FINAL PRELIMINARY ASSESSMENT AND SITE INSPECTION OF PER- AND POLYFLUOROALKYL SUBSTANCES

Hunter Army Airfield, Georgia

Prepared For:
U.S. Army Corps of Engineers, Baltimore District
2 Hopkins Plaza
Baltimore, Maryland 21201

July 2022

Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

Hunter Army Airfield, Georgia

Scott Bostian
Site Inspection Project Manager, Arcadis U.S., Inc.

Rhonda Stone, PMP
Program Manager, Arcadis U.S., Inc

Eric Killenbeck
Technical Expert, Arcadis U.S., Inc.

Prepared for:

U.S. Army Corps of Engineers

Contract No.: W912DR-18-D-0004

Delivery Order No.: W912DR1818F0685

Prepared by:

Arcadis U.S., Inc.

7550 Teague Road

Suite 210

Hanover

Maryland 21076

Arcadis Ref.:

30001992

Date:

July 2022

CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

The United States Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The PA identifies areas of potential interest (AOPIs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. This Hunter Army Airfield (HAAF) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense (DoD) policy and guidance.

HAAF encompasses 5,414 acres, 2,341 acres are utilized for 12 different training areas (including one amphibious training area). There are four operational live fire ranges, as follows:

- HAAF Small Arms Range that consists of 0.5 acres and 10 firing points (used since September 11, 2003.
- Live Fire Shoothouse that consists of 0.11 acres (used since September 11, 2003).
- Live Fire Breach (used since September 11, 2003).
- H9 Flat Range (used since April 1, 2021).

The HAAF PA identified 13 AOPIs for investigation during the SI phase. The AOPIs included were areas identified by the Army that had current or potential historical use of PFAS-containing materials. The PA conducted by the Army National Guard included AOPIs identified on parcels of land owned by the US Army and leased indefinitely to the Georgia Army National Guard. The Army National Guard PA resulted in the identification of one additional AOPI, resulting in a total of 14 AOPIs. SI sampling was completed at HAAF for all 14 identified AOPIs, which included the Army National Guard AOPI in addition to the AOPIs identified by the Army, to evaluate whether PFOS, PFOA, and/or PFBS were present at concentrations that exceed the OSD risk screening levels. SI sampling results from the 14 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and PFBS. PFOS, PFOA, and/or PFBS were detected in soil, groundwater, surface water and/or sediment at 13 AOPIs; 12 of the 13 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. The HAAF PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI.

Table ES-1. Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at HAAF, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)				Recommendation
	GW	SO	SW	SE	
Fire Training Site (HAA-01)	Yes	Yes	Yes	NS	Further study in a remedial investigation
Fire Station 04	Yes	Yes	NS	NS	Further study in a remedial investigation
Sleepy Hollow FTA	Yes	ND	NS	NS	Further study in a remedial investigation
Fire Station 02	Yes	No	NS	NS	Further study in a remedial investigation
Vehicle Fire 03	Yes	No	NS	NS	Further study in a remedial investigation
Nozzle Testing Area	Yes	No	NS	NS	Further study in a remedial investigation
Hangar 830	Yes	No	NS	NS	Further study in a remedial investigation
Hangars 7901 and 7902	Yes	No	Yes	No	Further study in a remedial investigation
Hangar 7911	Yes	NS	Yes	No	Further study in a remedial investigation
HAAF WWTP	Yes	NS	NS	NS	Further study in a remedial investigation
Vehicle Fire 02	No	ND	NS	NS	No action at this time
Vehicle Fire 04	Yes	ND	NS	NS	Further study in a remedial investigation
Vehicle Fire 05	ND	ND	NS	NS	No action at this time
Hangar 805	Yes	NS	NS	NS	Further study in a remedial investigation

Notes:
Light gray shading – detection greater than the OSD risk screening level
FTA – Fire Training Area
GW – groundwater
ND – not detected
NS – not sampled
SE – sediment
SO – soil
SW – surface water
WWTP – wastewater treatment plant

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA/SI consistent with its authority under CERCLA, 42 United States Code §§ 9600, et seq. (as amended), and the Defense Environmental Restoration Program, 10 United States Code §§ 2701, et seq. The PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at Hunter Army Airfield (HAAF) based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the Office of the Secretary of Defense (OSD) PFOS, PFOA, and PFBS risk screening levels to determine whether further investigation is warranted. This report provides the PA/SI for HAAF and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

PFAS are a class of compounds that have been used in a wide range of industrial applications and commercial products due to their unique surface tension/leveling properties. Due to industry and regulatory concerns about the potential health effects and adverse environmental impacts, there has been a reduction in the manufacture and use of PFAS worldwide. In the U.S., significant reductions in the production, importation, and use of PFOS and PFOA (two individual compounds in the PFAS class) occurred between 2001 and 2015 (Interstate Technology Regulatory Council 2017). PFBS replaced PFOS in some applications and is currently used and manufactured in the U.S.

In 2016, the United States Environmental Protection Agency (USEPA) established a lifetime health advisory of 70 nanograms per liter (ng/L) in drinking water for PFOS or PFOA and for the sum of PFOS and PFOA when both are present (USEPA 2016). On 15 October 2019, the OSD provided guidance on the investigation of PFOS, PFOA, and PFBS at Department of Defense (DoD) restoration sites (OSD 2019). The DoD guidance provides risk screening levels for PFOS, PFOA, and PFBS in tap water or soil, calculated using the USEPA's Regional Screening Level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD memo, on 08 April 2021, USEPA published an updated toxicity assessment for PFBS (USEPA 2021). Based on the updated toxicity assessment for PFBS, the OSD issued a memorandum on 15 September 2021 to include updated PFBS risk screening levels (OSD 2021). The September 2021 Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program is provided for reference as **Appendix A**. The OSD risk screening levels for tap water (also used to evaluate groundwater or surface water used as drinking water sources) are 40 ng/L for PFOS and PFOA, and 600 ng/L for PFBS. The PFOS and PFOA soil screening levels for the residential and industrial/commercial scenarios are 0.13 milligrams per kilogram (mg/kg) (residential) and 1.6 mg/kg (industrial/commercial).

The soil screening levels for PFBS are 1.9 mg/kg (residential) and 25 mg/kg (industrial/commercial). These screening criteria are discussed further in **Section 6.5**.

1.2 PA/SI Objectives

This PA/SI was conducted consecutively because the results of the PA yielded AOPIs that necessitated continuing onto the SI phase in accordance with CERCLA. Consequently, this report provides the combined objectives of both PA and SI reports.

1.2.1 PA Objectives

During the PA, investigators collect readily available information and conduct site reconnaissance. This PA will evaluate and document areas where PFAS-containing materials were used, stored, and/or disposed, so the Army can distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation.

1.2.2 SI Objectives

An SI is conducted when the PA determines an AOPI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required.

Installation-specific data quality objectives (DQOs) and the sampling design and rationale are summarized in **Sections 6.1** and **6.2**.

1.3 PA/SI Process Description

For HAAF, PA/SI development followed the process as described below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for HAAF. The PA and SI processes are documented in the PA/SI Quality Control Checklist included as **Appendix B**.

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), HAAF, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred 08 August 2018, 6 weeks before the site visit to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

Records review was conducted before the site visit to obtain electronically available documents from the installation and external sources for review. The purpose of the records research was to identify any area on the installation that may have been a location where PFAS-containing materials were used, stored, and/or disposed, as well as to gather information on the physical setting and site history at HAAF.

A read-ahead package was prepared and submitted to the appropriate POCs two weeks before the site visit. The read-ahead package contains the following information:

- The Installation Management Command (IMCOM)/Army Materiel Command operation order.
- The Army PA Operations Security requirements package, which includes the antiterrorism/operations security review cover sheet (**Appendix C**).
- The PFAS PA kickoff call minutes.
- An information paper on the PA portion of the Army's PFAS PA/SI.
- Contact information for key POCs.
- A list of the data sources requested and reviewed.
- A list of preliminary locations identified during the kickoff call and pre-site visit records review to be evaluated for use, storage, and/or disposal of PFAS-containing materials, where additional information on those areas will be collected through personnel interviews, additional document review, and site reconnaissance.
- A list of roles for the installation POC to consider when recommending potential interviewees.

1.3.2 Preliminary Assessment Site Visit

The site visit was conducted on 24 to 26 September 2018. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

Personnel interviews were conducted with individuals having significant historical knowledge at HAAF. The interviews focused on confirming information discussed in historical documents, collecting information that may have not been in historical documents, and corroborating other interviewees' information.

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts, and the migration potential from each AOPI (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved, unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells, if present, was also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. In addition, access limitations or advantages related to potential future sampling activities were noted. Photo documentation of the preliminary locations was prohibited by HAAF and therefore no photos were taken.

An exit briefing was offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The installation declined an exit briefing after it was determined by the PA team and installation personnel that all pertinent items had been discussed during the site visit.

1.3.3 Post-Site Visit

Information collected before, during, and after the site visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during site visit reconnaissance. A site visit trip report was completed and provided to the installation POC, applicable USAEC POCs, and USACE regional POCs following the site visit. The information collected during the pre-site visit and site visit activities was compiled to develop the installation-specific PA portion of the PA/SI report (**Section 3**). Site data obtained during the PA were used to develop preliminary conceptual site models (CSMs) for each AOPI, which serve as the basis for developing the SI scope of work presented in an installation-specific Quality Assurance Project Plan (QAPP) Addendum.

1.3.4 Site Inspection Planning and Field Work

The SI process was initiated at the installation to evaluate PFOS, PFOA, and PFBS presence or absence at each AOPI and determine whether further investigation is warranted. First, an SI kickoff teleconference was held between the Army PA team and HAAF.

