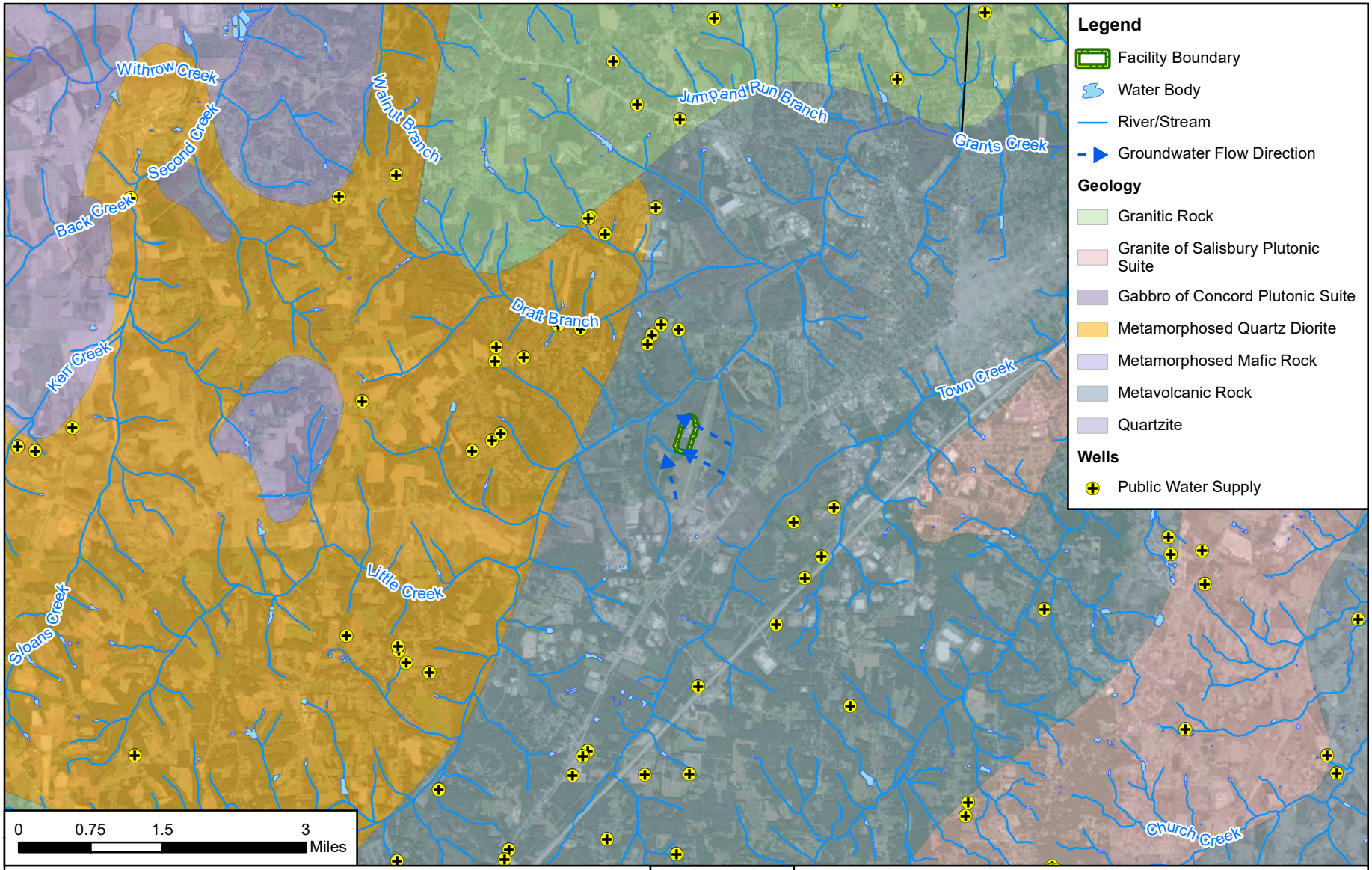

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Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

TITLE

Groundwater Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3

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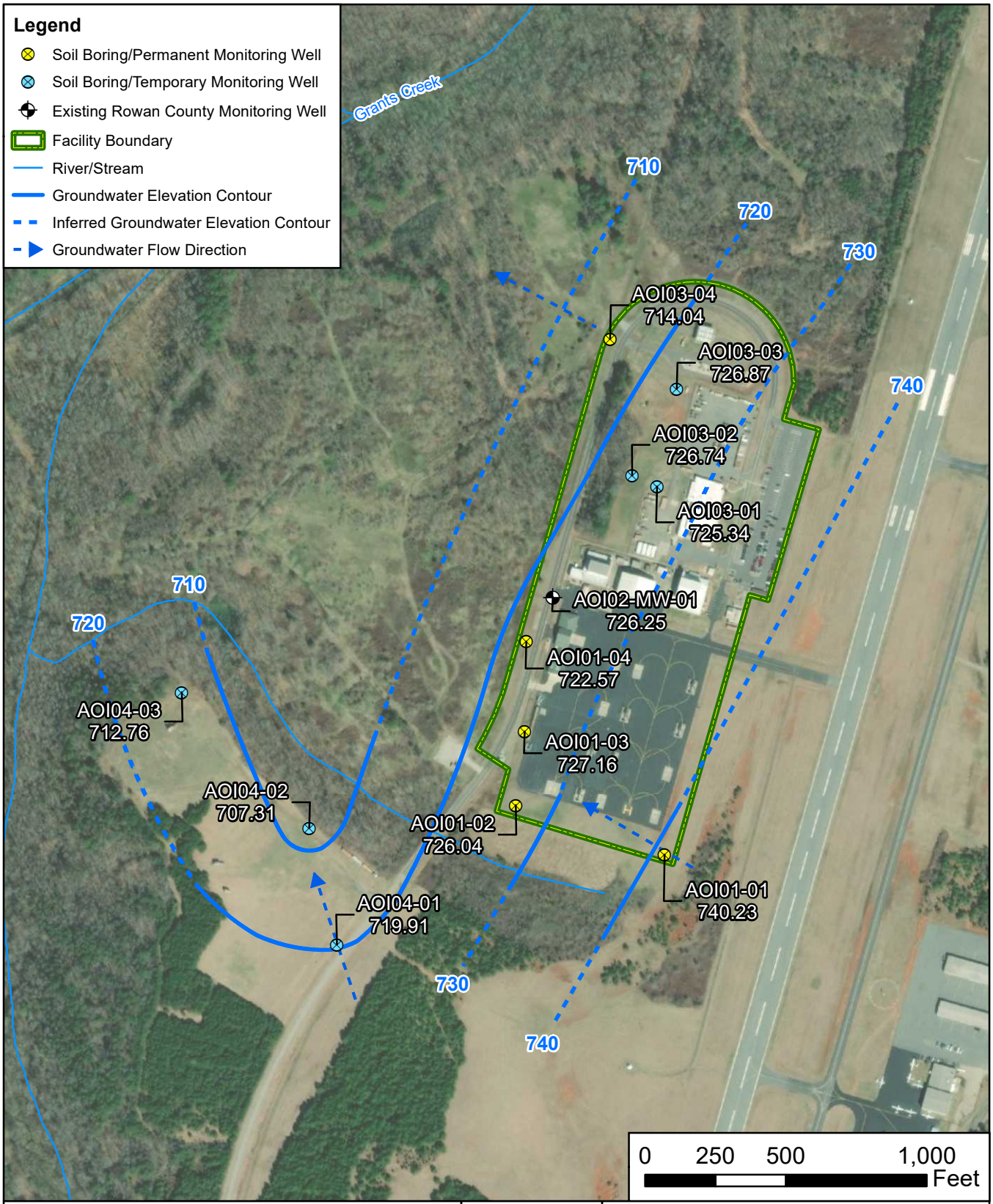

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Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	1/10/2022

N

Groundwater Elevations, June 2021

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4

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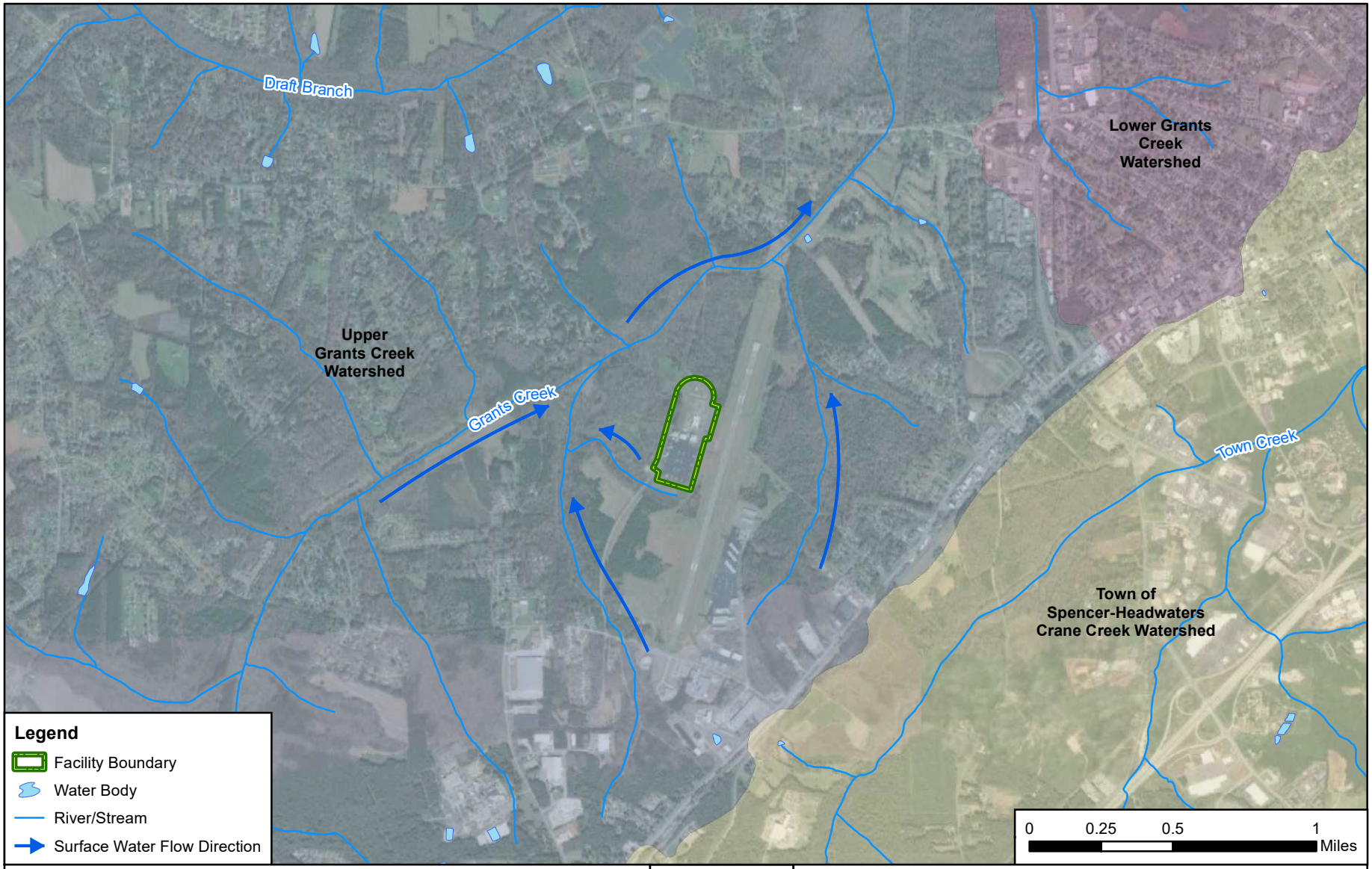

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:31,680	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

TITLE

Surface Water Features

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Figure 2-5

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3. Summary of Areas of Interest

This section presents a summary of each potential PFAS release area by AOI. Based on the PA findings, 15 potential PFAS release areas were identified at Salisbury AASF #2 and grouped into four AOIs (AECOM, 2020). The potential PFAS release areas are shown on **Figure 3-1**.

3.1 AOI 1 Current Aircraft Apron Fire Training Area, Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse

AOI 1 consists of four potential PFAS release areas: the Current Aircraft Apron fire training area (FTA), Aircraft Apron Fuel Spills, Defueling Pad, Current Firehouse, and the grassy areas surrounding the potential release areas. Based on PA findings, these are areas of known or suspected AFFF use and storage.

Potentially PFAS-laden water was dispensed at the FTA during training events towards the grassy area at the southwest corner of the apron and may migrate via runoff towards a drainage swale that flows downslope to the west, towards Grants Creek. AFFF has been used in response to historical fuel spills as a preventative measure to combat potential fires across the Aircraft Apron and Defueling Pad. Tri-Max™ 30 fire extinguishers have also been stored on the apron at various times. The Current Firehouse stores AFFF on firefighting vehicles and previously stored AFFF in 5-gallon buckets. Tri-Max™ 30 fire extinguishers are also stored outside, on the southern side of the current fire house. Additionally, the firefighting vehicles are washed outside the firehouse.

Historically, surface runoff across these areas generally flows west towards Grants Creek via sheet flow and the drainage swales on the north and south sides of the aircraft apron. It should be noted that the aircraft apron was resurfaced during the summer of 2021 using a recycling process which reused existing materials. Based on current surrounding topography the drainage patterns are unlikely to change significantly.

3.2 AOI 2 Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-MaxTM Demonstration FTA, Wash Rack, Former Firetruck Parking Area, and Drainage Swale

AOI 2 consists of six potential PFAS release areas: the Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max™ Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale, and grassy areas surrounding the potential release areas. Based on PA findings, these are areas of known or suspected AFFF use and storage. It should be noted that there is a hangar within AOI 2; however, the building is not equipped with an AFFF fire suppression system and is therefore not considered a potential release area.

Firetrucks containing AFFF and “protein foam” were historically stored at the Former Firehouse #2 and washed in the adjacent areas. AFFF concentrate in buckets and Tri-Max™ units were also stored in the Allied Storage Area adjacent to Former Firehouse #2. Although no known PFAS releases have occurred at the Wash Rack, its potential use as a wash area may have resulted in PFAS being rinsed from vehicles and equipment. Tri-Max™ units were discharged on the asphalt-paved area between the Current Firehouse and Former Firehouse #2 as part of firefighting demonstrations at the former FTA. Demonstrations took place in the 1990s, but the exact timeframe of use and the total volume of AFFF released during demonstration events are unknown. AFFF, protein-based foam, or PFAS-laden water may have been released from the vehicles to the pavement and nearby grassy areas at the Former Firetruck Parking area.

Surface runoff across areas are anticipated to generally flow west, via sheet flow, towards Grants Creek. Surface flow reaching National Guard Road may be conveyed to the north, along the road surface. A concrete drainage structure on the north side of the AOI also conveys water away from the firehouse into the Drainage Swale, located in a wooded area to the north.

3.3 AOI 3 Former Firehouse #1, Firetruck Parking (2014-2015), Ornamental Firetruck Parking Location (2016), and Former Live Fire FTA

AOI 3 consists of four potential PFAS release areas: the Former Firehouse #1, Firetruck Parking (2014-2015), Ornamental Firetruck Parking Location (2016), Former Live Fire FTA, and the grassy and paved areas surrounding the potential release areas. Based on PA findings, these are areas of known or suspected AFFF use and storage.

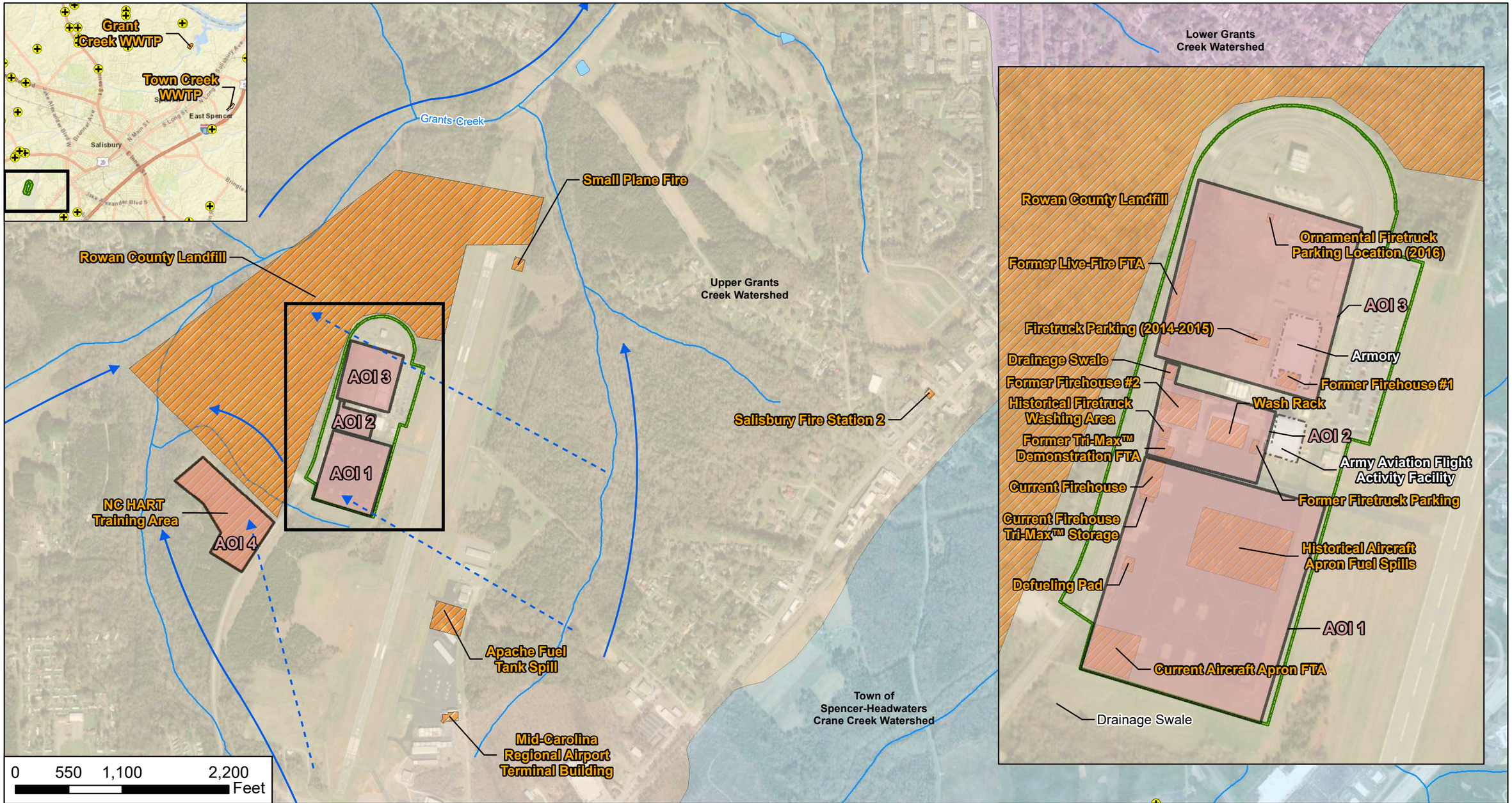
Firetrucks containing AFFF and “protein foam”, as well as AFFF concentrate in 5-gallon buckets, were historically stored at the Former Firehouse #1. AFFF was dispensed from a Tri-Max™ 30 fire extinguisher at the FTA at least once. AFFF sprayed in this area would have been released to the gravel ground surface in the 1990s, but the exact timeframe and the total volume, type, and concentration of AFFF released during training are unknown. AFFF, protein-based foam, or PFAS-laden water may have been released from the vehicles to the pavement and nearby grassy areas at the Firetruck Parking (2014-2015) and Ornamental Firetruck Parking Location (2016).

Surface runoff across the areas are anticipated to generally flow north and west via sheet flow towards Grants Creek, via National Guard Road, and via the concrete drainage structure on the west side of the AOI.

3.4 AOI 4 NC HART Training Area

AOI 4 consists of one potential PFAS release area: the North Carolina Helicopter Aquatic Rescue Team (NC HART) Training Area, an open field located off-facility and adjacent to the southwestern portion of the facility, where the 430th Engineer Firefighting Team performs fire training exercises. Although this training uses only water, the firetruck that is used also stores AFFF. It is possible that AFFF contained within the truck has migrated via backflow into other lines due to the corrosive nature of PFAS. As such, it is possible that the water within the firetruck used for training is contaminated with PFAS.

Runoff from the training exercises likely flows into the small stream/drainage swale, bordering the FTA to the north, that drains west into Grants Creek. Therefore, there is a potentially complete exposure pathway for surface soil, subsurface soil, surface water and sediment, and groundwater to all receptors.



CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:12,000	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction
- Groundwater Flow Direction
- Public Water Supply

N

Areas of Interest

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Figure 3-1

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4. Project Data Quality Objectives

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

4.1 Problem Statement

The following problem statement was developed during project planning:

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

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. The SLs are presented in **Section 6.1** of this Report.

The following quotes from the DA policy documents form the basis for this project (DA, 2016; DA, 2018):

- "The Army will research and identify locations where PFOS- and/or PFOA-containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider FTAs, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas.".
- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination.".
- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels." (USEPA, 2016a; USEPA, 2016b).

4.2 Goals of the Study

The following goals were established for this SI:

1. Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.
2. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.

3. Determine the potential need for a Time Critical Removal Action (TCRA) (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.
4. Collect data to better characterize the release areas for more effective and rapid initiation of a RI (if determined necessary).
5. If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).
6. Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

4.3 Information Inputs

Primary information inputs included:

- The PA for Salisbury AASF #2 (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy-Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.4 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was included in the scope of this SI to address any potential releases by NCARNG during fire training activities completed at the NC HART Training Area. The required right of entry was obtained by ARNG prior to the SI sampling event.

4.5 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the 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 and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a). These rules governed response actions based on the results of the SI sampling effort.

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

Groundwater:

- Is there a human receptor within 4 miles of the facility?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?
- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of the potential release areas?

- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil:

- What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil (0 to 2 feet bgs)?
- What is the concentration of PFOA, PFOS, and PFBS in deep soil (i.e., capillary fringe)?
- What does the CSM suggest in terms of source, pathway, and receptor?

Soil and groundwater samples were collected from each of the AOIs. Groundwater was encountered between approximately 4.85 to 27.71 feet bgs.

4.6 Data Usability Assessment

The Data Usability Assessment is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017b).

Data Quality Indicators (DQIs) (Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity) are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this SI report are of high quality. Although the SI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The Data Validation Report (**Appendix A**) presents explanations for all qualified data in greater detail.

4.6.1 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPD); laboratory precision is measured with calibration verification, internal standard recoveries, laboratory control spike (LCS) and matrix spike (MS) duplicate RPD.

Injection internal standards (IIS) were added by the laboratory after sample extraction and prior to analysis as a legacy requirement of DoD Quality Systems Manual (QSM) 5.1 to measure relative responses of target analytes. Even though not required under the current DoD QSM 5.3 analysis, the IIS are still added to the sample after extraction as an additional quality control (QC) measure. The IIS percent recoveries were within the established precision limits presented in the SI QAPP Addendum (AECOM, 2021a).

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSDs performed during the laboratory analyses were within the project established precision limits presented in the SI QAPP Addendum (AECOM, 2021a), with one exception. One LCS/LCSD displayed a RPD greater than the QC limit of 30%, at 32% for perfluoroheptanoic acid (PFDoA). The positive associated field sample results were qualified as estimate and should be considered usable as qualified.

MS/MS duplicate (MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5%. The MS/MSD samples were within the project established precision limits presented in the SI QAPP Addendum (AECOM, 2021a)

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the SI QAPP Addendum (AECOM, 2021a), with limited exceptions. Two field duplicate pairs displayed a positive result in one field sample and a non-detect result in the associated duplicate sample. The associated field sample results were qualified as estimate and should be considered usable as qualified. One field duplicate pair displayed RPD exceedances for PFBS and perfluorohexanesulfonic acid (PFHxS). The associated field sample results were qualified as estimate and should be considered usable as qualified.

4.6.2 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogates.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis. The LCS/LCSDs performed during the laboratory analyses were within the project established accuracy limits presented in the SI QAPP Addendum (AECOM, 2021a) with limited exceptions. One LCS/LCSD displayed percent recoveries greater than the upper QC limits for perfluorodecanoic acid (PFDA), perfluorononanoic acid (PFNA), and perfluorotridecanoic acid (PFTrDA). The associated field sample results were non-detect and should be considered usable as reported.

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. The MS/MSDs performed during that laboratory analyses were within the project established accuracy limits presented in the SI QAPP Addendum (AECOM, 2021a) with limited exceptions. Three MS/MSD displayed percent recoveries outside the QC limits for PFHxS and/or PFOS. The positive parent sample results associated with high MS/MSD percent recoveries were qualified as estimate with a high bias. The field sample result associated with the low MS/MSD percent recovery was positive and was qualified as estimate with a low bias. The associated field sample results should be considered usable as qualified.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. The calibration verifications performed during the laboratory analyses were within the project established accuracy limits presented in the SI QAPP Addendum (AECOM, 2021a).

4.6.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect site conditions. Factors that affect the representativeness of analytical data include appropriate

sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) Compliant with QSM 5.1 Table B-15, including the specific preparation requirements (i.e. ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branched and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. All preservation techniques were followed by the field staff. All technical and analytical holding times were met by the laboratory with the exception of field samples that required re-extraction after failing QC in the initial analysis in accordance with the DoD QSM. The laboratory used approved standard methods in accordance with the SI QAPP Addendum (AECOM, 2021a) for all analyses.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. Six instrument blanks and fours method blank displayed concentrations for multiple analytes greater than the detection limit (DL). The positive field sample results associated with the blank detections that displayed concentrations less than five times the blank detections were qualified as likely false positives and should be treated as non-detect. The remaining field sample results associated with the blank detections were all greater than five times the blank concentration or were non-detect. The associated field sample results should be considered usable as reported.