The objectives of the SI kickoff teleconference were to:

- discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI
- gauge regulatory involvement requirements or preferences
- identify overlapping unexploded ordnance (UXO) or cultural resource areas
- determine the plan for investigation-derived waste (IDW) handling and disposal
- identify specific installation access requirements and potential schedule conflicts
- discuss general SI deliverable and field work schedule information and logistics

Following development of the SI sampling technical approach, an SI scoping teleconference was held to obtain concurrence on the SI sampling plan from USAEC, USACE, and the installation. Additional discussion topics included:

- regulatory involvement requirements or preferences
- confirm no overlapping UXO or cultural resource areas
- confirm the plan for IDW handling and disposal
- confirm specific installation access requirements and potential schedule conflicts
- provide an updated SI deliverable and field work schedule.

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP) was developed and finalized in October 2019 for the USAEC PFAS PA/SI (Arcadis 2019). The PQAPP details general planning processes for collecting data and describes the implementation of quality assurance (QA) and quality control (QC) activities for the SI portion for Army installations nationwide. Additionally, an installation-specific QAPP Addendum was developed to define the DQOs, present the sampling design and rationale, and provide qualifications for project personnel. The SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation-specific QAPP Addendum. A

Site Safety and Health Plan (SSHP) was also developed as an attachment to the QAPP Addendum to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for Army installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

The DQOs, sampling design and rationale, and field methods employed for the SI are summarized from the QAPP Addendum developed for HAAF (Arcadis 2020) in **Sections 6.1** through **6.3**.

After finalization of the QAPP Addendum and SSHP, field planning and coordination with the installation and subcontractors was completed. Once the schedule was determined, field teams mobilized to the installation to complete the scope of work defined in the QAPP Addendum.

1.3.5 Data Analysis, Validation, and Reporting

Environmental samples collected during the SI were submitted to a laboratory which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry and compliant with the DoD Quality Systems Manual (QSM) 5.3 (DoD and Department of Energy 2019). Laboratory analytical results were then validated and verified by a project chemist to assess the usability of the data collected. Validated analytical results were summarized in the context of OSD risk screening levels (defined in **Section 6.5**).

2 INSTALLATION OVERVIEW

The following subsections provide general information about HAAF, including the location and layout, the installation mission(s) over time, a brief site history, current and projected land use, climate, topography, geology, hydrogeology, surface water hydrology, potable wells within a 5-mile radius of the installation, and applicable ecological receptors.

2.1 Site Location

HAAF encompasses approximately 5,600 acres in Chatham County, Georgia, south of the City of Savannah (**Figure 2-1**). HAAF includes the Army's longest runway east of the Mississippi River and the Truscott Air Deployment Terminal (**Figure 2-2**). Serving as a sub-installation to Fort Stewart, HAAF is located 25 miles to the northeast. HAAF is the home base of operations for the 3rd Infantry Division (Mechanized) Aviation Brigade, several other Army battalions (e.g., Rangers, Special Operations, and Military Intelligence), Georgia Air National Guard (Tactical Control Squadron), U.S. Navy (for P-3 training), U.S. Marine Corps Reserve, and U.S. Coast Guard Air Station Savannah (Malcom Pirnie 2006).

2.2 Mission and Brief Site History

HAAF first became an airfield in 1929 to serve as the future site of the Savannah Municipal Airport. However, in 1940, the U.S. government approved construction of an Army Air Corps base and, in 1941, the Savannah Air Base opened. During World War II, the air base supported all types of bomber, fighter, transport, and cargo aircraft. In 1950, the Second Bomb Wing moved from Arizona to HAAF, and B-47 bombers dominated the airfield until 1963. From 1963 to 1967, the installation was a Materiel Air Transport Serve base, U.S. Air Force, home of the 63rd Troop Carrier Wing. In 1967, the Air Force transferred the installation to the Army. In 1973, HAAF went into caretaker status; in 1975, it was again reopened as a support facility for the reactivated mechanized infantry division at Fort Stewart. In 1980, the 24th Infantry Division (Mechanized) became part of the Army's rapid deployment force.

Historical activities at HAAF included municipal aviation and operational training for various aircraft. The small arms range located in the northern portion of the installation was previously used as a bore sight range (Malcom Pirnie 2006).

2.3 Current and Projected Land Use

HAAF encompasses 5,414 acres, 2,341 acres are utilized for 12 different training areas (including one amphibious training area). There are four operational live fire ranges, as follows:

- HAAF Small Arms Range that consists of 0.5 acres and 10 firing points (used since September 11, 2003
- Live Fire Shoothouse that consists of .11 acres (used since September 11, 2003)
- Live Fire Breach (used since September 11, 2003)
- H9 Flat Range (used since April 1, 2021).

The non-munitions-use ranges include three fixed-wing parking aprons, one rotary-wing parking apron, one field training area, one obstacle course, one parade/drill field, two personnel/equipment drop zones, two parachute landing fall platforms, one fixed-wing runway surface, and one rappelling training area (note that some of the ranges have multiple uses). Historically, a landfill was located in one of the light training/maneuver areas on the northern portion of the installation, a U.S. Air Force runway was located near the center of the installation, a U.S. Air Force ammunition storage area was located on one of the light training/maneuver areas on the installation's northern portion, and a bore sighting range was collocated with the current small arms firing range (Malcom Pirnie 2006).

2.4 Climate

The climate is humid subtropical with short, mild winters and hot, humid summers. The monthly mean temperatures in the Savannah area range from 49 degrees Fahrenheit (°F) in January to 82°F in July. The average low temperature is 38°F in January; the average high temperature is 91°F in July. Snow and freezing temperatures are extremely rare, with an average annual snowfall of less than 0.5 inches. The greatest amount of rainfall is received mainly in midsummer, and the dry season occurs during October and November. The average annual precipitation is 49 inches. Prevailing winds are from the southwest during the summer months, from the northeast from September to December, and variable from January to May (U.S. Climate Data. 2021). The principal source of recharge to groundwater is via precipitation infiltration (Malcom Pirnie 2006).

2.5 Topography

HAAF's topography is characterized by gently rolling hills towards the west to relatively flat, featureless plains towards the southeast (**Figure 2-3**). The highest elevations generally occur in the northern portion of the installation, with a gradual decrease in elevation towards the east, west, and south. Elevations across most of the installation range from 6.5 to 14.0 feet above mean sea level (amsl). Low-lying areas with elevations less than 1.5 feet amsl occur along the western boundary and in the southwest corner of the installation near the Little Ogeechee River (The Nature Conservancy 1995).

2.6 Geology

HAAF lies within the Southern Coastal Plain physiographic province. The installation is underlain by a wedge of Quaternary to Cretaceous-aged unconsolidated and semi consolidated sediments that gently dip and thicken towards the southeast. The unconsolidated sediments in this region are dominated by interbedded sand, silt, and clay in the up-dip areas and become more non-clastic (e.g., limestone and dolomite) near the coast. Underlying the coastal plain sediments is a variety of igneous and metamorphic rocks known as the basement complex, which ranges in age from the Precambrian to Triassic (Cramer and Arden 1980). These rocks dip at approximately 29.9 feet per mile in a southeastern direction from the fall line near Macon and Augusta, where they appear at the surface, and drop to approximately 4,000 feet below ground surface (bgs) in the Savannah area (Environmental Science and Engineering (ESE) 1993, U.S. Army Environmental Hygiene Agency 1987).

2.7 Hydrogeology

There are three distinct aquifer systems in the HAAF region: the surficial, the Brunswick, and the Floridan aquifer systems. The surficial aquifer consists of Miocene to post-Miocene age deposits of sand silt and clay ranging in thicknesses from 155 to 230 feet. The Brunswick aquifer is further divided into the upper and lower Brunswick aquifers and consists of Miocene-to-Oligiocene-aged fine to coarse sand, silt and clay. These deposits extend between 375 and 445 feet bgs. Beneath the Brunswick aquifer is the Floridan aquifer system, which is considered the principal source of all water uses in the coastal area. The Floridan aquifer serves as the primary source of large groundwater withdrawals in the coastal area. This aquifer is comprised of two distinct layers, the upper Floridan and lower Floridan aquifers. This system consists of deep sequences of limestone and dolomite of the Eocene to Oligocene age. The upper Floridan aquifer is derived from the Oligocene series of sandy, phosphatic limestone and is underlain by the Ocala Limestone of the Eocene age (Gonthier and Clarke 2013).

According to regional aquifer and groundwater flow studies conducted by the United States Geological Survey in the Coastal Plain area, the Floridan aquifer system is under artesian conditions and is separated from the two shallow aquifer systems by confining units consisting of silty clay and dense phosphatic dolomite. These confining units occur beneath the surficial aquifer and beneath the Brunswick aquifer. Reported vertical hydraulic conductivities of the confining unit separating the surficial aquifer and the Brunswick aquifer range from $5.3x10^{-5}$ to $1.3x10^{-4}$ feet per day. The hydraulic conductivities for the confining unit separating the Brunswick and upper Floridan aquifers range from 2.3x10-3 to 3.0 feet per day (Gonthier and Clarke 2013).