Field blanks and equipment blanks were also collected for groundwater and soil samples. Two field rinsate blanks and two equipment blanks displayed concentrations for multiple target analytes greater than the DL. The positive field sample results associated with the blank detections that displayed concentrations less than five times the blank detections were qualified as likely false positives and should be treated as non-detect. The remaining field sample results associated with the blank detections were all greater than five times the blank concentration or were non-detect. The associated field sample results should be considered usable as reported.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The decontamination sample (SA-DECON) displayed concentrations for several target analytes greater than the DL. The positive field sample results associated with the blank detections that displayed concentrations less than five times the blank detections were qualified as likely false positive and should be treated as non-detect. The remaining field sample results associated with the blank detections were all greater than five times the blank concentration or were non-detect. The associated field sample results should be considered usable as reported.

Field samples were extracted and analyzed within the appropriate holding time in order to qualitatively express the degree to which data accurately reflect site conditions, with limited exceptions. Three field samples were re-extracted and reanalyzed outside technical holding time due to QC failures. The associated field sample results were qualified as estimate and should be considered usable as qualified. The holding time for pH analysis is “immediate”, and all field samples analyzed for pH were qualified as estimate and should be considered usable as qualified.

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI.

4.6.4 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

4.6.5 Completeness

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

- PFAS in aqueous media by LC/MS/MS compliant with QSM 5.3 Table B-15 at 100%
- PFAS in solid media by LC/MS/MS compliant with QSM 5.3 Table B-15 at 99.5%
- pH in soil by USEPA Method 9045D at 100%
- Total organic carbon (TOC) by USEPA Method 9060 at 100%

4.6.6 Sensitivity

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

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* dated March 2018 (AECOM, 2018a);
- *Final Site Safety and Health Plan, Salisbury Army Aviation Support Facility #2, North Carolina* dated May 2021 (AECOM, 2021b);
- *Final Preliminary Assessment Report, Salisbury Army Aviation Support Facility #2, North Carolina* dated August 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Salisbury Army Aviation Support Facility #2, North Carolina* dated June 2021 (AECOM, 2021a); and
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b).

The SI field activities were conducted from 7 to 17 June 2021 and consisted of utility clearance, sonicsoil boring, soil sample collection, temporary and permanent monitoring well installations, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 to fulfill the project DQOs:

- Forty-one (41) soil samples from 17 boring locations;
- Six grab groundwater samples from six permanent well locations;
- Six grab groundwater samples from six temporary well locations;
- Eighteen (18) quality assurance (QA) 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**, monitoring well development forms are provided in **Appendix B3**, a Field Change Request Form is provided in **Appendix B4**, and survey data are provided in **Appendix B5**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

The 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 quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 17 March 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, NCARNG, USACE, North Carolina Department of Environmental Quality, and representatives familiar with the facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the 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's drilling subcontractor, Cascade Technical Services, LLC., placed a ticket with the North Carolina 811 utility clearance provider to notify them of intrusive work on 16 April 2021; however, because the AASF #2 is a private facility, the participating "Call Before You Dig" locators did not clear utilities at the entire facility. Therefore, AECOM contracted Taylor Wiseman & Taylor, LLC., a private utility location service, to perform utility clearance. Taylor Wiseman & Taylor, LLC. performed utility clearance of the proposed boring locations on 1 June 2021, with input from the AECOM field team and Salisbury AASF #2 facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use in a PFAS investigation prior to the start of field activities. A sample from a potable water source at Salisbury AASF #2 was collected on 30 March 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample are provided in **Appendix F**, and a discussion of the results is presented in **Section 4.6.3**.

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021a). Prior to the start of field work each day, a PFAS 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

Soil samples were collected via a sonic drill rig, in accordance with the SI QAPP Addendum (AECOM, 2021a). A hand auger was used to collect soil from the top 5 feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and depths are provided **Table 5-1**.

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample

approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table.

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

Soil borings completed during the SI found abundant lean clay, sandy lean clay, and clayey sand as the dominant lithology of the unconsolidated sediments below the Salisbury AASF #2. Borings were completed at depths between 20 and 60 feet bgs. Isolated layers of sand and silty sand were observed, along with varying percentages of gravel in some logs. In some borings at AOIs 3 and 4, saprolite and weathered bedrock were observed at varying depths. These observations are consistent with the understood geology of this region, including weathered metamorphic and igneous bedrock underlying fine-grained surficial sediments. Grain size samples were taken from surface soil at AOI02-01 and from the mid-point to the water table (15 to 20 feet bgs) at AOI03-01. Results of this analysis (**Appendix G**) indicated high percentages of clay (27% to 33%) and silt (44% to 50%) along with sand, a majority of which was in the fine range (16% to 18%), and a small portion of medium-coarse sand (0.16% to 4.4%) and gravel (0.18% to 0.48%).

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 for PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15), 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. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, equipment rinsate blanks were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

Sonic borings were converted to permanent and temporary wells. Temporary wells were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) using bentonite chips after completion of sampling activities. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Six temporary wells were installed using a sonic drill rig system. Once the borehole was advanced to the desired depth, wherever conditions allowed, a temporary well was constructed of a 5-foot section of 1-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**.

The temporary wells were allowed to recharge after installation before collection of groundwater samples. After the recharge period, groundwater samples were collected using a bladder pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature,

specific conductance, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) after 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. Foaming was not noted on sampling forms or the CoC.

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 for PFAS 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 SI QAPP Addendum (AECOM, 2021a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with bentonite chips. Temporary wells were installed in grass areas to avoid disturbing concrete or asphalt.

5.4 Permanent Well Installation and Groundwater Sampling

During the SI, five permanent monitoring wells were installed within or downgradient of potential source areas. The locations of the wells are shown on **Figure 5-1**.

A sonic drill rig system was used to install five 2-inch diameter monitoring wells. Water was not added during the drilling of the wells with the exception of AOI04-03, where it was necessary to add approximately 100 gallons of water during rock coring. Drill water was removed during development. The monitoring wells were constructed with Schedule 40 PVC, flush threaded 5- or 10-foot sections of riser, 0.010-inch slotted well screen, and a threaded bottom cap. A filter pack of 20/40 silica sand was installed in the annulus around the well screen to a minimum of 2-foot above the well screen.
A 2-foot-thick bentonite seal was placed above the filter sand and hydrated with water. Bentonite grout was placed in the well annulus from the top of the bentonite seal to ground surface. The bentonite grout was allowed to set for 24 hours prior to well completion in accordance with the SI QAPP Addendum (AECOM, 2021a). All monitoring wells were completed with flush mount well vaults. The screen interval of each of the groundwater monitoring wells is provided in **Table 5-3**.

Development and sampling of wells was completed in accordance with the SI QAPP Addendum (AECOM, 2021a). The newly installed monitoring wells were developed no sooner than 24 hours following installation by a combination of surging with a surge block and over-pumping with a submersible monsoon pump. Samples were collected no sooner than 24 hours following development via low-flow sampling methods using a QED Sample Pro® bladder pump with disposable PFAS-free, HDPE tubing. New tubing was used at each well and the pumps were decontaminated between each well. The wells were purged at a rate determined in the field to reduce draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, DO, and ORP) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**). Water levels were measured to the nearest 0.01 inch and recorded. Additionally, a subsample of each groundwater sample was collected in a separate container and a shaker test was completed to identify if there was 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 for PFAS 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 FRB 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.

5.5 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 17 June 2021 of the six new permanent monitoring wells. The synoptic gauging event did not include temporary monitoring wells, due to a North Carolina time restriction on temporary well abandonment. However, groundwater elevation measurements were taken from the six temporary monitoring wells on 9 June 2021 and 11 June 2021. 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 for temporary and permanent monitoring wells are provided in **Table 5-2** and **5-3**, respectively.

5.6 Surveying

The northern side of each well casing was surveyed by North Carolina-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from all temporary and permanent wells on the facility were collected on 15 June 2021 in the applicable Universal Transverse Mercator zone projection with World Geodetic System 84 datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B5**.

5.7 Investigation-Derived Waste

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Ten 55-gallon drums of soil IDW (i.e. soil cuttings) and sixteen 55-gallong drums of liquid IDW generated during the SI activities were placed in the drum staging area as indicated in the Photographic Log (**Appendix C**). The drums were labeled to indicate the type of media (i.e. soil or water) and the source location. The soil and liquid IDW were not sampled, and it is assumed that the PFAS characteristics of the associated samples collected from that source location.

Other solids such as spent PPE, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities were containerized and staged with the rest of the rest of the IDW.

5.8 Laboratory Analytical Methods

Samples were analyzed for a subset of 18 PFAS 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. The 18 PFAS analyzed as part of the ARNG SI program include the following:

- 6:2 fluorotelomer sulfonic acid (6:2 FTS)
- 8:2 fluorotelomer sulfonic acid (8:2 FTS)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutyrate (PFBA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanoic acid (PFHxA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUdA)

Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.9 Deviations from SI QAPP Addendum

Five deviations from the SI QAPP Addendum were identified during review of the field documentation. The deviations are noted below and documented in one Field Change Request Form (**Appendix B4**).

- During the utility clearance prior to subsurface investigations, it was deemed appropriate to move proposed well location AOI01-03 75 feet to the east to be closer to the potential release area.
- Proposed well location AOI01-04 was moved approximately 65 feet to the west to avoid utility conflicts.
- The proposed location for AOI02-01 was located adjacent to the gas and water utility lines and was not installed. The boring location was removed from the SI Sampling scope because it was co-located with an existing Rowan County monitoring well (AOI02-MW-1). Rowan County provided permission to sample this well location for the SI, , and it was determined appropriate to replace the original proposed well location AOI02-01 with a groundwater sample collected from the existing well.
- The proposed location for AOI02-02 was located on a steep slope, close to trees, and on top of the gas utility line. The purpose of the proposed location was to measure the potential effects of drainage from AOI2, which would not be achieved by drilling at the next available closest location due to the terrain. All of the surface water drainage at AOI2 is funneled to the proposed location for AOI02-02; therefore, it was determined appropriate to replace the subsurface boring with a surface soil sampling location. Note that because sample location AOI2-01 was removed from the sampling scope, that AOI1-02 was renumbered as AOI2-01.
- Proposed well location AOI03-02 was moved approximately 200 feet east, to the lowest drainage point of AOI 3 and within the potential release area. Additionally, presence of underground utilities did not allow for drilling at the original proposed location. This proposed well location was also converted from a permanent to a temporary well, due to the new location being in the middle of the potential release area, rather than downgradient of the AOI as originally planned.

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Salisbury AASF #2, North Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	6/10/2021 8:40	0 - 2	x				
AOI01-01-SB-0-2-D	6/10/2021 8:40	0 - 2	x				FD
AOI01-01-SB-8-10	6/10/2021 11:30	8 - 10	x			x	
AOI01-01-SB-8-10-MS	6/10/2021 11:30	8 - 10	x				MS
AOI01-01-SB-8-10-MSD	6/10/2021 11:30	8 - 10	x				MSD
AOI01-01-SB-18-20	6/10/2021 11:55	18 - 20	x				
AOI01-02-SB-0-2	6/10/2021 14:00	0 - 2	x				
AOI01-02-SB-11-13	6/10/2021 14:30	11 - 13	x				
AOI01-02-SB-11-13-D	6/10/2021 14:30	11 - 13	x				FD
AOI01-02-SB-23-25	6/10/2021 14:40	23 - 25	x				
AOI01-03-SB-0-2	6/10/2021 15:25	0 - 2	x				
AOI01-03-SB-09-11	6/10/2021 16:45	9 - 11	x	x	x		
AOI01-03-SB-18-20	6/10/2021 17:15	18 - 20	x				
AOI01-04-SB-0-2	6/11/2021 6:15	0 - 2	x				
AOI01-04-SB-10-12	6/11/2021 9:30	10 - 12	x				
AOI01-04-SB-20-22	6/11/2021 9:20	20 - 22	x				
AOI02-01-SB-0-2	6/8/2021 11:45	0 - 2	x	x	x	x	
AOI03-01-SB-0-2	6/7/2021 10:00	0 - 2	x				
AOI03-01-SB-13-15	6/7/2021 11:25	13 - 15	x				
AOI03-01-SB-15-20	6/7/2021 11:30	15 - 20				x	
AOI03-01-SB-25-30	6/7/2021 12:50	25-30	x				
AOI03-02-SB-0-2	6/8/2021 8:30	0 - 2	x				
AOI03-02-SB-5-10	6/8/2021 11:40	5 - 10		x	x		
AOI03-02-SB-7-10	6/8/2021 11:45	7 - 10	x				
AOI03-02-SB-13-15	6/8/2021 12:00	13 - 15	x				
AOI03-03-SB-0-2	6/8/2021 8:00	0 - 2	x				
AOI03-03-SB-13-15	6/8/2021 9:15	13 - 15	x				
AOI03-03-SB-15-20	6/8/2021 9:30	15 - 20	x				
AOI03-04-SB-0-2	6/11/2021 11:25	0 - 2	x				
AOI03-04-SB-13-15	6/11/2021 12:40	13 - 15	x				
AOI03-04-SB-52-54	6/11/2021 15:20	52 - 54	x				
AOI04-01-SB-0-2	6/10/2021 6:22	0 - 2	x				
AOI04-01-SB-5-7	6/10/2021 7:30	5 - 7	x				
AOI04-01-SB-5-7-D	6/10/2021 7:30	5 - 7	x				FD
AOI04-01-SB-5-7-MS	6/10/2021 7:30	5 - 7	x				MS
AOI04-01-SB-5-7-MSD	6/10/2021 7:30	5 - 7	x				MSD
AOI04-01-SB-11-13	6/10/2021 7:40	11 - 13	x				
AOI04-02-SB-0-2	6/9/2021 12:20	0 - 2	x				
AOI04-02-SB-10-12	6/9/2021 14:35	10 - 12	x				
AOI04-02-SB-10-12-D	6/9/2021 14:35	10 - 12	x				FD
AOI04-02-SB-22-24	6/9/2021 14:38	22 - 24	x				
AOI04-03-SB-0-2	6/8/2021 14:30	0 - 2	x	x	x		
AOI04-03-SB-0-2-D	6/8/2021 14:30	0 - 2		x	x		FD
AOI04-03-SB-0-2-MS	6/8/2021 14:30	0 - 2		x	x		MS
AOI04-03-SB-0-2-MSD	6/8/2021 14:30	0 - 2		x	x		MSD
AOI04-03-SB-13-15	6/8/2021 16:30	13 - 15	x				
AOI04-03-SB-28-30	6/9/2021 10:31	28 - 30	x				
AOI04-04-SB-0-2	6/9/2021 11:50	0 - 2	x				
AOI04-05-SB-0-2	6/9/2021 11:30	0 - 2	x				
AOI04-05-SB-0-2-D	6/9/2021 11:30	0 - 2	x				FD
AOI04-06-SB-0-2	6/9/2021 10:15	0 - 2	x				

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Salisbury AASF #2, North Carolina

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
AOI04-06-SB-0-2-MS	6/9/2021 10:15	0 - 2	x				MS
AOI04-06-SB-0-2-MSD	6/9/2021 10:15	0 - 2	x				MSD
AOI04-07-SB-0-2	6/9/2021 9:20	0 - 2	x				
AOI04-08-SB-0-2	6/9/2021 9:40	0 - 2	x				
Groundwater Samples							
AOI01-01-GW	6/14/2021 10:40	NA	x				
AOI01-01-GW-D	6/14/2021 10:40	NA	x				FD
AOI01-02-GW	6/14/2021 14:20	NA	x				
AOI01-03-GW	6/17/2021 13:00	NA	x				
AOI01-04-GW	6/17/2021 14:05	NA	x				
AOI02-MW-1-060721	6/7/2021 13:15	NA	x				
AOI02-MW-1-060721-MS	6/7/2021 13:15	NA	x				MS
AOI02-MW-1-060721-MSD	6/7/2021 13:15	NA	x				MSD
AOI03-01-GW	6/8/2021 10:05	NA	x				
AOI03-02-GW	6/9/2021 14:10	NA	x				
AOI03-03-GW	6/9/2021 9:58	NA	x				
AOI03-04-GW	6/17/2021 10:20	NA	x				
AOI04-01-GW	6/10/2021 9:35	NA	x				
AOI04-01-GW-D	6/10/2021 9:35	NA	x				FD
AOI04-02-GW	6/10/2021 13:20	NA	x				
AOI04-03-GW	6/10/2021 10:45	NA	x				
Quality Control Samples							
SA-ERB-01	6/11/2021 8:55	NA	x				Sonic Core Barrel
SA-ERB-02	6/14/2021 8:00	NA	x				Sonic Core Barrel
SA-ERB-03	6/9/2021 13:07	NA	x				Hand Auger
SA-ERB-04	6/11/2021 8:00	NA	x				1.75" Bladder Pump
SA-ERB-05	6/10/2021 11:00	NA	x				0.85" Bladder Pump
SA-FRB-01	6/8/2021 15:45	NA	x				

Notes:
AASF = Army Aviation Support Facility
AOI = Area of Interest
ASTM = American Society for Testing and Materials
bgs = below ground surface
D = duplicate
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
NA = not applicable
PFAS = per- and polyfluoroalkyl substances
pH = potential for hydrogen
QSM = Quality Systems Manual
SB = soil boring
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, Salisbury AASF #2, North Carolina

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)
3	AOI03-01	40	30 - 40	750.48	746.28	25.14	20.94	725.34
	AOI03-02	20	10 - 20	735.39	731.59	8.65	4.85	726.74
	AOI03-03	30	20 - 30	746.34	740.94	19.47	14.07	726.87
4	AOI04-01	20	15 - 20	732.91	731.57	13.00	11.66	719.91
	AOI04-02	30	20 - 30	727.13	727.13	19.82	19.82	707.31
	AOI04-03	40	30 - 40	742.1	740.47	29.34	27.71	712.76

Notes:
Temporary well screen set above total depth to capture groundwater interface

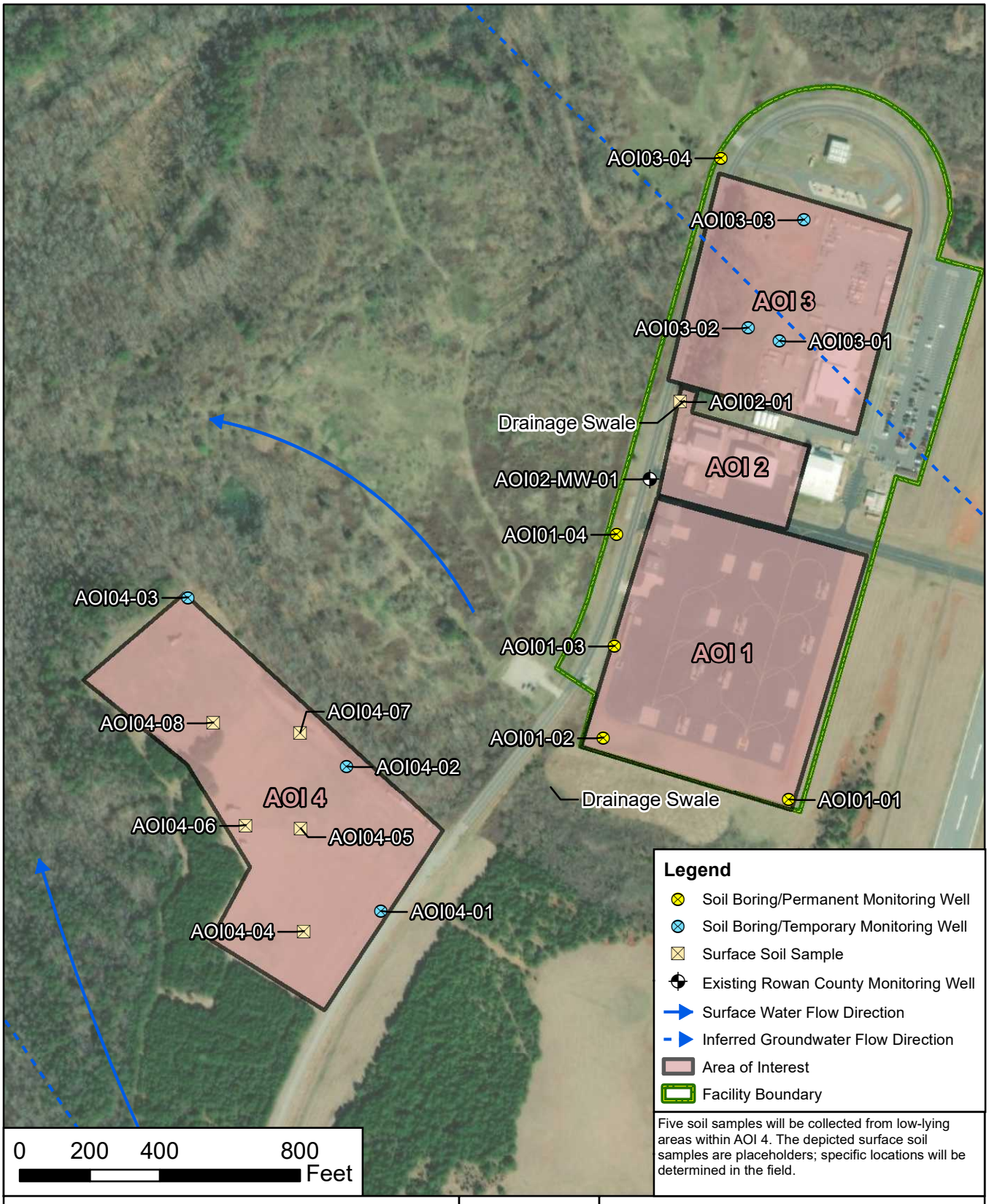
AASF = Army Aviation Support Facility
AOI = Area of Interest
bgs = below ground surface
btoc = below top of casing
NAVD88 = North American Vertical Datum 1988

Table 5-3
Permanent Monitoring Well Screen Intervals and Groundwater Elevations
Site Inspection Report, Salisbury AASF #2, North Carolina

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Permanent 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	25	15 - 25	752.78	753.08	12.55	12.85	740.23
	AOI01-02	30	20 - 30	741.84	742.20	15.80	16.16	726.04
	AOI01-03	30	20 - 30	744.88	745.16	17.72	18.00	727.16
	AOI01-04	30	20 - 30	747.54	747.76	24.97	25.19	722.57
2	AOI02-MW-1	38.22	Unknown	748.24	740.47	21.99	14.22	726.25
3	AOI03-04	50	50 - 60	726.83	727.11	12.79	13.07	714.04

Notes:
Permanent well screen set above total depth to capture groundwater interface

AASF = Army Aviation Support Facility
AOI = Area of Interest
bgs = below ground surface
btoc = below top of casing
MW = monitoring well
NAVD88 = North American Vertical Datum 1988



CLIENT	ARNG			
Site Inspection for PFAS at Salisbury AASF #2, NC				
REVISED	1/7/2022	GIS BY	MS	1/7/2022
SCALE	1:4,800	CHK BY	ST	1/7/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	1/7/2022

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\NC\Salisbury_AASF_Figures\SI_Figures\SI_Report\Fig_5-1_Salisbury_AASF_SI_Sample_Locations.mxd

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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 6.6**. **Table 6-2** through **Table 6-5** present PFAS results for samples with detections in soil or groundwater; only constituents detected in one or more samples are included. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. The SLs are presented on **Table 6-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]	USEPA HA (Groundwater representative of Drinking Water) (ng/L)[b,c]
PFOA	130	1,600	40	70
PFOS	130	1,600	40	70
PFBS	1,900	25,000	600	-

Notes:

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

b.) USEPA. 2016a. Drinking Water Health Advisory (HA) for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-005. May 2016. / USEPA. 2016b. Drinking Water HA for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-004. May 2016.

c.) USEPA HAs apply to the PFOA and PFOS concentrations individually or combined.

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes four potential PFAS release areas: Current Aircraft Apron FTA, Historic Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at AOI 1. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (8 to 13 feet bgs), and deep subsurface soil (18 and 25 feet bgs) at AOI01-01, AOI01-02, AOI01-03, and AOI01-04. PFOA, PFOS, and PFBS were detected in soil, at concentrations several orders of magnitude lower than the SLs. In the surface soil, PFOA was detected at AOI01-02, AOI01-03, and AOI01-04, with concentrations ranging from 0.138 J micrograms per kilogram (µg/kg) to 0.208 J µg/kg. PFOS was detected at locations AOI01-01 (Duplicate) and AOI01-04, at concentrations of 0.099 J µg/kg and 11.6 µg/kg, respectively. PFBS was detected at AOI01-02 and AOI01-04, with concentrations of 1.12 J µg/kg and 0.979 J µg/kg, respectively. In the shallow subsurface soil, there were no detections of PFOA at any of the four sampling locations. PFOS was detected at AOI01-03 and AOI01-04, with concentrations of 2.13 µg/kg and 0.120 J µg/kg, respectively. PFBS was detected at AOI01-04 with a concentration of 0.097 J µg/kg. In the deep subsurface soil, PFOA, PFOS, and PFBS were not detected at any of the four sampling locations.

6.3.2 AOI 1 Groundwater Analytical Results

PFOS exceeded the SLs of in groundwater at AOI 1. PFOA and PFBS did not exceed the SLs at AOI 1. **Figure 6-4** presents the ranges of detections of PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled at four permanent monitoring well locations (AOI01-01 through AOI01-04). PFOA was detected below the OSD SL of 40 ng/L and the USEPA HA SL of 70 ng/L at all four locations, ranging from not detected (ND) to 25.2 ng/L. The OSD SL of 40 ng/L and the

USEPA HA SL of 70 ng/L for PFOS were exceeded at AOI01-04, with a concentration of 139 ng/L, and it was detected below the SLs at the remaining well locations with concentrations ranging from ND to18.0 ng/L. PFBS was detected below the OSD SL of 600 ng/L at all four locations, with concentrations ranging from ND to 233 ng/L.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 1. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the SLs. PFOS was detected in groundwater at a concentration above both SLs at AOI01-04. PFOA and PFBS was detected in groundwater below the SLs at AOI 1. Based on the exceedance of the SL for PFOS 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, which includes six potential PFAS release areas: Wash Rack, Former Firetruck Parking, Former Tri-Max™ Demonstration Area, Historical Firetruck Washing Area, Former Firehouse #2, and Drainage Swale. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**. During utility clearance activities, the proposed location of AOI02-01 was not able to be drilled due to utility conflicts. A nearby existing permanent well, MW-1, was sampled in lieu of AOI02-01. Thus, only one surface soil sample was collected within AOI 2. This action was documented in a Field Change Request Form provided in **Appendix B4**.