Recharge for the Floridan aquifer system is an area 60 to 100 miles northwest of Savannah. The directional flow of the surficial aquifer is inconclusive; however, it is believed to follow the flow patterns of the surface water. The surficial aquifer is recharged directly from rainfall percolating through sediments. During dry months, the base flow of streams and rivers of the coastal area is maintained by discharge from the surficial aquifer. The two shallow aquifer systems are used almost exclusively for domestic water, but primarily as a secondary water supply rather than for drinking water (U.S. Army Toxic and Hazardous Materials Agency 1983; Gonthier and Clarke 2013). In recent years, GAEPD has capped withdrawal from the Upper Floridian aquifer due to demand from saltwater intrusion. Currently, research is underway to seek alternative groundwater sources to that might include the Brunswick and/or surficial aquifers.

2.8 Surface Water Hydrology

Surface water resources at HAAF include 12 miles of brackish water streams and several small impoundments ranging in size from 4.3 to 9.7 acres. Surface water flow at HAAF is towards the south-southwest to the Little Ogeechee and south-southeast to the Vernon River. Surface runoff is directed to the Little Ogeechee salt marsh/river system due to the large area of impervious surface associated with the airfield and cantonment area. The Lamar Canal, located along the northwestern boundary of HAAF, receives drainage from the airfield, cantonment area, and Fire Station 04. Drainage from these areas flows to the west through a storm drain system that includes a series of ditches to the Lamar Canal, which travels to the southwest to the Little Ogeechee River. The Harmon Canal, located on the southern boundary of HAAF, receives drainage from fire training areas (FTAs), and Fire Station 02, which travels to

the southeast to the Vernon River (U.S. Army Toxic and Hazardous Materials Agency 1983 Gonthier and Clarke 2013).

2.9 Relevant Utility Infrastructure

The following subsections provide general information regarding the installation's stormwater and wastewater management systems, as well as information on how the utility infrastructures may influence the fate and transport of PFAS constituents at HAAF.

2.9.1 Stormwater Management System Description

Storm water drainage at HAAF is controlled through an extensive network of surface and subsurface conduits and culverts. The principal drainage channels flowing through improved grounds on the installation eventually discharge to the Little Ogeechee River.

2.9.2 Sewer System Description

Sludge from the domestic sewage wastewater treatment plant (WWTP) at HAAF was historically disposed of at the Post South Central Landfill (FST-001) at Fort Stewart, Georgia. The WWTP received waste from Fire Station 02 where aqueous film-forming foam (AFFF) leaks and routine nozzle testing occurred. In 1991, biosolid disposal was changed to Waste Management's Superior Landfill off-site. Since 1991, all biosolids from the HAAF WWTP (received drainage from fire stations) have been disposed of at Waste Management's Superior Landfill site in Savannah, Georgia.

2.10 Potable Water Supply and Drinking Water Receptors

Groundwater is the principal source of potable water in coastal Georgia. HAAF operates four separate groundwater systems for supplying safe drinking water to residents and employees and for providing water for fire protection. A total of eight potable wells are included in these systems, two of which have been capped. All the wells in the eight groundwater systems pump from the Floridan aquifer. The main post system is a community water system and consists of two deep potable wells located in the cantonment area. Water treatment for the main post system consists of chlorination and fluoridation. On-post potable wells are shown on **Figure 2-2**. Available on-post potable well depths can be found in **Table 2-1**.

An Environmental Data Resources, Inc. (EDR) report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. An EDR report was generated for HAAF which along with state and county GIS provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary (**Figure 2-4**). The EDR report providing well search results is provided as **Appendix E**.

2.11 Ecological Receptors

The PA team collected information regarding ecological receptors that was available in the installation documents. The following information is provided for future reference should the Army decide to evaluate exposure pathways relevant to the ecological receptors.

Sensitive Environments

Approximately 885 acres of wetlands are located on the southwestern portion of HAAF and are regulated as part of the Coastal Plain-National Wetlands management system by the U.S. Fish and Wildlife Service (Malcolm Pirnie 2006).

Habitat Type(s)

The majority of HAAF is developed cantonment, aircraft runway, and parking areas. Natural habitats exist along the perimeter and the western portion of the Installation. The remaining portions of the installation (where the majority of the operational ranges are located) are developed and include urban-type habitats. Off-range areas considered sensitive ecological habitat include wetlands and associated streams and the Little Ogeechee River (Malcolm Pirnie 2006).

Ecological Receptors

The federally listed threatened wood stork regularly occurs on HAAF when water levels are conducive for foraging, but no breeding rookeries occur on HAAF. The West Indian manatee occasionally occurs for short periods in the Forest River and its tributaries when water temperatures are above 60 ^{o}F. Some endangered sea turtles (green, Kemp's ridley, and loggerhead) may travel up the Forest River towards the installation, though none have ever been identified near HAAF. Historically, the red-cockaded woodpecker (federally endangered) and the gopher tortoise (state threatened) occurred on HAAF, but after years of fire exclusion these species have long been extirpated from HAAF. HAAF does not have suitable habitat for any other federally listed species and therefore, no critical habitat for any listed species occurs on HAAF (USFWS, 2019).

2.12 Previous PFAS Investigations

Previous (i.e., pre-PA) PFAS investigations relative to HAAF, including both those conducted and not conducted by the Army, are summarized to provide full context of available PFAS data for HAAF. However, only data collected by the Army will be used to make recommendations for further investigation.

In 2014, under the third Unregulated Contaminant Monitoring Rule, samples were collected from three public water systems (PWS) within 5-miles of HAAF: Pooler PWS, Richmond Hill PWS, and Larchmont Utilities PWS. Samples were analyzed for various parameters, including PFOS and PFOA, using USEPA Method 537. PFOS and PFOA were not detected.

In May 2016, the USEPA issued a PFOS and PFOA health advisory level of 70 ng/L (USEPA 2016); subsequently, in June 2016, the Army issued a guidance publication for PFAS contamination assessments (Army 2018). In response to these actions, the third Unregulated Contaminant Monitoring Rule, and IMCOM Operations Order 16-088, Army installations began initial PFAS sampling in 2016 at water supply wells. The Army performed PFAS sampling in September 2016 at seven public water supply wells within the installation boundary of HAAF; PFOS and PFOA were not detected. PFAS data collected at HAAF potable wells in 2016 can be found in **Table 2-1**. As indicated by HAAF, the Army performed subsequent PFAS sampling in December 2019 at seven wells within the installation boundary of HAAF; PFOS and PFOA were not detected. The USEPA third Unregulated Contaminant Monitoring Rule data indicate that PFOS and/or PFOA were not detected in public water systems above the USEPA lifetime health advisory within a 20-mile radius of the facility.

3 SUMMARY OF PA ACTIVITIES

To document areas where any potential current and/or historical PFAS-containing materials were used, stored and/or disposed at HAAF, data was collected from three principal sources of information and are described in the subsections below:

1. Records review
2. Personnel interviews
3. Site reconnaissance

Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review, personnel interviews, and/or site reconnaissance) and were categorized as AOPIs or as areas not retained for further investigation at this time based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches). A summary of the observations made, and data collected through records reviews (**Appendix F**), installation personnel interviews (**Appendix G**), and site reconnaissance logs (**Appendix H**) during the PA process for HAAF is presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**, and further discussion regarding categorizing areas as AOPIs is presented in **Section 5.2**.

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various Installation Restoration Program (IRP) administrative record documents, compliance documents, HAAF fire department documents, HAAF Directorate of Public Works documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for HAAF is provided in **Appendix F**.

3.2 Personnel Interviews

Interviews were conducted during the site visit. If a previously identified interviewee was not available during the site visit, attempts were made to complete the interview via telephone before or following the site visit or by contacting an alternate interviewee identified by the installation POC.

The list of roles for the installation personnel interviewed during the PA process for HAAF is presented below (affiliation is with HAAF unless otherwise noted).

- HAAF/Fort Stewart, Directorate of Public Works, Remedial Section Leader
- HAAF/Fort Stewart, Infrastructure Section Team Leader
- HAAF/Fort Stewart, Prevention and Compliance Branch Chief
- HAAF/Fort Stewart, Wastewater Program Support
- HAAF/Fort Stewart, Stormwater Program Support
- HAAF/Fort Stewart, Water Program Manager

- HAAF/Fort Stewart, Photo Lab Manager
- HAAF, Station Chief
- HAAF, Airfield Safety Manager
- HAAF, Aviation Manager
- HAAF, Fire Inspector
- HAAF, Fire Station Captain
- Resource Conservation and Recovery Act Program Manager and Environmental Spill Response POC
- USACE, Savannah Facility Operations Branch Chief
- USAEC, Environmental Support Manager

The compiled interview logs are provided in **Appendix G**.

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at HAAF during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. Photographs were not permitted by HAAF during the site reconnaissance activities. The site reconnaissance logs are provided in **Appendix H**.

Access to existing groundwater monitoring wells, if present, were also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling.

4 POTENTIAL PFAS USE, STORAGE, AND/OR DISPOSAL AREAS

HAAF was evaluated for all potential current and historical use, storage, and/or disposal of PFAS-containing materials. There are a variety of PFAS-containing materials used in relation to current and historical Army operations. However, the use, storage, and/or disposal of aqueous film-forming foam (AFFF) is the most prevalent potential source of PFAS chemicals at DoD facilities. As such, this section is organized to summarize the AFFF-related uses first, and all remaining potential PFAS-containing materials in the subsequent section.

4.1 AFFF Use, Storage, and Disposal Areas

AFFF was developed in the mid-1960s in response to a need for firefighting foams better suited to extinguish Class B, fuel-based fires. AFFF formulations consist of water, an organic solvent, up to 5 percent (%) hydrocarbon surfactants, and 1 to 3% PFAS (Interstate Technology Regulatory Council 2020). AFFF concentrate is designed to be diluted with water to become a 1, 3, or 6% foam. AFFF releases at DoD facilities may have occurred during firefighter training, emergency response actions, equipment testing, or accidental releases. The military still primarily uses AFFF for Class B fires; however, the current formulations of AFFF contain significantly lower amounts of PFOS, PFOA, and their precursors, and significant operational changes have been implemented to restrict uncontrolled releases and non-essential use of PFAS-containing foams. Army installations may still house AFFF, commonly stored in closed containers (e.g., 55-gallon drums, 5-gallon buckets), within designated storage buildings or at firehouses.