6.4.1 AOI 2 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at AOI 2. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

At the Drainage Swale potential release area, soil was sampled from surface soil (0 to 2 feet bgs) at AOI02-01. PFOA, PFOS, and PFBS were detected in surface soil, at concentrations below the SLs. PFOA was detected with a concentration of 0.280 J µg/kg, PFOS was detected at a concentration of 42.1 µg/kg, and PFBS was detected at a concentration of 0.136 J µg/kg.

6.4.2 AOI 2 Groundwater Analytical Results

PFOA and PFOS exceeded the SLs in groundwater at AOI 2. PFBS did not exceed the SL at this AOI. **Figure 6-4** presents the range of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled at AOI02-MW-1, located west of the Former Tri-Max™ Demonstration FTA potential release area. PFOA and PFOS were detected above the OSD SLs of 40 ng/L and the individual and combined USEPA HA SLs of 70 ng/L at AOI02-MW-1, with concentrations of 85.2 ng/L and 2,700 J ng/L, respectively. PFBS was detected below the OSD SL of 600 ng/L, at a concentration of 200 ng/L.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 2. The detected concentrations of PFOA, PFOS, and PFBS in soil were below the SLs. PFOA and PFOS were detected in groundwater at concentrations above the SLs. PFBS was

detected in groundwater, at concentrations below the SL. Based on the exceedances of the SLs for PFOA and PFOS 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, which includes four potential PFAS release areas: Former Live Fire FTA, Firetruck Parking (2014-2015), Former Firehouse #1, and Ornamental Firetruck Parking Location (2016). The detected compounds in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.5.1 AOI 3 Soil Analytical Results

PFOA, PFOS, and PFBS in soil did not exceed the SLs in soil at the four potential PFAS release areas in AOI 3. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (7 to 15 feet bgs), and deep subsurface soil (15 and 54 feet bgs). Soil was sampled from three intervals at boring locations AOI03-01, AOI03-03, and AOI03-04; and from two intervals at boring location AOI03-02. PFOA, PFOS, and PFBS were detected at concentrations several orders of magnitude lower than the SLs. PFOA was detected in surface soil (0 to 2 feet bgs) at all four locations, with concentrations ranging from 0.188 J µg/kg to 2.92 µg/kg. PFOS was also detected in surface soil at all four locations, with concentrations ranging from 0.453 J µg/kg to 17.3 µg/kg. PFBS was detected at AOI03-01, with a concentration of 0.024 J µg/kg. In shallow subsurface soil, PFOA and PFOS were detected at AOI03-01, AOI03-02, and AOI03-03. PFOA was detected at AOI03-03, with a concentration of 0.476 J µg/kg. PFOS was detected at AOI03-01 and AOI03-02, with concentrations of 0.166 J µg/kg and 0.697 J µg/kg, respectively. PFBS was not detected in subsurface soil at any of the four locations sampled at AOI 3. In deep subsurface soil, PFOA detected at AOI03-03 with a concentration of 0.513 J µg/kg. PFBS and PFOS were not detected in deep subsurface soil.

6.5.2 AOI 3 Groundwater Analytical Results

PFOA and PFOS exceeded the SLs in groundwater at AOI 3. PFBS did not exceed the SL at this AOI. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from three temporary monitoring well locations (AOI03-01 through AOI03-03) and one permanent monitoring well location (AOI03-04). PFOA was detected above the OSD SL of 40ng/L and the USEPA HA SL of 70 ng/L at AOI03-03, with a concentration of 93.5 ng/L. PFOA was detected below the OSD SL of 40 ng/L and the USEPA HA SL of 70 ng/L at AOI03-01, AOI03-02 and AOI03-04, with concentrations ranging from ND to 26.2 ng/L. PFOS was detected above the OSD SL at AOI03-02, with a concentration of 50.5 ng/L. PFOS was detected below the SLs at AOI03-01, AOI03-02, and AOI03-04, with concentrations ranging from 1.38 J ng/L to 6.90 ng/L. PFBS was detected in all four well locations below the OSD SL of 600 ng/L, with concentrations ranging from 1.22 J ng/L to 2.97 J ng/L.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 3. The detected concentrations of PFOA, PFOS, and PFBS in soil were orders of magnitude lower than the SLs. PFOA was detected in groundwater at concentrations exceeding

the SLs at AOI3-03. PFOS was detected in groundwater at concentrations exceeding the OSD SL at AOI03-02. PFBS was detected in groundwater at concentrations below the SL. Based on the exceedances of the SLs for PFOA and PFOS in groundwater, further evaluation at AOI 3 is warranted.

6.6 AOI 4

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 4, which includes one potential PFAS release area: NC HART Training Area. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.6.1 AOI 4 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (5 to 15 feet bgs), and deep subsurface soil (22 and 30 feet bgs) at boring locations AOI04-01 AOI04-03, and AOI04-03. Soil was sampled from surface soil (0 to 2 feet) at boring locations AOI04-04, AOI04-05, AOI04-06, AOI04-07, and AOI04-08. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the SLs. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** through **Table 6-4** summarize the detected compounds in soil.

PFOA and PFBS were not detected in the eight surface soil sample locations. PFOS was detected in five of the eight sample locations, with concentrations ranging from ND to 0.890 J- µg/kg. In shallow subsurface soil, PFOA and PFOS were not detected in soil at any boring location. PFBS was detected at AOI04-01, with a concentration of 0.045 J µg/kg, which is several orders of magnitudes below the SL of 25,000 µg/kg. In deep subsurface soil, PFOA and PFOS were not detected in soil at any boring location. PFBS was detected at AOI04-02, with a concentration of 0.253 J µg/kg.

6.6.2 AOI 4 Groundwater Analytical Results

PFOA, PFOS and PFBS did not exceed the SLs in groundwater at AOI 4. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-5** summarizes the detected compounds in groundwater.

Groundwater was sampled from three temporary monitoring well locations (AOI04-01, AOI04-02, and AOI04-03). PFOA was detected below the SL of 40 ng/L and the USEPA HA SL of 70 ng/L at all well locations, with concentrations ranging from 2.25 J ng/L to 7.04 ng/L. PFOS was detected below the SL of 40 ng/L and the USEPA HA SL of 70 ng/L at all well locations, with concentrations ranging from 2.59 J ng/L to 15.9 ng/L. PFBS was also detected below the OSD SL of 600 ng/L at all well locations, with concentrations ranging from 1.25 J ng/L to 308 ng/L.

6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil and groundwater at AOI 4. The detected concentrations of PFOA, PFOS, and PFBS in soil were several orders of magnitude lower than the SLs. PFOA, PFOS, and PFBS were detected in groundwater at concentrations below the SLs at all well locations. Based on these observations, no further evaluation is warranted at AOI 4. If screening levels are revised in the future, further evaluation of AOI 4 may be required.

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Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Salisbury AASF Facility #2

Area of Interest		AOI01										AOI02		AOI03							
Sample ID		AOI01-01-SB-0-2		AOI01-01-SB-0-2-D		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI02-01-SB-0-2		AOI03-01-SB-0-2		AOI03-02-SB-0-2		AOI03-03-SB-0-2		AOI03-04-SB-0-2	
Sample Date		06/10/2021		06/10/2021		06/10/2021		06/10/2021		06/11/2021		06/08/2021		06/07/2021		06/08/2021		06/08/2021		06/11/2021	
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, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
8:2 FTS	-	ND		ND		ND		ND		ND		ND		0.079	J	ND		0.064	J	ND	
NEtFOSAA	-	ND		ND		ND		ND		ND		0.043	J	ND		ND		ND		0.282	J
PFBA	-	ND		ND		ND		ND		0.058	J	0.390	J	0.114	J	0.139	J	1.08	J	0.097	J
PFBS	1900	ND		ND		1.12	J	ND		0.979	J	0.136	J	0.024	J	ND		ND		ND	
PFDA	-	ND		ND		ND		ND		ND		0.136	J	0.104	J	0.059	J	0.247	J	ND	
PFDoA	-	ND		ND		ND		ND		0.034	J	0.084	J	0.024	J	ND		ND		0.038	J
PFHpA	-	ND		ND		ND		ND		0.113	J	0.126	J	0.155	J	0.159	J	1.67		0.049	J
PFHxA	-	ND		ND		ND		ND		0.544	J	0.416	J	0.243	J	0.192	J	0.957	J	0.085	J
PFHxS	-	ND		ND		ND		0.695	J	8.41		1.78		0.943	J	0.311	J	ND		0.096	J
PFNA	-	ND		ND		0.063	J	0.042	J	ND		0.177	J	0.520	J	0.123	J	2.64		0.047	J
PFOA	130	ND		ND		0.159	J	0.138	J	0.208	J	0.280	J	0.489	J	0.658	J	2.92		0.188	J
PFOS	130	ND	UJ	0.099	J	ND		ND		11.6		42.1		17.3		4.81		0.453	J	1.23	
PFPeA	-	ND		ND		ND		ND		0.085	J	0.549	J	0.257	J	0.196	J	1.87		0.135	J
PFTeDA	-	ND		ND		ND		ND		ND		0.053	J	ND		ND		ND		ND	
PFTrDA	-	ND		ND		ND		ND		ND		0.057	J	ND		ND		ND		ND	
PFUnDA	-	ND		ND		ND		0.025	J	ND		0.121	J	0.046	J	ND		0.043	J	0.025	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

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

Acronyms and Abbreviations

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

Chemical Abbreviations

8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Salisbury AASF Facility #2

	Area of Interest	AOI04																	
	Sample ID	AOI04-01-SB-0-2		AOI04-02-SB-0-2		AOI04-03-SB-0-2		AOI04-04-SB-0-2		AOI04-05-SB-0-2		AOI04-05-SB-0-2-D		AOI04-06-SB-0-2		AOI04-07-SB-0-2		AOI04-08-SB-0-2	
	Sample Date	06/10/2021		06/09/2021		06/08/2021		06/09/2021		06/09/2021		06/09/2021		06/09/2021		06/09/2021		06/09/2021	
	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	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																			
8:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
NEtFOSAA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFBA	-	ND		ND		ND		ND		ND		ND		0.051	J	ND		0.050	J
PFBS	1900	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFDoA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFHpA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFHxA	-	0.030	J	ND		0.041	J	ND		0.026	J	ND	UJ	0.041	J	0.043	J	ND	UJ
PFHxS	-	ND		0.097	J	ND		ND		ND		ND		0.049	J	ND		ND	UJ
PFNA	-	ND		ND		ND		ND		ND		ND		0.026	J	ND		ND	UJ
PFOA	130	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
PFOS	130	ND		0.100	J	0.099	J	ND		0.471	J	0.141	J	0.890	J-	0.239	J	ND	UJ
PFPeA	-	ND		ND		0.026	J	ND		ND		ND		0.031	J	ND		ND	UJ
PFTeDA	-	ND		ND		ND		ND		0.144	J	ND	UJ	ND		ND		ND	UJ
PFTrDA	-	ND		ND		ND		ND		0.109	J	ND	UJ	ND		ND		ND	UJ
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

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

Acronyms and Abbreviations

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

Chemical Abbreviations

8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Salisbury AASF Facility #2

Area of Interest		AOI01										AOI03									
Sample ID		AOI01-01-SB-8-10		AOI01-02-SB-11-13		AOI01-02-SB-11-13-D		AOI01-03-SB-09-11		AOI01-04-SB-10-12		AOI03-01-SB-13-15		AOI03-02-SB-7-10		AOI03-02-SB-13-15		AOI03-03-SB-13-15		AOI03-04-SB-13-15	
Sample Date		06/10/2021		06/10/2021		06/10/2021		06/10/2021		06/11/2021		06/07/2021		06/08/2021		06/08/2021		06/08/2021		06/11/2021	
Depth		8 - 10 ft		11 - 13 ft		11 - 13 ft		9 - 11 ft		10 - 12 ft		13 - 15 ft		7 - 10 ft		13 - 15 ft		13 - 15 ft		13 - 15 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBA	-	ND		ND		ND		ND		ND		ND		ND		ND		0.105	J	ND	
PFBS	25000	ND		ND		ND		ND		0.097	J	ND		ND		ND		ND		ND	
PFHpA	-	ND		ND		ND		ND		ND		0.029	J	ND		ND		0.970	J	0.090	J
PFHxA	-	ND		ND		ND		ND		0.071	J	0.075	J	ND		ND		0.203	J	0.114	J
PFHxS	-	ND		ND		ND		0.110	J	0.331	J	0.583	J	0.042	J	ND		ND		ND	
PFOA	1600	ND		ND		ND		ND		ND		ND		ND		ND		0.476	J	ND	
PFOS	1600	ND		ND		ND		2.13		0.120	J	0.697	J	0.166	J	ND		ND		ND	
PFPeA	-	ND		ND		ND		ND		ND		0.058	J	ND		ND		0.218	J	0.132	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