AFFF was stored historically and is currently stored within various fire trucks and/or crash trucks at Fire Station 02 and Fire Station 04. Additionally, AFFF is stored in Hangar 805 (Architecture Engineering Construction Operations and Management [AECOM] 2020), Hangar 830, Hangar 7901, and Hangar 7902, which are equipped with fire suppression systems. An AFFF release (volume unknown) reportedly occurred from the shared fire suppression system of Hangars 7901 and 7902 in the 1990s. An AFFF leak from the suppression system in Hangar 830 reportedly occurred in September 2015. According to HAAF personnel interviews and HAAF site records, AFFF releases occurred at Hangar 805 in 2007 and 2017.

According to personnel interviews and HAAF site records, a high expansion foam release occurred in 2018 at Hangar 7911. A defoaming agent was used to reduce the foam, which was then vacuumed and containerized.

On June 4, 2021, an accidental release of approximately 2 gallons of AFFF foam (3% concentrate) mixed with water (approximately 2,000 gallons of mixed foam) was released from the fire suppression system at Hangar 7901. The foam mixture did reach the trench drains outside the hangar door which lead to the sanitary sewer system. The lift station pumps were turned off to prevent transport to the WWTP. The released foam was pumped from the lift station.

Findings from personnel interviews, site reconnaissance, and document research indicate the use of AFFF at HAAF has been primarily associated with HAAF fire department operations, including firefighter training and crash responses.

Documents provided by the Army prior to the site visit indicated that 1,568 gallons of AFFF remained on hand at HAAF. Documentation provided during the site visit indicated that 1,333 gallons of AFFF remained on hand at HAAF.

Safety data sheets and AFFF inventory sheets collected during the site visit are included in **Appendix I.**

There are currently two fire stations on HAAF utilized by the HAAF fire department: Fire Station 02 and Fire Station 04. Routine nozzle testing was reported to have occurred in a grassy area approximately 300 feet southeast of Fire Station 02. Additionally, from approximately 2005 to 2016, a slow AFFF leak from Crash Truck 02 of less than four ounces of AFFF per day occurred inside Fire Station 02, as indicated during site reconnaissance and personnel interviews (**Appendix H**). The interior of Fire Station 02 contains floor drains that connect to the sanitary sewer system and waste drainage from Fire Station 02 has historically and continues to be treated at the HAAF WWTP. Routine nozzle testing was reported to occur in a grassy area to the north of Fire Station 04. “Wet checks” and annual operational testing occurred in the grassy area located to the northeast of Fire Station 04.

FTAs have been identified within HAAF. The historical Fire Training Site (HAA-01) was reportedly used from an unknown time to 1991 for training involving utilization of foam to extinguish fuel fires. The Sleepy Hollow FTA was reportedly used for training involving utilizing foam to extinguish fuel fires set to a decommissioned C-130 airplane; the dates of operation for the Sleepy Hollow FTA are not known.

4.2 Other PFAS Use, Storage, and/or Disposal Areas

Following document research, personnel interviews, and site reconnaissance at HAAF, the WWTP was identified as a potential PFAS source based on releases that flowed to drains connected to the sanitary sewer that would have flowed to the WWTP. Other potential PFAS use, storage, or disposal types were either not identified at the installation or did not prompt further research or constitute categorization as AOPIs. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion regarding areas not retained for further investigation is presented in **Section 5.1** and specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**.

During a telephonic interview with the IMCOM Pest Management Consultant, it was noted that products containing Sulfluramid (i.e., associated with insecticides) may have contained PFAS and were phased out in 1996. During the PA records review, the IMCOM Pest Management Consultant provided records of potentially PFAS-containing pesticides used and/or stored at Army installations and did not identify HAAF as an installation having used or stored PFAS-containing pesticides/insecticides. Additionally, the PA team reviewed available pesticide use inventory documentation provided by the installation and did not identify PFAS-containing pesticides use, storage, or disposal.

4.3 Readily Identifiable Off-Post PFAS Sources

An exhaustive search to identify all potential off-post PFAS sources (i.e., not related to operations at HAAF) is not part of the PA/SI. However, potential off-post PFAS sources within a 5-mile radius of the installation that were identified during the records search and site visit are described below.

Nearby firefighting civilian operations could potentially be off-post PFAS sources within a 5-mile radius of HAAF. Chatham Emergency Services Station #3, Isle of Hope Volunteer Fire Department, and Savannah

Fire Stations 01, 02, 04, 05, 06, 07, 08, 10, and 15 are within a 5-mile radius of HAAF. Based on the high connectivity of shallow groundwater to surface water features in the region, the facilities may be downgradient and downstream of the installation since surface water runoff likely flows to the Savannah River, Wilmington River, or Ogeechee River and their tributaries. It is not known if these facilities currently or have historically used PFAS-containing Class B AFFF.

A large, but unknown, volume of AFFF was deployed to the Puerto Rico Air National Guard WC-130 crash that occurred on 02 May 2018. The crash occurred off-installation, approximately 9 miles north of HAAF. Drainage from this area flows toward a channel along the western side of the highway which flows south and likely discharges to a tributary of the Savannah River.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage and/or disposal of PFAS-containing materials at HAAF were further refined during the PA process and identified either as an area not retained for further investigation or as an AOPI. In accordance with the established process for the PA/SI, 14 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

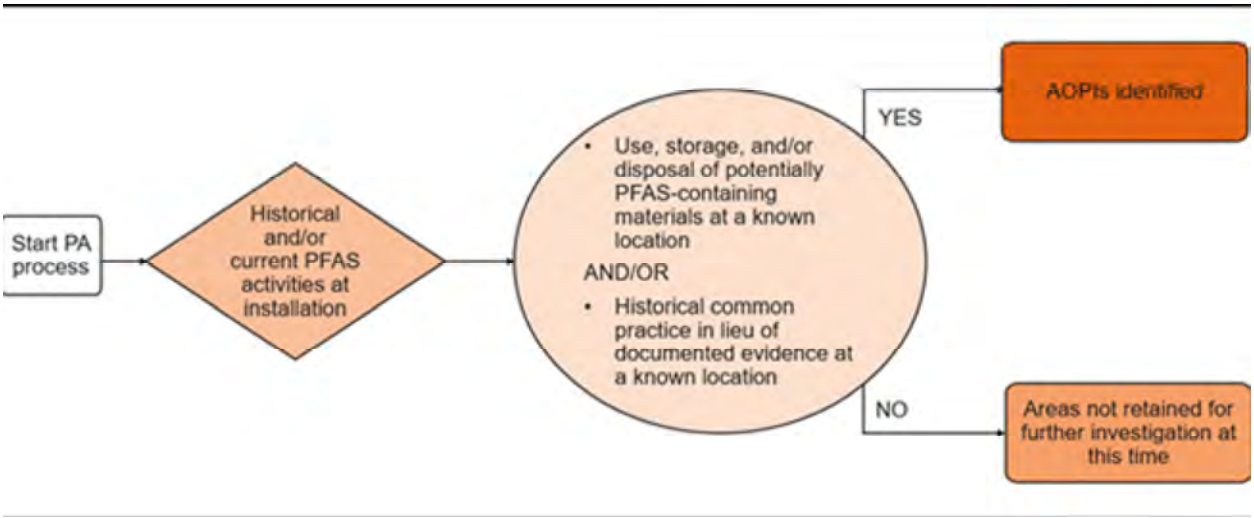


Figure 5-1: AOPI Decision Flowchart

The areas not retained for further investigation are presented in **Section 5.1**. The areas retained as AOPIs are presented in **Section 5.2**.

5.1 Areas Not Retained for Further Investigation

Through the evaluation of information obtained during records review, personnel interviews, and/or site reconnaissance, the area described below was categorized as an area not retained for further investigation at this time.

A brief site history and rationale for the area not retained for further investigation are presented in Table 5-1, below.

Table 5-1. Installation Areas Not Retained for Further Investigation

Area Description	Dates of Operation	Relevant Site History	Rationale
F 01	9/21/2015	A potential volume of AFFF was used to extinguish the vehicle fire in the parking lot.	No evidence was identified confirming AFFF was used to extinguish the vehicle

Area Description	Dates of Operation	Relevant Site History	Rationale
			fire. The fire occurred on an impermeable concrete surface with no nearby drainage points or permeable surfaces.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. One of the AOPIs overlaps with an HAAF IRP site and Headquarters Army Environmental System site (**Figure 5-2**). The AOPI, overlapping IRP site identifier, Headquarters Army Environmental System number, and current site status are discussed within the applicable AOPI subsection presented below. At the time of this PA, none of the HAAF IRP sites have historically been investigated or are currently being investigated for the possible presence of PFAS.

The AOPI locations are shown on **Figure 5-2**. Aerial photographs of each AOPI are presented on **Figures 5-3 through 5-13** and include active monitoring wells designated for sampling in the vicinity of each AOPI.

5.2.1 Fire Training Site (HAA-01); (1154A.1001)

Fire Training Site (HAA-01) is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to historical use of foam (unknown type and volume) to extinguish fuel fires. The area is predominantly covered with grass or exposed soil. Drainage likely seeps to the subsurface or flows to a nearby stormwater drainage channel that discharges to tributaries of Little Ogeechee River. This AOPI coincides with the IRP site HAA-01 (1154A.1001). Monitoring wells associated with the IRP investigation are present on site (**Figure 5-3**).

5.2.2 Fire Station 04

Fire Station 04 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to AFFF storage and nozzle testing activities. A small storage trailer with expired AFFF was observed behind Fire Station 04 during the PA site visit. Nozzle testing occurred in the grassy area to the north of Fire Station 04. "Wet checks" and annual testing occurred in the grassy area located northeast of Fire Station 04. Drainage likely seeps to the subsurface or flows into the storm system, which eventually discharges to tributaries of the Little Ogeechee River (**Figure 5-3**).

5.2.3 Sleepy Hollow FTA

Sleepy Hollow FTA is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to historical use of foam (unknown type and volume) to extinguish fuel fires. An unknown volume of foam was used to extinguish fuel fires set to a decommissioned C-130 aircraft.

Installation drinking water well 5 is approximately 75 feet upgradient of Sleepy Hollow FTA. Drainage in the immediate vicinity of the training area would primarily seep to the subsurface; however, some drainage may discharge to nearby tributaries to the Little Ogeechee River (**Figure 5-4**).

5.2.4 Fire Station 02

Fire Station 02 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to a historical AFFF leak that occurred from Crash Truck 02 while on site. This fire station houses Crash Truck 02, which had a slow AFFF leak (less than 0.1 liter per day) at an unknown frequency from approximately 2005 to 2016. Installation drinking water well 2 is approximately 0.5 miles upgradient of Fire Station 02. The interior of Fire Station 02 contains floor drains that discharge to the sanitary sewer system which then discharges to the HAAF WWTP (**Figure 5-5**).

5.2.5 Vehicle Fire 03

Vehicle Fire 03 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to AFFF usage to extinguish a vehicle fire adjacent to Fire Station 02. An unknown volume of AFFF was used to extinguish the vehicle fire. Drainage from this area leads to the storm system which discharges to the Harmon canal, which leads to tributaries of the Vernon River (**Figure 5-5**).

5.2.6 Nozzle Testing Area

The Nozzle Testing Area is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to routine nozzle testing potentially involving AFFF discharge. The area is grass covered. Drainage likely seeps to the subsurface or flows into the storm system, which flows to the Harmon Canal and eventually discharges to tributaries of the Vernon River (**Figure 5-5**).

5.2.7 Hangar 830

Hangar 830 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to a leaking AFFF fire suppression system. This hangar contains an AFFF suppression system. An unknown amount of foam leaked in 2015. Drainage from the interior of the hangar flows through floor drains to a large underground storage tank (UST) behind the hangar. The UST has reportedly never been emptied. (**Figure 5-6**)

5.2.8 Hangars 7901 and 7902

Hangars 7901 and 7902 were identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to an AFFF release in the 1990s from the shared hangar fire suppression system. An unknown volume of AFFF was released. On 04 June 2021, an accidental release of approximately 2 gallons of AFFF foam (3% concentrate) mixed with water (approximately 2,000 gallons of mixed foam) was released from the fire suppression system at Hangar 7901. The foam mixture did reach the trench drains outside the hangar door which lead to the sanitary sewer system. The lift station pumps were turned off to prevent transport to the WWTP. The released foam was pumped from the drains and lift station. Drainage from the hangar interior flows into floor drains with an unknown discharge

location. Drainage from the trench drains flows to the sanitary sewer. Drainage from some areas of the hangar exterior flows into the stormwater system, which eventually discharges to tributaries of the Little Ogeechee River (**Figure 5-7**).

5.2.9 Hangar 7911

Hangar 7911 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to an AFFF release from the building's fire suppression systems. An unknown amount of high expansion foam release occurred in 2018. A defoaming agent was used to reduce the foam, which was then vacuumed and containerized. PFAS-related compounds were detected in IDW samples. Some foam extruded outside of the building doors and foam was detected in a stormwater outfall (**Figure 5-8**).

5.2.10 HAAF WWTP

The HAAF WWTP is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to history of accepting drainage from Fire Station 02 that may have contained PFAS impacted liquid. Waste drainage from Fire Station 02 has historically and continues to be treated at the HAAF WWTP. Historically, biosolids were applied to drying beds, then bed drainage was sent back through the HAAF WWTP. A belt-press is now used to dry solids instead of the drying beds. HAAF WWTP effluent eventually discharges to the Savannah River. Pre-1991, biosolids were disposed at Post South Central Landfill (FST-001), located within the footprint of Fort Stewart. Post-1991, biosolids were disposed off-site at Waste Management's Superior Landfill (**Figure 5-9)**.

Additionally, releases at Hangar 805 that flowed to surface drains potentially flowed through the sanitary sewer to the HAAF WWTP. A release of AFFF in 2007 was washed to surface drains at Hangar 805 that may have been connected to the sanitary sewer.

5.2.11 Vehicle Fire 02

The Vehicle Fire 02 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to AFFF usage to extinguish a vehicle fire in the Commissary parking lot. An unknown volume of AFFF was used to extinguish the vehicle fire. Drainage from this area leads to the storm system which discharges to the Lamar Canal, which leads to tributaries of the Little Ogeechee River. HAAF Child Development Center is located across the street (less than 0.5 mile) (**Figure 5-10**).

5.2.12 Vehicle Fire 04

The Vehicle Fire 04 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to AFFF usage to extinguish a fire near the Building 1027 parking lot. An unknown volume of AFFF was used to extinguish the vehicle fire. Drainage from this area leads to the storm system which discharges to tributaries of Little Ogeechee River (**Figure 5-11**).

5.2.13 Vehicle Fire 05

The Vehicle Fire 05 is identified as an AOPI following document research, personnel interviews, and site reconnaissance trips due to AFFF usage to extinguish a vehicle fire near the Lott Island Campground. An unknown volume of AFFF was used to extinguish the vehicle fire. Drainage seeps to the subsurface and potentially discharges to tributaries of the Little Ogeechee River (**Figure 5-12).**

5.2.14 Hangar 805

Hangar 805 is identified as an AOPI due to AFFF storage and documented releases following document research, personnel interviews, and site reconnaissance trips conducted by AECOM for the Army National Guard (AECOM 2020). The PA conducted by the Army National Guard included AOPIs identified on parcels of land owned by the US Army and leased indefinitely to the Georgia Army National Guard. The Army PA team was directed to include AOPIs identified by the Army National Guard. Hangar 805 was identified as an AOPI during a PA site visit conducted in February 2019 by The Army National Guard. Findings from the PA investigation can be found in the *PFAS Preliminary Assessment Report* submitted in August 2020 by AECOM in **Appendix J**.

Hangar 805 contains a fire suppression system supplied by a 400-gallon tank housed outside the hangar and covered by a low roof overhang. Three bulk 55-gallon drums of AFFF supply the fire suppression system in the storage room between the hangar and the 400-gallon tank. There is a drain in the storage room which is currently plumbed to an oil-water separator which discharges to the HAAF WWTP. The ARNG PA Report also notes that the drain at the time of the 2007 release may have been a storm sewer drain. A release of an unknown volume of AFFF from the fire suppression system occurred in 2007 during a safety inspection, in which the foam was hosed into the drains inside and outside the hangar. Additionally, a 2017 bladder leak released an unknown amount of AFFF concentrate from the 400-gallon tank onto the concrete. The tank was covered in insulation wrap which contained the leak. The remaining AFFF concentrate was pumped out and removed from the facility, along with the damaged bladder (AECOM 2020). The AOPI is shown on **Figure 5-13.**

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at HAAF, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at all 14 AOPIs at HAAF to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. Due to the proximity of AOPIs Fire Station 02 and Vehicle Fire 03 and a shared surface water drainage area, one common sample location was utilized for these two AOPIs. As such, an installation-specific QAPP Addendum (Arcadis 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified 9 soil, 8 groundwater, 10 surface water, and 10 sediment pathways as potentially complete which guided the SI sampling. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in October 2020 through the collection of field data and analytical samples.

The SI field work was completed in accordance with the standard operating procedures (SOPs), technical guidance instructions (TGIs), sampling design, and QA/QC requirements as detailed in the QAPP Addendum (Arcadis 2020) and PQAPP (Arcadis 2019). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at HAAF. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.3**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

As identified during the DQO process and outlined in the site-specific QAPP Addendum (Arcadis 2020), the objective of the SI is to identify whether there has been a release to the environment at the AOPIs identified in the PA and to determine if further investigation is warranted. This SI evaluated groundwater, soil, surface water, and sediment for PFOS, PFOA, and PFBS presence or absence at each of the sampled AOPIs.

6.2 Sampling Design and Rationale

The rationale for sampling at each AOPI is illustrated on **Figure 6-1** below.