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

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Salisbury AASF Facility #2

	Area of Interest	AOI04											
	Sample ID	AOI04-01-SB-5-7		AOI04-01-SB-5-7-D		AOI04-01-SB-11-13		AOI04-02-SB-10-12		AOI04-02-SB-10-12-D		AOI04-03-SB-13-15	
	Sample Date	06/10/2021		06/10/2021		06/10/2021		06/09/2021		06/09/2021		06/08/2021	
	Depth	5 - 7 ft		5 - 7 ft		11 - 13 ft		10 - 12 ft		10 - 12 ft		13 - 15 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)													
PFBA	-	ND		ND		ND		ND		ND		ND	
PFBS	25000	ND		ND		0.045	J	ND		ND		ND	
PFHpA	-	ND		ND		ND		ND		ND		ND	
PFHxA	-	ND		ND		0.037	J	ND		ND		ND	
PFHxS	-	ND		ND		0.405	J	ND		ND		ND	
PFOA	1600	ND		ND		ND		ND		ND		ND	
PFOS	1600	ND		ND		ND		ND		ND		ND	
PFPeA	-	ND		ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

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

Table 6-4
PFAS Detections in Deep Subsurface Soil
Site Inspection Report, Salisbury AASF Facility #2

Area of Interest	AOI01								AOI03						AOI04			
Sample ID	AOI01-01-SB-18-20		AOI01-02-SB-23-25		AOI01-03-SB-18-20		AOI01-04-SB-20-22		AOI03-01-SB-25-30		AOI03-03-SB-15-20		AOI03-04-SB-52-54		AOI04-02-SB-22-24		AOI04-03-SB-28-30	
Sample Date	06/10/2021		06/10/2021		06/10/2021		06/11/2021		06/07/2021		06/08/2021		06/11/2021		06/09/2021		06/09/2021	
Depth	18 - 20 ft		23 - 25 ft		18 - 20 ft		20 - 22 ft		25 - 30 ft		15 - 20 ft		52 - 54 ft		22 - 24 ft		28 - 30 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																		
6:2 FTS	ND		ND		ND		ND		ND		1.20	J	ND		ND		ND	
PFBA	ND		ND		ND		ND		ND		0.195	J	ND		ND		ND	
PFBS	ND		ND		ND		ND		ND		ND		ND		0.253	J	ND	
PFDoA	ND		ND		0.044	J	ND		ND		ND		ND		ND		ND	
PFHpA	ND		ND		ND		ND		ND		0.789	J	ND		ND		ND	
PFHxA	ND		ND		ND		ND		ND		0.408	J	0.035	J	ND		ND	
PFNA	ND		ND		ND		ND		ND		0.067	J	ND		ND		ND	
PFOA	ND		ND		ND		ND		ND		0.513	J	ND		ND		ND	
PFPeA	ND		ND		ND		ND		ND		0.571	J	0.060	J	ND		ND	
PFTeDA	ND		ND		ND	UJ	ND		ND		ND		ND		ND		0.096	J

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
ft	feet
ID	identification
LOD	limit of detection
ND	analyte not detected above the LOD
Qual	interpreted qualifier
SB	soil boring
µg/kg	micrograms per Kilogram

Table 6-5
PFAS Detections in Groundwater
Site Inspection Report, Salisbury AASF Facility #2

Area of Interest		AOI01										AOI02		AOI03					
Sample ID		AOI01-01-GW		AOI01-01-GW-D		AOI01-02-GW		AOI01-03-GW		AOI01-04-GW		AOI02-MW-1-060721		AOI03-01-GW		AOI03-02-GW		AOI03-03-GW	
Sample Date		06/14/2021		06/14/2021		06/14/2021		06/17/2021		06/17/2021		06/07/2021		06/08/2021		06/09/2021		06/09/2021	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																			
6:2 FTS	-	ND		ND		ND		ND		ND		24.6		ND		ND		35.8	
8:2 FTS	-	ND		ND		ND		ND		ND		7.18		ND		ND		ND	
PFBA	-	ND		ND		ND		1.68	J	26.3		36.3		ND		8.04		49.4	
PFBS	600	ND		ND		17.4		3.43	J	233		200		2.97	J	2.37	J	1.22	J
PFHpA	-	ND		ND		ND		ND		22.2		33.6		ND		9.41		63.5	
PFHxA	-	ND		ND		ND		4.87		145		178		1.53	J	13.7		37.5	
PFHxS	-	ND		ND		31.7		25.6		709		627	J+	2.06	J	29.4		2.57	J
PFNA	-	ND		ND		ND		ND		ND		ND		ND		3.46	J	27.1	
PFOA	40	ND		ND		ND		1.38	J	25.2		85.2		ND		24.1		93.5	
PFOS	40	ND		ND		ND		18.0		139		2700	J	1.38	J	50.5		6.90	
PFPeA	-	ND		ND		ND		2.65	J	41.6		70.8		1.90	J	11.7		79.6	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
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
RE	re-extracted
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter
-	not applicable

Table 6-5
PFAS Detections in Groundwater
Site Inspection Report, Salisbury AASF Facility #2

	Area of Interest	AOI03		AOI04							
	Sample ID	AOI03-04-GW		AOI04-01-GW (RE)		AOI04-01-GW-D (RE)		AOI04-02-GW		AOI04-03-GW	
	Sample Date	06/17/2021		06/11/2021		06/11/2021		06/10/2021		06/10/2021	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)											
6:2 FTS	-	16.6		ND	UJ	ND	UJ	ND		ND	
8:2 FTS	-	ND		ND	UJ	ND	UJ	ND		ND	
PFBA	-	130		2.16	J	1.81	J	11.2		1.56	J
PFBS	600	1.82	J	10.9	J	9.78	J	308		1.25	J
PFHpA	-	101		2.28	J	1.96	J	8.73		ND	
PFHxA	-	313		9.16	J	8.16	J	76.1		2.16	J
PFHxS	-	3.77	J	30.8	J	26.1	J	597		1.59	J
PFNA	-	1.84	J	ND	UJ	ND	UJ	ND		ND	
PFOA	40	26.2		2.71	J	2.47	J	7.04		2.25	J
PFOS	40	3.53	J	4.29	J	3.67	J	15.9		2.59	J
PFPeA	-	573		4.55	J	4.30	J	11.5		1.76	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, and PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
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
RE	re-extracted
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter
-	not applicable

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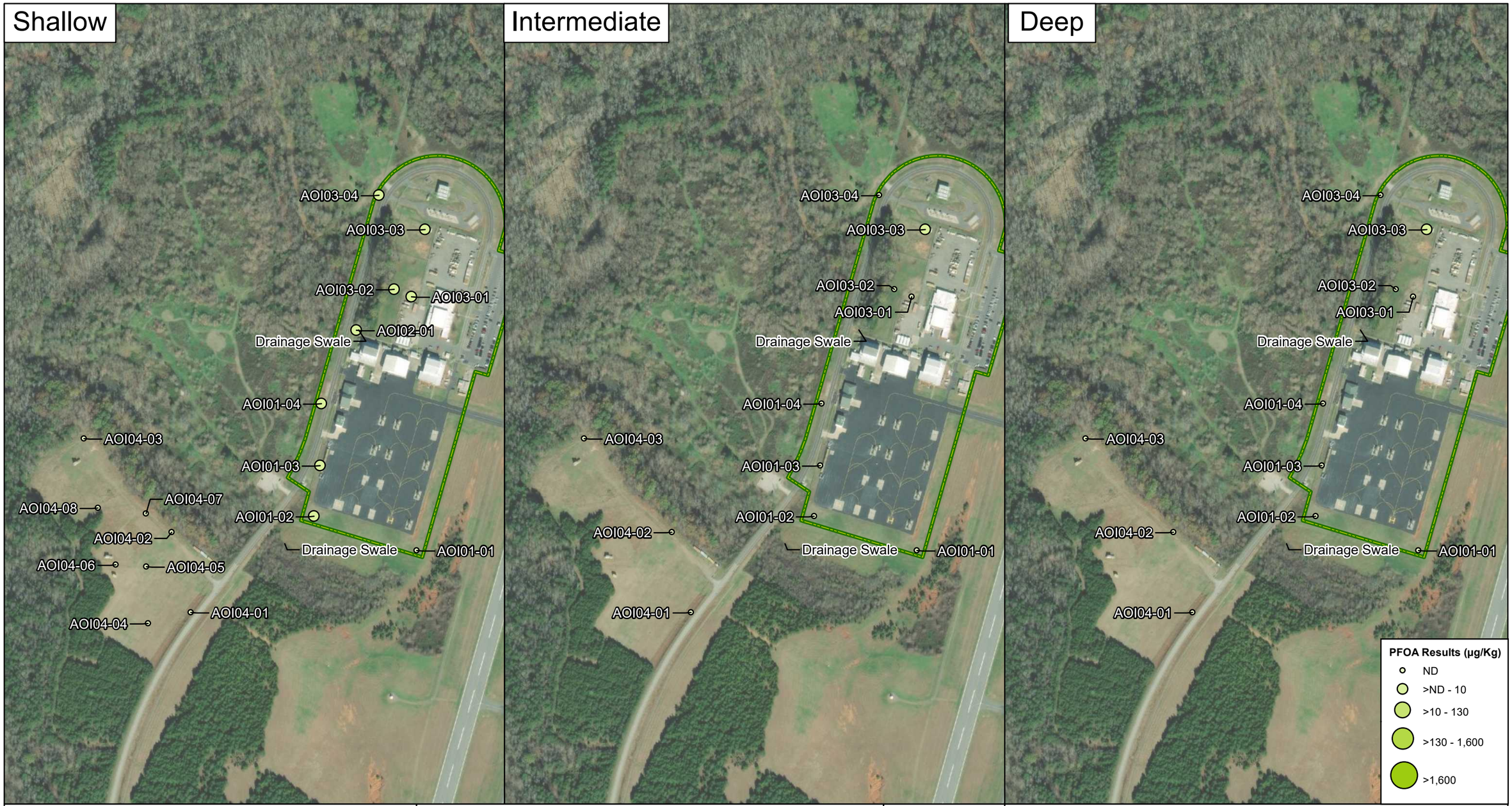

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PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:6,000	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

Legend

Facility Boundary

0 250 500 1,000 Feet

N

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1

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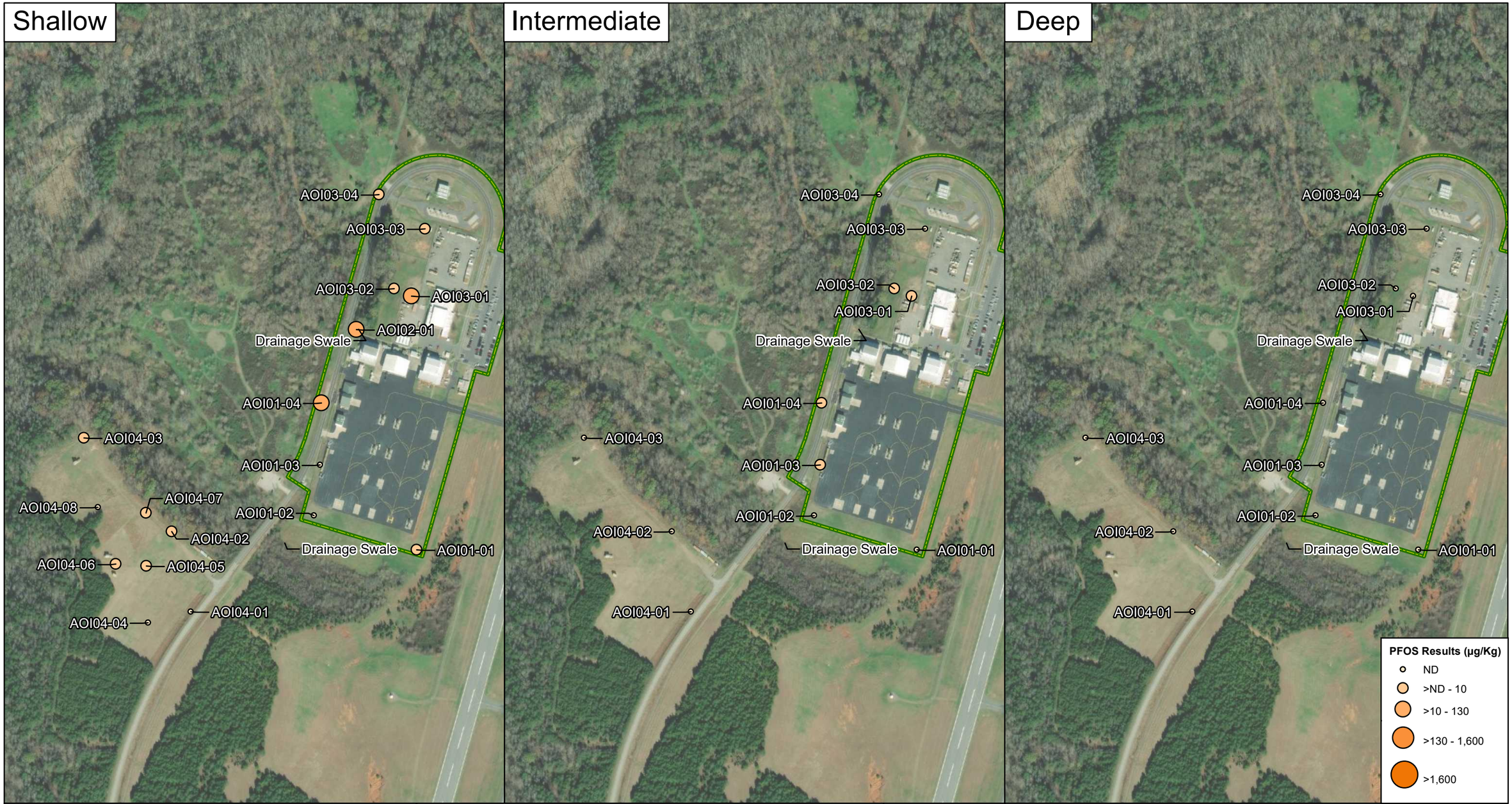

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:6,000	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

Legend

Facility Boundary

0 250 500 1,000 Feet

N

PFOS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2

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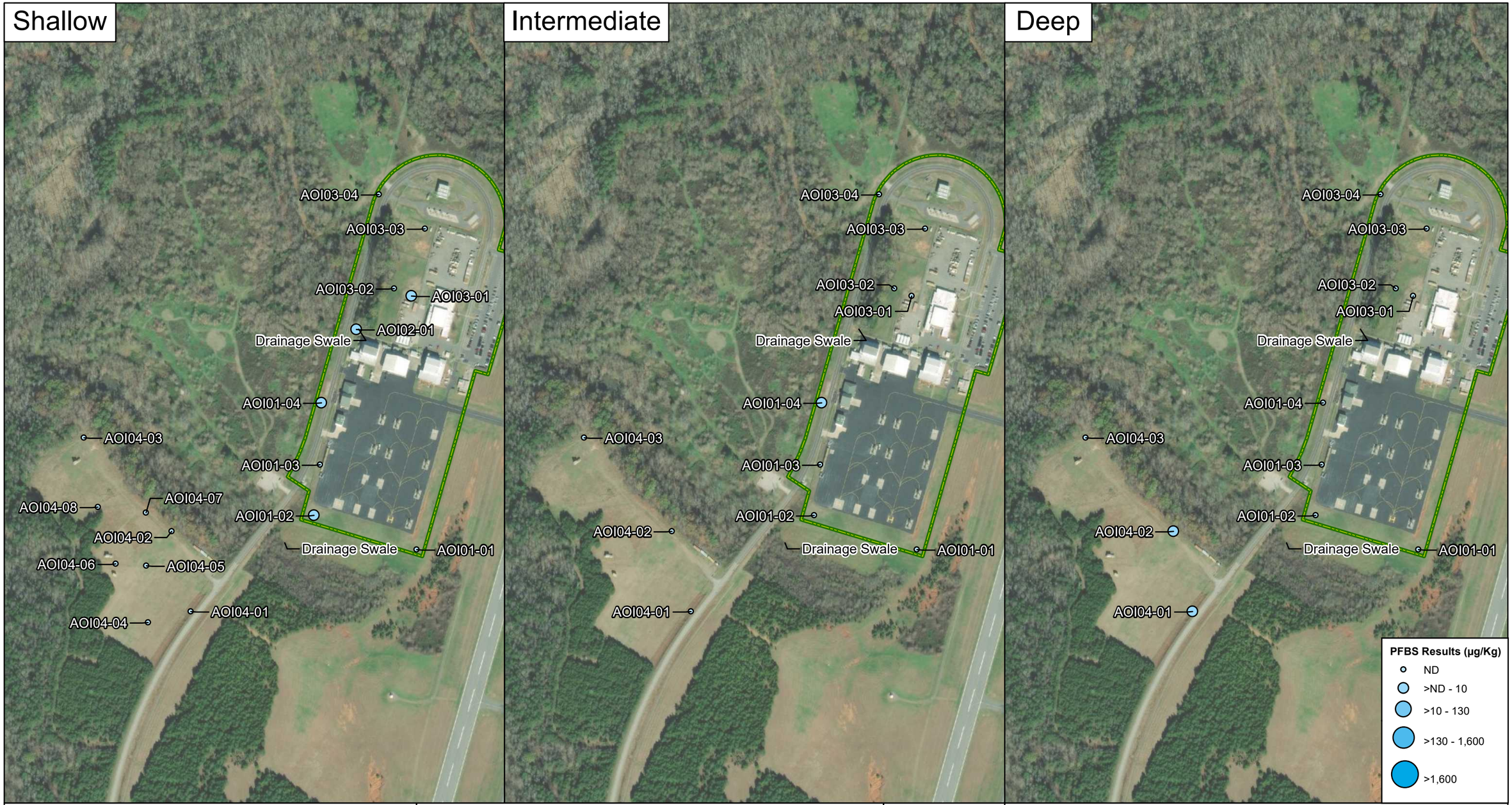

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:6,000	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

Legend

Facility Boundary

0 250 500 1,000 Feet

N

PFBS Detections in Soil

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-3

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PFOA

PFOS

PFBS

AOI03-04
AOI03-03
AOI03-02
AOI03-01
Drainage Swale
AOI02-MW-01
AOI01-04
AOI04-03
AOI01-03
AOI01-02
AOI04-02
Drainage Swale
AOI01-01
AOI04-01

PFOA Results (ng/L)
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

PFOS Results (ng/L)
- ND
- >ND - 10
- >10 - 40
- >40 - 70
- >70 - 400
- >400

PFBS (ng/L)
- ND
- >ND - 100
- >100 - 600
- >600 - 1,000
- >1,000 - 6,000
- >6,000

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Salisbury AASF #2, NC			
REVISED	11/9/2021	GIS BY	MS	11/9/2021
SCALE	1:6,000	CHK BY	ST	11/9/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/9/2021

Legend
- Facility Boundary
- Groundwater Flow Direction

0 250 500 1,000 Feet

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** and **Figure 7-2**. A CSM presents the current understanding of the site conditions with respect to known and suspected on-facility 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 PFOA, PFOS, or PFBS are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway that have detections of PFOA, PFOS, or PFBS above the SLs may warrant further investigation.

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

7.1 Soil Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 through 4 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 encompasses the Current Aircraft Apron FTA, Aircraft Apron Fuel Spills, Defueling Pad, Current Firehouse, and the grassy areas surrounding the potential release areas. AFFF was released in three of the potential release areas to combat potential fires, and AFFF is also stored on the aircraft apron and at the Current Firehouse. It is also possible that AFFF were released during training activities at the Current Aircraft Apron FTA. PFOA, PFOS, and PFBS were detected in soil below the SLs and confirm the release of PFAS to soil at AOI 1. Based on the results of the SI in AOI 1, ground-disturbing activities could potentially result in site worker or future construction worker exposure to PFOA, PFOS, and PFBS via inhalation of dust or incidental ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOS and PFBS via incidental ingestion of subsurface soil. AOI 1 was being resurfaced during the SI activities; however, no current construction is occurring at AOI 1. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 encompasses the Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max™ Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale, and grassy areas surrounding the potential release areas. During the 1990s, AFFF was released to asphalt pavement between the Current and Former Firehouses during firefighting demonstrations conducted at the former FTA. PFOA, PFOS, and PFBS were detected in soil below the SLs and confirm the release of PFAS to soil at AOI 2. Based on the results of the SI in AOI 2, ground-disturbing activities could potentially result in site worker and future construction worker exposure to PFOA, PFOS and PFBS via inhalation of dust or incidental ingestion of surface soil. Ground-disturbing activities could potentially result in future construction worker exposure to PFOA, PFOS, and PFBS via incidental ingestion of subsurface soil. No current construction is occurring at AOI 2. The CSM for AOI 2 is presented on **Figure 7-1**.

7.1.3 AOI 3

AOI 3 encompasses the Former Firehouse #1, Firetruck Parking (2014-2015), Ornamental Firetruck Parking Location (2016), Former Live Fire FTA, and the grassy and paved areas surrounding the potential release areas. In the 1990s, AFFF was dispensed at the FTA at least once, likely to the gravel ground surface, and AFFF could have been released at other potential release areas where AFFF was stored. PFOA, PFOS, and PFBS were detected in soil below the SLs and confirm the release of PFAS to soil at AOI 3. Based on the results of the SI in AOI 3, ground-disturbing activities could potentially result in site worker and future construction worker exposure to PFOA, PFOS, and PFBS via inhalation of dust or incidental ingestion of surface soil. Ground-disturbing activities could also potentially result in future construction worker exposure to PFOA and PFOS via incidental ingestion of subsurface soil. No current construction is occurring at AOI 3. The CSM for AOI 3 is presented on **Figure 7-1**.

7.1.4 AOI 4

There were no known releases of AFFF at AOI 4, which encompasses the NC HART Training Area to the southwest of the facility boundary. This area is adjacent to the facility where the 430th Engineer Firefighting Team conducts fire training exercises. Although this training uses only water, the firetruck used also stores AFFF. PFOA was not detected in soil at AOI 4. PFOS and PFBS were detected in soil below the SLs and confirm the release of PFAS at AOI 4. Based on the results of the SI at AOI 4, ground-disturbing activities could potentially result in site worker and future construction worker exposure to PFOS and PFBS via inhalation of dust or incidental ingestion of surface soil. Ground-disturbing activities could also potentially result in future construction worker exposure to PFBS via incidental ingestion of subsurface soil. No current construction is occurring at AOI 4. The CSM for AOI 4 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria. Salisbury AASF receives its potable water from Salisbury-Rowan Utilities, which sources from the confluence of the South Yadkin River and the Yadkin River, approximately 8 miles northeast of the facility. Therefore, the ingestion exposure pathway for site workers is considered incomplete.

7.2.1 AOI 1

PFOS exceeded the SL in one monitoring well location in AOI 1 (AOI01-04). PFOA, PFOS, and PFBS were detected at the remaining monitoring wells below the SLs (AOI01-02 and AOI01-03). Based on the results of the SI and groundwater flow direction the ingestion exposure pathway is considered potentially complete for off-facility residents. Due to the presence of shallow groundwater (less than 15 feet bgs), future construction workers may be exposed to contaminated groundwater under trenching scenarios. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOA and PFOS exceeded the SLs at the one monitoring well location in AOI 2 (AOI02-MW-1), which is located west and downgradient of the Former Tri-Max™ Demonstration FTA potential release area. PFBS was detected below the SL. Based on the results of the SI and groundwater flow direction the ingestion exposure pathway is considered potentially complete for off-facility residents. Due to the presence of shallow groundwater (less than 15 feet bgs), future construction workers may be exposed to contaminated groundwater under trenching scenarios. The CSM for AOI 2 is presented on **Figure 7-1**.

7.2.3 AOI 3

PFOA exceeded the SL in one temporary monitoring well location (AOI01-03). PFOS exceeded the SL in one temporary well location (AOI3-02). PFOA, PFOS, and PFBS were detected at additional monitoring wells below the SLs (AOI01-02 and AOI01-03). Based on the results of the SI and groundwater flow direction the ingestion exposure pathway is considered potentially complete for off-facility residents. Due to the presence of shallow groundwater (less than 15 feet bgs), future construction workers may be exposed to contaminated groundwater under trenching scenarios. The CSM for AOI 3 is presented on **Figure 7-1**.

7.2.4 AOI 4

PFOA, PFOS, and PFBS were all detected below the SLs at AOI 4, which is associated with the NC HART Training Area. Based on the results of the SI and groundwater flow direction the ingestion exposure pathway is considered potentially complete for off-facility residents. Due to the presence of shallow groundwater (less than 15 feet bgs), future construction workers may be exposed to contaminated groundwater under trenching scenarios. The CSM for AOI 4 is presented on **Figure 7-2**.

7.3 Surface Water Sediment Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because PFOA, PFOS, and PFBS were detected in soil and groundwater at the AOIs, it is possible that those compounds may have migrated from soil and groundwater to Grants Creek and tributaries to Grant Creek west of the facility via groundwater discharge or drainage swales. Therefore, the surface water and sediment ingestion exposure pathway for the off-facility recreational user is considered potentially complete. Grants Creek is a tributary of the Yadkin River (US Fish and Wildlife Service [USFWS], 2020). The CSM for AOI 1, AOI 2, AOI 3, and AOI 4 are presented on **Figure 7-1** and **Figure 7-2**.