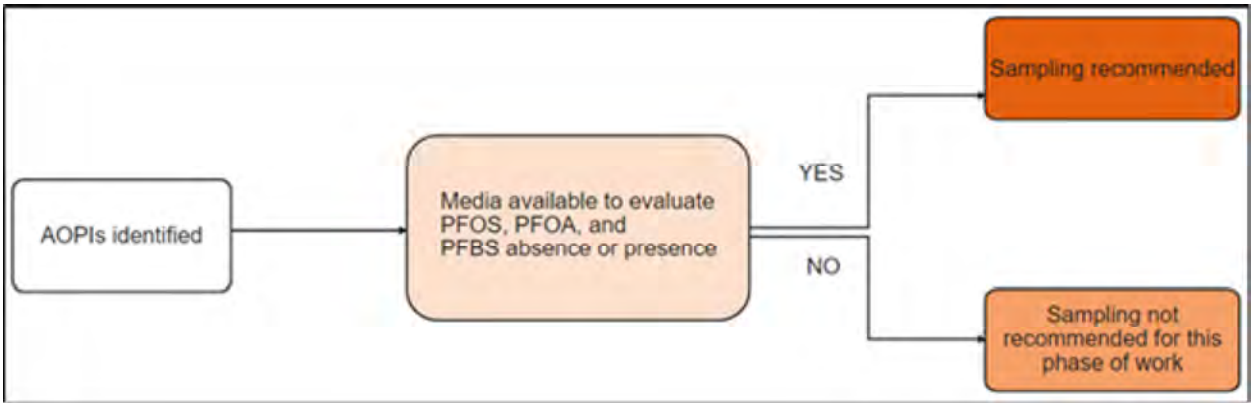


Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at HAAF is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Briefly, groundwater samples were collected for 14 AOPIs to inform the interpretation of PFAS presence at the respective AOPIs. Soil samples were collected for 11 AOPIs to evaluate PFAS presence or absence at potential release areas, to evaluate the potential for those areas to be sources of PFAS to surface water and groundwater as an influence to drinking water. Additionally, surface water samples were collected at two AOPIs to inform the presence or absence of PFAS in possible source areas, and a sediment sample was collected at one AOPI. The surface water and sediment data were collected at HAAF to determine presence or absence and to support re-evaluation of the CSMs.

Soil samples were not collected at Hangar 7911. The documented release was contained on impervious surfaces, but foam was noted in drains and at a stormwater outfall. Therefore, a groundwater sample was taken downgradient, and surface water and sediment samples were collected at a proximate stormwater outfall. The surface water at the outfall is likely reflective of groundwater downgradient of Hangar 7911. The surface water and sediment samples may also be indicative of impacts from Hangars 7901 and 7902 depending on the areas of any releases.

Soil samples were not collected at the WWTP. Drying beds are no longer utilized and biosolids were not stored on site. There was no information on potential release locations, so groundwater samples were located at the downgradient extent of the WWTP area.

Soil samples were not collected at the Army National Guard Hangar 805. The PA conducted for the Army National Guard noted that foam from the 2007 release was contained on the impervious concrete surface in and around the hangar and hosed into the drains inside and outside the hangar. Therefore, a downgradient groundwater sample was collected from a monitoring well. Additionally, groundwater samples taken at the WWTP, where a release may have flowed, were considered potentially indicative of impacts from Hangar 805.The sampling depths at existing monitoring wells were at approximately the center of the saturated screened interval. **Table 6-1** includes the monitoring well construction details for the wells sampled during the SI.

6.3 Sampling Methods and Procedures

Environmental data were collected and analyzed in accordance with the PQAPP (Arcadis 2019), the SOPs and TGIs included as Appendix A to the PQAPP, the QA/QC requirements identified in Worksheet #20 of the PQAPP, the approved scope and sampling methods outlined in the site-specific QAPP Addendum (Arcadis 2020), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020). The sampling methods described in the SOPs and TGIs establish equipment requirements, procedures for preparing equipment and containers before sampling, sampling procedures under various conditions, and procedures for storing samples to ensure that sample contamination does not occur during collection, and transport. In general, sampling techniques used in the SI were consistent with conventional sampling techniques used in the environmental industry, but special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019) and QAPP Addendum (Arcadis 2020). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., soil boring logs, groundwater purging logs, equipment calibration forms, tailgate health and safety forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices K** and **L**, respectively.

6.3.1 Field Methods

Groundwater samples were collected by advancing soil borings using a direct-push technology (DPT) drill rig with Screen Point-22 sampler. Soil lithologic descriptions were logged during sampling activities. Shallow (first encountered) groundwater was sampled at each of these sampling points. DPT borings were completed in accordance with the TGI for PFAS-Specific Drilling and Monitoring Well Installation (P-12 in Appendix A to the PQAPP [Arcadis 2019]). A total of three groundwater samples from pre-existing monitoring wells were collected from the following AOPI locations:

- Monitoring wells HMW-06 and HMW-08, located at AOPI Fire Station 04 and Fire Training Site (HAA-01)
- Monitoring well MW-05B, located to the southeast of AOPI HAAF WWTP and downgradient of AOPI Hangar 805.

The wells were purged via low flow procedures with a peristaltic pump and a sample was collected from approximately the center of the saturated screened interval. Field parameters (temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured during purging with a YSI-556 and allowed to stabilize in accordance with the TGI for PFAS Sampling Procedures and Low-Flow Groundwater Purging for Monitoring Wells (P-11 in Appendix A to the PQAPP; Arcadis 2019) (or purged for a maximum of 20 minutes, whichever is sooner) before groundwater sampling to ensure a representative sample is collected and, potentially, to inform the interpretation of analytical data. Coordinates for each borehole's groundwater sampling location were recorded using a handheld global positioning system.

Soil lithological descriptions were logged and documented on field forms. Soil samples were collected via DPT dual tube DT22 system in accordance with the TGI for PFAS-Specific Drilling and Monitoring Well

Installation (P-12 in Appendix A to the PQAPP [Arcadis 2019]). A hand auger was used to collect the shallow soil samples.

Surface water samples were collected from downstream to upstream to reduce siltation in sequential samples. Field parameters (temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured with a YSI-556 during surface water sampling to potentially inform the interpretation of analytical data. Coordinates for each surface water sampling location were recorded using a handheld global positioning system.

One sediment sample was collected from the upper 4 inches using a decontaminated Lexan™ tube and stainless-steel trowel; the sediment sample was decanted before bottling for laboratory analysis.

Decontamination procedures for non-dedicated equipment used during sampling are described in **Section 6.3.4**.

6.3.2 Quality Assurance/Quality Control

Worksheets #20 of the PQAPP and QAPP Addendum provide QA/QC requirements for field duplicates, matrix spike/matrix spike duplicates, equipment blanks (EBs), source blanks for water used in the initial decontamination step for drill tooling, and field blanks for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of 1 per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS, and total organic carbon (TOC) only. EBs were collected for media sampled for PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which EBs were collected include tubing, tubing weights, drill casing and cutting shoes, hand augers, water-level meters, bailers, screen-point samplers and stainless-steel trowels as applicable to the sampled media. Source blanks were collected from the water used to pressure-wash drill tooling. Analytical results for blank samples are discussed in **Section 7.16**.

6.3.3 Field Change Reports

No instances of major scope modifications (i.e., those that may have had a significant impact on the project scope and/or data usability/quality, or required stop-work, and warranted discussion with USACE) were encountered during the HAAF SI work.

In some cases, clarifications to the established scope of work were needed but do not necessarily constitute a non-conformance from the sampling plans described in the QAPP Addendum. Minor modifications from and clarifications for the procedures and scope of work detailed in the QAPP Addendum and PQAPP and that did not affect DQOs are documented in Field Change Reports included as **Appendix M** and are summarized below:

- Vehicle Fire 02: Sampling locations HAAF-VF02-SO-01 and HAAF-VF02-GW-01 were moved approximately 20 feet from the original location due to a power line in the vicinity.

- Vehicle Fire 04: Sample locations HAAF-VF04-SO-01 and HAAF-VF04-GW-01 were moved to the pavement because of the presence of power and telecom lines close to the originally proposed location.
- HAAF WWTP: The originally proposed location, HAAF-WWTP-GW-02, was not accessible due to tents being set up in the sample location. As a result, the point was moved to the other side of the tents.
- Hangar 830: Sample locations HAAF-H830-SO-01 and HAAF-H830-GW-01 were moved approximately 10 feet in the western area further away from the parking lot, due to the location of parked cars.

6.3.4 Decontamination

Non-dedicated reusable sampling equipment (e.g., stainless-steel trowels, hand augers, drill cutting shoes and casing, screen-point samplers, water-level meters) that came into direct contact with sampling media was decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019; Appendix A).

6.3.5 Investigation-Derived Waste

IDW, including soil cuttings, excess sediment, groundwater, surface water, decontamination fluids, and disposable equipment were collected and placed in Department of Transportation-approved 55-gallon drums, segregated by medium: waters, soil/sediment, and equipment and then transported to the HAAF Hazardous Waste Storage Area prior to transport to the disposal facility. Equipment IDW, which includes personal protective equipment and other disposable materials (e.g., gloves, plastic sheeting, Lexan™ tubes, and high-density polyethylene and silicon tubing) that may come in contact with sampling media, was drummed and disposed of with the soil/sediment media. All drums were labeled as non-hazardous based on analytical results and site knowledge. All IDW was disposed of offsite at ECOFLO, Inc. under permit # NCD980842132.

The waste manifest for the HAAF IDW removal is in **Appendix N**.

6.4 Data Analysis

The subsections below summarize the laboratory analytical methods and the methodology used to evaluate data collected during the SI through data verification and usability assessments (as completed by a project chemist, independent of the project team).

6.4.1 Laboratory Analytical Methods

Analytical samples collected during the SI were submitted to Pace South Carolina (formerly Shealy Environmental Services, Inc.), an ELAP-accredited laboratory for PFAS analysis, including PFOS, PFOA, and PFBS by liquid chromatography with tandem mass spectrometry. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.4 in the PQAPP (Arcadis 2019). Eighteen PFAS-related compounds, including PFOS, PFOA, and PFBS, were analyzed for

groundwater, soil, surface water, and sediment samples using a PFAS analytical method that is ELAP-accredited and compliant with QSM 5.3 (DoD and Department of Energy 2019), Table B-15.