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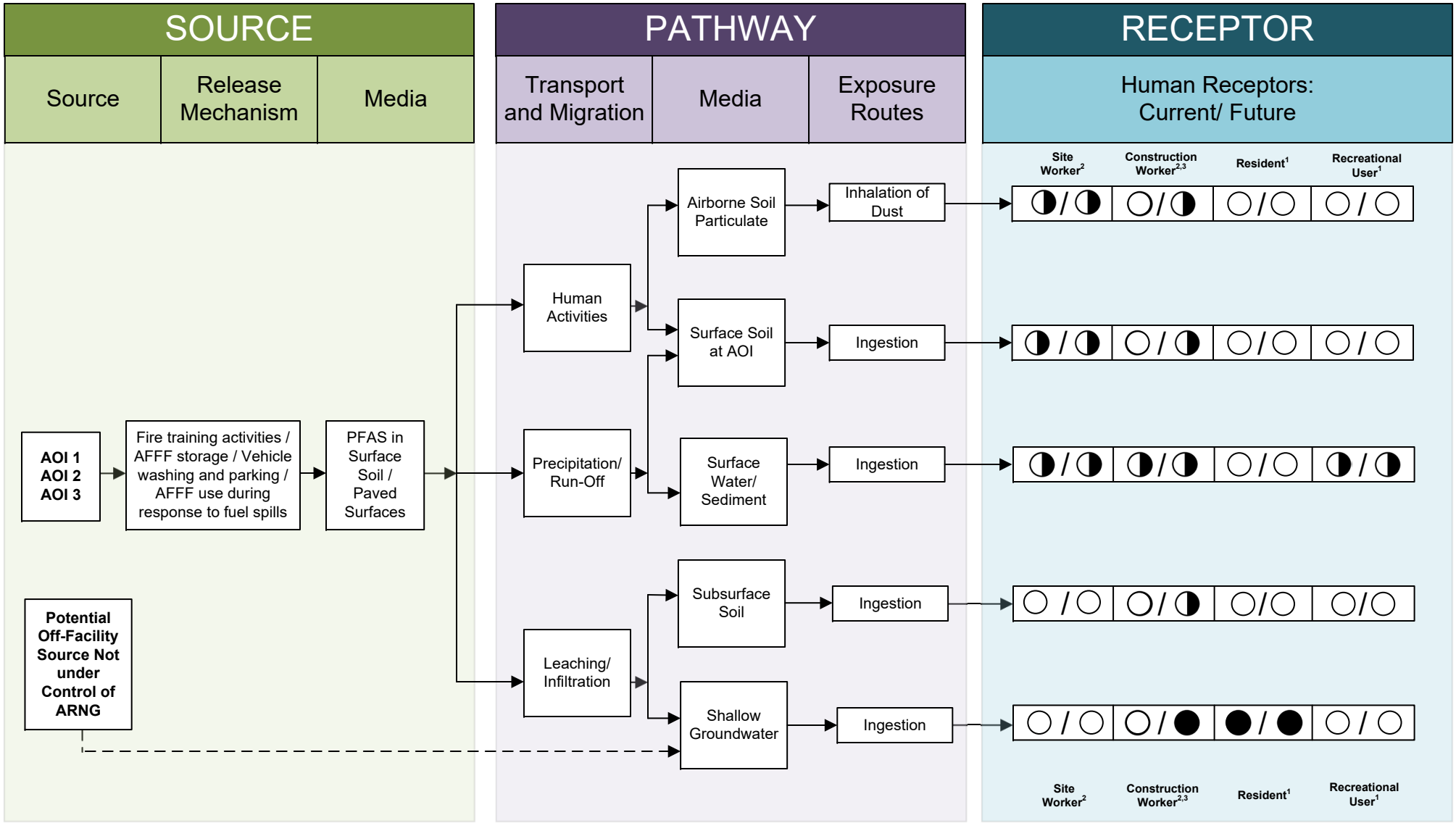


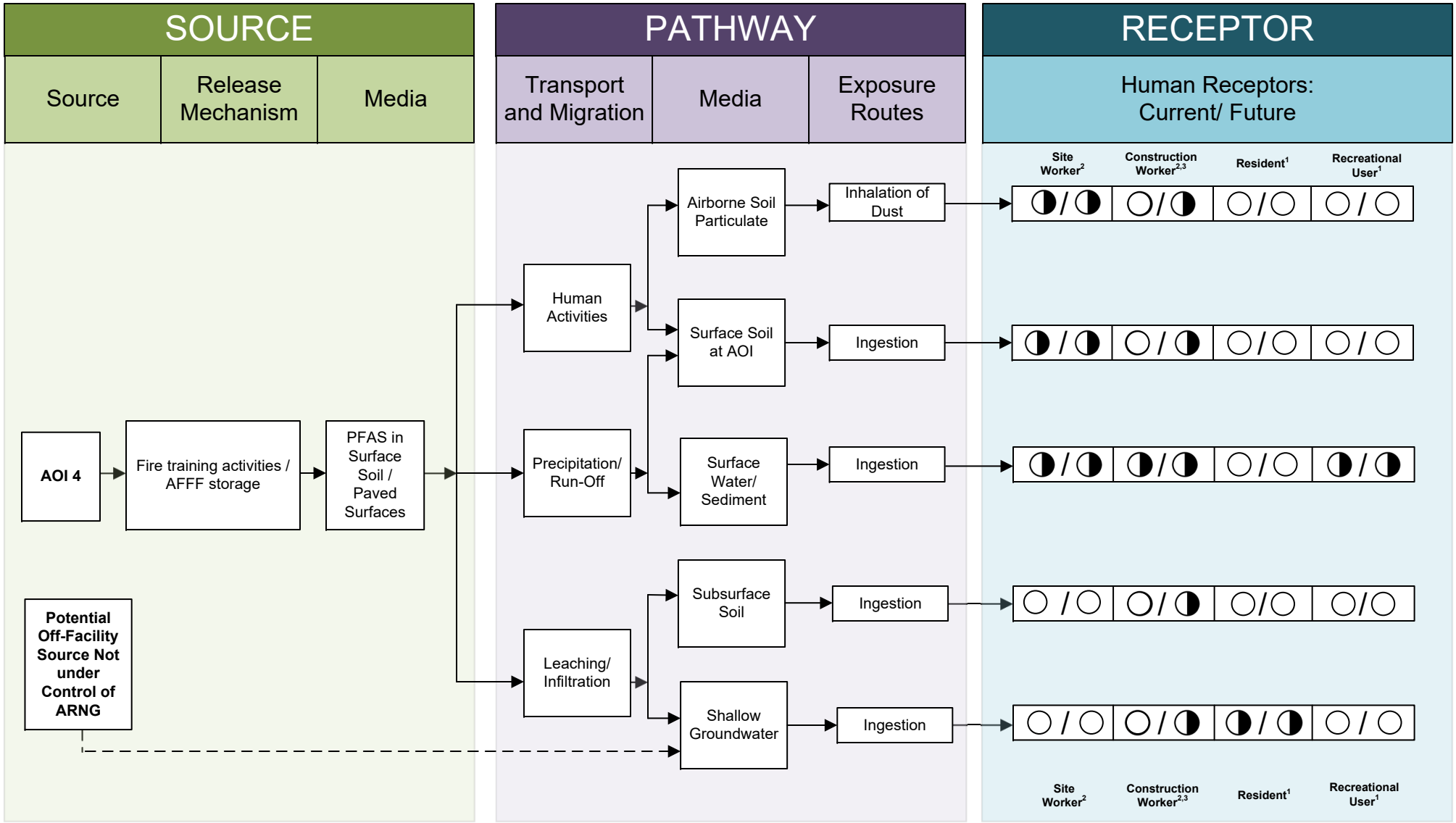
LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Complete Pathway

Notes:

1. The resident and recreational user receptors refer to an off-site resident and recreational user.
2. The site worker and construction worker receptors refer only to Salisbury AASF #2 site and construction workers.
3. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1, AOI 2, and AOI 3
Salisbury AASF #2



LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Complete Pathway

Notes:

1. The resident and recreational user receptors refer to an off-site resident and recreational user.
2. The site worker and construction worker receptors refer only to Salisbury AASF #2 site and construction workers.
3. No current active construction at the facility.

Figure 7-2
Conceptual Site Model, AOI 4
Salisbury AASF #2

8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted from 7 to 17 June 2021 and consisted of utility clearance, sonic drilling, soil sample collection, temporary and permanent monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.7** of this Report.

- Forty-one (41) soil samples from 17 boring locations;
- Six grab groundwater samples from six permanent well locations;
- Six grab groundwater samples from six temporary well locations; and
- Eighteen (18) QA samples.

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

8.2 SI Goals Evaluation

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

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

   PFOA, PFOS, and PFBS were detected at the facility in soil and groundwater. PFOA in groundwater at AOI 2 and AOI 3 exceeded the SL of 40 ng/L. PFOS in groundwater at AOI 1, AOI 2, and AOI 3 exceeded the SL of 40 ng/L. PFBS was detected in groundwater below the SL of 600 ng/L at all AOIs. The detected concentrations of PFOA, PFOS, and PFBS in soil samples from all AOIs were below the SLs.

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

   One potential PFAS release area was removed from further consideration based on the soil and groundwater data collected during this SI: NC HART Training Area. PFOA, PFOS, and PFBS were not detected in groundwater and/ or soil above the SLs in this area; therefore, AOI 4 poses no significant threat to human health or the environment.

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

   Based on the data collected during the SI, there is a potentially complete pathway between the potential PFAS release areas and downgradient public supply wells.

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

   The geological data collected as part of the SI indicate moderately- to low-permeability environment, with soils dominated by lean clay, sandy lean clay, and clayey sand. These observations are consistent with the understood geology of this region, including weathered metamorphic and igneous bedrock underlying fine-grained surficial sediments.

   Depth to water at the facility ranges from 4.85 to 27.71 feet bgs. Groundwater flow direction at the facility is towards the north and northwest. These geologic and hydrogeologic observations inform development of technical approach for the RI.

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

   Based upon the evaluation of soil and groundwater results in comparison to SLs, in combination with the groundwater flow direction analysis, the results of the SI indicate that the source of detected concentrations of PFOA, PFOS, and PFBS at the facility is likely attributable to ARNG activities.

6. *Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.*

   Detections of PFOA, PFOS, and PFBS in soil and groundwater at source areas and the facility boundary indicate there are a potentially complete pathways between source and off-facility receptors.

8.3 Outcome

Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to off-facility residents from AOI 1 through 3 from sources on facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared against the project SLs for PFOA, PFOS, and PFBS 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, PFOS in groundwater at the potential release areas exceeded the SL of 40 ng/L, with a maximum concentration of 139 ng/L at location AOI01-04. PFOS in groundwater downgradient of AOI 1 also exceeded the USEPA HA SL of 70 ng/L. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

- At AOI 2, PFOA and PFOS in groundwater at the potential release areas exceeded the SLs of 40 ng/L with maximum concentrations of 85.2 ng/L and 2,700 ng/L, respectively, at location AOI02-MW-1(existing Rowan County Monitoring Well). PFOA and PFOS in groundwater downgradient of AOI 2 also exceeded the individual and combined USEPA HA SL of 70 ng/L. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

- At AOI 3, PFOA in groundwater at the potential PFAS release areas exceeded the SL of 40 ng/L, with a concentration of 93.5 ng/L at location AOI03-03. Additionally, PFOS in groundwater at the potential PFAS release areas exceeded the SL of 40 ng/L, with a concentration of 50.5 ng/L at location AOI03-02. PFOA in groundwater at the Ornamental Firetruck Parking Location also exceeded the USEPA HA SL of 70 ng/L. Based on the results of the SI, further evaluation of AOI 3 is warranted in the RI.
- At AOI 4, detected concentrations of PFOA, PFOS, and PFBS in groundwater were below SLs. Based on the results of the SI, no further evaluation of AOI 4 is warranted. If screening levels are revised in the future, further evaluation of AOI 4 may be required.
- The detected concentrations of PFOA, PFOS, and PFBS in soil at all AOIs were below the SLs.

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

Table 8-2 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 1: Southern Portion of the facility, AOI 2: Central Portion of the facility, and AOI 3: Northern Portion of the facility.

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Table 8-1: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Southern Portion of Salisbury AASF #2 (Current Aircraft Apron FTA, Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse)	◐	●	●
2	Central Portion of Salisbury AASF #2 (Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale)	◐	●	●
3	Northern Portion of Salisbury AASF #2 (Former Firehouse #1, Firetruck Parking, Ornamental Firetruck Parking Location, Former Live Fire FTA	◐	●	◐
4	NC HART Training Area	◐	◐	◐

Legend:
N/A = Not applicable
NC HART = North Carolina Helicopter Aquatic Rescue Team
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

Table 8-2: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Southern Portion of Salisbury AASF #2 (Current Aircraft Apron FTA, Aircraft Apron Fuel Spills, Defueling Pad, and Current Firehouse)	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
2	Central Portion of Salisbury AASF #2 (Former Firehouse #2, Historical Firetruck Washing Area, Former Tri-Max Demonstration FTA, Wash Rack, Former Firetruck Parking Area, Drainage Swale)	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
3	Northern Portion of Salisbury AASF #2 (Former Firehouse #1, Firetruck Parking, Ornamental Firetruck Parking Location, Former Live Fire FTA	Exceedances of SLs in groundwater at potential release areas. No exceedances of SLs in soil.	Proceed to RI
4	NC HART Training Area	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action*

Notes:
* If screening levels are revised in the future, further evaluation of AOI 4 may be required.
NC HART = North Carolina Helicopter Aquatic Rescue Team

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