Additionally, the following general chemistry and physical characteristic analyses were completed for select soil and sediment samples in accordance with Worksheet #18 of the QAPP Addendum (Arcadis 2020) by the analytical method noted:

- TOC by Solid Waste Test Method 846 9060A
- Grain size analysis by American Society for Testing and Materials D422-63
- pH by Solid Waste Test Method 846 9045D.

These data are collected as they may be useful in future fate and transport studies.

The laboratory limit of detection (LOD) is defined as “the lowest concentration for reliable reporting of a non-detect of a specific analyte in a specific matrix with a specific method at 99 percent confidence” (DoD 2017). The lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias is known as the limit of quantitation (LOQ; DoD 2017). Concentrations detected between the LOD and LOQ, therefore, are considered estimates and are qualified as such on laboratory analytical reports. Instrument-specific detection limits (e.g., the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99 percent confidence; DoD 2017), as provided for each analyte by the laboratory, are reported along with the LODs and LOQs in the laboratory analytical reports included in the Data Usability Summary Report (DUSR) (**Appendix O**).

6.4.2 Data Validation

All analytical data generated during the SI, except grain size and data generated from IDW profiling, were verified and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.3 (DoD and Department of Energy 2019) and in accordance with Data Validation Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD 2020). Additionally, 10% of the data underwent Stage 4 data validation. Copies of the data validation reports for each sample delivery group are included as attachments to the DUSR in **Appendix O**. The Level IV analytical reports are included within **Appendix O** in the final electronic deliverable only.

6.4.3 Data Usability Assessment and Summary

A data usability assessment was completed for all analytical data associated with SI sampling at HAAF. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix O**), was prepared in accordance with the USACE Engineer Manual 200-1-10 (USACE 2005), the Final DoD General Data Validation Guidelines (DoD 2019) and the Final DoD Data Validation Guidelines Module 3: Data Validation Procedure for Per-and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD 2020), that reviewed precision, accuracy, completeness, representativeness, comparability, and sensitivity. A statement of overall data usability is included in the DUSR.

Based on the final data usability assessment, the environmental data collected at HAAF during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the

DUSR and its associated data validation reports (**Appendix O**), and as indicated in the full analytical tables (**Appendix P**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and HAAF QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at HAAF are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of DUSR. Qualifiers for data shown on figures are defined in the notes of figures.

6.5 Office of the Secretary of Defense Risk Screening Levels

The OSD risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) and soil were calculated using the USEPA's RSL calculator for residential and industrial/commercial worker receptor scenarios and current toxicity values. These risk screening levels are shown in **Table 6-2**.

Table 6-2 OSD Risk Screening Levels Calculated for PFOS, PFOA, and PFBS in Tap Water and Soil Using USEPA's Regional Screening Level Calculator

Chemical	Residential Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator		Industrial/Commercial Scenario Risk Screening Levels Calculated Using USEPA RSL Calculator
	Tap Water (ng/L or ppt) [1]	Soil (mg/kg or ppm) [1,2]	Soil (mg/kg or ppm) [1,2]
PFOS	40	0.13	1.6
PFOA	40	0.13	1.6
PFBS	600	1.9	25

Notes:

1. Risk screening levels for tap water and soil provided by the OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15 (**Appendix A**).
2. All soil and/or sediment data will be screened against both the Residential Scenario and Industrial/Commercial risk screening levels (if collected from less than 2 feet bgs), regardless of the current and projected land use of the AOPI. Soil samples collected from greater than 2 feet, but less than 15 feet bgs will be compared to the Industrial/Commercial risk screening levels only.

mg/kg = milligrams per kilogram
ng/L = nanograms per liter
ppm = parts per million
ppt = parts per trillion

The OSD residential tap water risk screening levels will be compared to groundwater and surface water data (if the surface water is an expression of groundwater [i.e., springs/seeps] or if surface water is used as a drinking water source nearby) for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at HAAF are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil and sediment concentrations (if sediment comparisons are appropriate, e.g., if the sediment was collected from a typically-dry streambed or drainageway and therefore exposure scenarios would be similar to that of soil). Other surface water and sediment data are collected only to determine presence or absence and to support re-evaluation of the CSMs and are therefore not compared to the respective

groundwater and soil OSD risk screening levels. The data from the SI sampling event are compared to the OSD risk screening levels in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than the applicable OSD risk screening levels, further study in a remedial investigation is recommended in **Section 9**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at HAAF (field duplicate results are provided in the associated tables). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020). The sample results discussion below focuses on the PFOS, PFOA, and PFBS analytical results because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 through **7-4** provide a summary of the groundwater, soil, surface water, and sediment analytical results for PFOS, PFOA, and PFBS. **Table 7-5** summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. **Appendix P** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at HAAF with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-12** show the PFOS, PFOA, and PFBS analytical results in groundwater, soil, surface water, and sediment for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and/or PFBS greater than the applicable OSD risk screening levels are highlighted in summary tables and on figures. Final qualifiers applied to the data by the laboratory and the project chemist (as defined in **Section 6.4.3**) are presented on the analytical tables. Groundwater and surface water data collected during the SI are reported in ng/L, or ppt, and soil and sediment data are reported in mg/kg, or ppm.

Field parameters measured for groundwater during low-flow purging and sample collection, as well as for surface water during sample collection, are provided on the field forms in **Appendix L**. Soil and sediment descriptions are provided on the field forms in **Appendix L**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Groundwater was generally first encountered at depths of approximately 7.0 to 20.0 feet bgs at all HAAF AOPIs.

Table 7-5 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Fire Training Site (HAA-01)	Yes
Fire Station 04	Yes
Sleepy Hollow FTA	Yes
Fire Station 02	Yes
Vehicle Fire 03	Yes
Nozzle Testing Area	Yes
Hangar 830	Yes
Hangars 7901 and 7902	Yes
Hangar 7911	Yes
HAAF WWTP	Yes
Vehicle Fire 02	No

AOPI Name	OSD Exceedances (Yes/No)
Vehicle Fire 04	Yes
Vehicle Fire 05	No
Hangar 805	Yes

7.1 Fire Training Site (HAA-01)

The subsections below summarize the groundwater, soil, and surface water PFOS, PFOA, and PFBS analytical results associated with the Fire Training Site (HAA-01).

7.1.1 Groundwater

One grab groundwater sample was collected from two existing monitoring wells at the Fire Training Site (HAA-01); HMW-06 and HMW-08 (**Figure 7-2**). Each monitoring well groundwater sample was collected mid-screen. Screen intervals are 3.0 to 13.0 feet bgs at HMW-06 and HMW-08. Additionally, two soil borings were advanced via DPT drill rig to collect shallow groundwater grab samples at first encountered groundwater (8.0 feet bgs at both locations) at the Fire Training Site (HAA-01) (HAAF-HAA01-GW-01 [and one duplicate] and HAAF-HAA01-GW-02; **Figure 7-2**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at monitoring wells HMW-06 (1,800 J[1] ng/L) and HMW-08 (8,900 J ng/L). Additionally, groundwater grab sample location results indicated PFOS concentrations above the OSD risk screening level at HAAF-HAA01-GW-01 (7,100 J ng/L) and HAAF-HAA01-GW-02 (74,000 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at monitoring wells HMW-06 (300 ng/L) and HMW-08 (2,800 J ng/L). Groundwater grab sample location results indicated PFOA concentrations above the OSD risk screening level at HAAF-HAA01-GW-01 (1,800 J ng/L) and HAAF-HAA01-GW-02 (7,500 J ng/L).

PFBS was detected above the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-HAA01-GW-02 (2,000 J ng/L). PFBS was detected in HMW-06 (260 ng/L) and HMW-08 (72 ng/L), as well as groundwater grab sample location HAAF-HAA01-GW-01 (47 J- ng/L) at concentrations below the OSD risk screening level.

---

[1] J/J+/J- qualifier indicates the sample result is estimated. See DUSR in **Appendix O** for sample-specific details.

7.1.2 Soil

Soil samples were collected from three locations at the Fire Training Site (HAA-01): (HAAF-HAA01-SO-01 through 03 [and one duplicate at HAAF-HAA01-SO-01]; **Figure 7-2**). Each boring included one surface

soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD risk screening level for residential (0.13 mg/kg), but below the industrial/commercial OSD risk screening level (1.6 mg/kg) at sample locations HAAF-HAA01-SO-02 (0.53 J mg/kg) and HAAF-HAA01-SO-03 (0.94 J mg/kg). In the sample collected from location HAAF-HAA01-SO-01, PFOS was detected at 0.01 mg/kg which is below the OSD residential risk screening level.

PFOA was detected below the OSD risk screening level for residential (0.13 mg/kg) at all three sample locations HAAF-HAA01-SO-01 (0.0048 mg/kg), HAAF-HAA01-SO-02 (0.0.0011 J- mg/kg), and HAAF-HAA01-SO-03 (0.048 mg/kg).

PFBS was detected below the OSD risk screening level for residential (1.9 mg/kg) at sample location HAAF-HAA01-SO-03 (0.003 mg/kg). PFBS was not detected in any other sample.

7.1.3 Surface Water

One surface water sample was collected from the Fire Training Site (HAA-01): (HAAF-HAA01-SW-01; **Figure 7-2**). The surface water sampled was collected from the upper 6 inches of the canal on the western portion of the AOPI. The surface water is considered potentially reflective of groundwater. A summary of PFOS, PFOA, and PFBS surface water analytical results is provided in **Table 7-3**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, and PFBS were detected at surface water sample location HAAF-HAA01-SW-01 (4,100 J ng/L; 620 ng/L; 170 ng/L, respectively). PFOS and PFOA were above the OSD risk screening level (40 ng/L).

7.2 Fire Station 04

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Station 04.

7.2.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (6.0 feet bgs) at the Fire Station 04 (HAAF-FS04-GW-01; **Figure 7-2**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FS04-GW-01 (2,100,000 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FS04-GW-01 (27,000 J ng/L).

PFBS was detected above the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-FS04-GW-01 (9,700 J ng/L).

7.2.2 Soil

One soil sample was collected at the Fire Station 04 (HAAF-FS04-SO-01; **Figure 7-2**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD risk screening levels for residential (0.13 mg/kg) and industrial/commercial (1.6 mg/kg) at sample location HAAF-FS04-SO-01 (5.6 J mg/kg).

PFOA was detected below the OSD risk screening level for residential (0.13 mg/kg) at sample location HAAF-FS04-SO-01 (0.077 J mg/kg).

PFBS was detected below the OSD risk screening level for residential (1.9 mg/kg) at sample location HAAF-FS04-SO-01 (0.15 J mg/kg).

7.3 Sleepy Hollow FTA

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Sleepy Hollow FTA.

7.3.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (10.5 feet bgs) at the Sleepy Hollow FTA (HAAF-FTA-GW-01; **Figure 7-3**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected at concentrations above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FTA-GW-01 (94 J+ ng/L).

PFOA was detected below the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FTA-GW-01 (6.8 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-FTA-GW-01 (91 ng/L).

7.3.2 Soil

One soil sample was collected from the Sleepy Hollow FTA (HAAF-FTA-SO-01; **Figure 7-3**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, and PFBS were not detected in the soil sample collected at location HAAF-FTA-SO-01.

7.4 Fire Station 02 and Vehicle Fire 03

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Station 02 and Vehicle Fire 03.

7.4.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (8.0 feet bgs) at the Fire Station 02 and Vehicle Fire 03 (HAAF-FTA-GW-01; **Figure 7-4**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected at concentrations above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FS02-GW-01 (1,700 J ng/L).

PFOA was detected at concentrations above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-FS02-GW-01 (160 ng/L).

PFBS was detected at concentrations below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-FS02-GW-01 (69 ng/L).

7.4.2 Soil

One soil sample was collected from a common location at the Fire Station 02 and Vehicle Fire 03 (HAAF-FS02-SO-01; **Figure 7-4**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected below the OSD risk screening level for residential (0.13 mg/kg), at sample location HAAF-FS02-SO-01 (0.0024 mg/kg).

PFOA was detected below the OSD risk screening level for residential (0.13 mg/kg), at sample location HAAF-FS02-SO-01 (0.0018 mg/kg).

PFBS was not detected at sample location HAAF-FS02-SO-01.

7.5 Nozzle Testing Area

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Nozzle Testing Area.

7.5.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (8.0 feet bgs) at the Nozzle Testing Area (HAAF-NTA-GW-01; **Figure 7-4**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-NTA-GW-01 (8,100 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-NTA-GW-01 (65 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-NTA-GW-01 (56 ng/L).

7.5.2 Soil

One soil sample was collected from a location at the Nozzle Testing Area (HAAF-NTA-SO-01; **Figure 7-4**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected below the OSD risk screening level for residential (0.13 mg/kg), at sample location HAAF-NTA-SO-01 (0.028 mg/kg).

PFOA and PFBS were not detected at sample location HAAF-NTA-SO-01.

7.6 Hangar 830

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Hangar 830.

7.6.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (7.0 feet bgs) at the Hangar 830 (HAAF-H830-GW-01; **Figure 7-5**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-H830-GW-01 (410 ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-H830-GW-01 (63 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-H830-GW-01 (130 ng/L).

7.6.2 Soil

A soil sample was collected from one location at the Hangar 830 (HAAF-H830-SO-01; **Figure 7-5**). The boring included a subsurface soil sample collected from approximately 5.0 – 6.0 feet bgs, due to releases in the interior of the hangar being captured by floor drains and sent to a UST behind the hangar. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected below the OSD risk screening levels for residential (0.13 mg/kg) and industrial/commercial (1.6 mg/kg) at sample location HAAF-H830-SO-01 (0.0067 mg/kg).

PFOA and PFBS were not detected at sample location HAAF-H830-SO-01.

7.7 Hangars 7901 & 7902

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Hangars 7901 & 7902.

7.7.1 Groundwater

Two soil borings were advanced via DPT drill rig to collect shallow groundwater grab samples at first encountered groundwater (15.0 feet bgs) at the Hangars 7901 & 7902 (HAAF-H7901-GW-01 and HAAF-H7901-GW-02; **Figure 7-6**). The sample HAAF-H7901-GW-02 is also potentially indicative of impacts related to Hangar 7911 and was included in results presented in **Section 7.8**. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample locations HAAF-7901-GW-01 (240 ng/L) and HAAF-7901-GW-02 (31,000 J ng/L).

PFOA was detected below the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-7901-GW-01 (37 ng/L) and was detected at a concentration above the OSD risk screening level at groundwater grab sample location HAAF-7901-GW-02 (340 J ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample locations HAAF-H7901-GW-01 (22 ng/L) and HAAF-7901-GW-02 (350 J ng/L).

7.7.2 Soil

Soil samples were collected from two locations at the Hangars 7901 & 7902 (HAAF-7901-SO-01 through 02; **Figure 7-6**). Each boring included one surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected below the OSD risk screening level for residential (0.13 mg/kg), at sample locations HAAF-7901-SO-01 (0.012 mg/kg) and HAAF-7901-SO-02 (0.0046 mg/kg).

PFOA and PFBS were not detected at sample locations HAAF-H7901-SO-01 and HAAF-H7901-SO-02.

7.7.3 Surface Water

One surface water sample was collected that could be indicative of impacts related to Hangar 7901&7902 (HAAF-H7911-SW-01; **Figure 7-6**). Although originally selected for sampling as potentially indicative of impacts from Hangar 7911, the outfall currently receives surface water runoff from drains associated with Hangars 7901&7902. The surface water sample was collected from the upper 6 inches of the water in the outfall located west of the AOPI. Based on the depth of the outfall relative to groundwater in the area, the water in the outfall may be reflective of groundwater impacts related to the AOPI. A summary of PFOS,

PFOA, and PFBS surface water analytical results is provided in **Table 7-3**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at surface water sample location HAAF-7911-SW-01 (2,600 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at surface water grab sample location HAAF-7911-SW-01 (190 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at surface water sample locations HAAF-H7901-GW-01 (370 ng/L).

7.7.4 Sediment

One sediment sample was collected that could be indicative of impacts related to Hangars 7901&7902 (Hangar 7911 (HAAF-H7911-SE-01; **Figure 7-6**). Although originally selected for sampling as potentially indicative of impacts from Hangar 7911, the outfall currently receives surface water runoff from drains associated with Hangars 7901&7902. The sediment sample was collected from the upper 10 centimeters of the sediment in the outfall located west of the AOPI. The sample area is typically wet, so analytical results were not compared to the OSD risk screening levels for soil. A summary of PFOS, PFOA, and PFBS sediment analytical results is provided in **Table 7-4**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected at sample location HAAF-H7911-SE-01 (0.0037 mg/kg).

PFOA and PFBS were not detected at sediment sample location HAAF-H7911-SE-01.

7.8 Hangar 7911

The subsections below summarize the groundwater, surface water and sediment PFOS, PFOA, and PFBS analytical results associated with the Hangar 7911.

7.8.1 Groundwater

One soil boring was advanced via DPT drill rig to collect a shallow groundwater grab samples at first encountered groundwater (15.0 feet bgs) downgradient of Hangar 7911 near Hangars 7901 & 7902 (HAAF-H7901-GW-02; **Figure 7-7**). This sample is also potentially indicative of impacts related to Hangars 7901 & 7902 and was included in results presented in **Section 7.7**. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-7901-GW-02 (31,000 J ng/L).

PFOA was detected above the OSD tap water risk screening level at groundwater grab sample location HAAF-7901-GW-02 (340 J ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-7901-GW-02 (350 J ng/L).

7.8.2 Surface Water

One surface water sample was collected that could be indicative of impacts related to Hangar 7911 (HAAF-H7911-SW-01; **Figure 7-7**). The surface water sample was collected from the upper 6 inches of the water in the outfall located northwest and downgradient of the AOPI. Based on the depth of the outfall relative to groundwater in the area, the water in the outfall is potentially reflective of groundwater impacts. A summary of PFOS, PFOA, and PFBS surface water analytical results is provided in **Table 7-3**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at surface water sample location HAAF-7911-SW-01 (2,600 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at surface water sample location HAAF-7911-SW-01 (190 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at surface water sample location HAAF-H7901-GW-01 (370 ng/L).

7.8.3 Sediment

One sediment sample was collected for Hangar 7911 (HAAF-H7911-SE-01; **Figure 7-7**). The sediment sampled was collected from the upper 10 centimeters of the sediment in the outfall located northwest of the AOPI. The sample area is typically wet, so analytical results were not compared to the OSD risk screening levels for soil. A summary of PFOS, PFOA, and PFBS sediment analytical results is provided in **Table 7-4**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected at sample location HAAF-H7911-SE-01 (0.0037 mg/kg).

PFOA and PFBS were not detected at sediment sample location HAAF-H7911-SE-01.

7.9 HAAF WWTP

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with the HAAF WWTP.

7.9.1 Groundwater

Two borings were advanced via DPT drill rig to collect shallow groundwater grab samples at first encountered groundwater (13.0 and 7.0 feet bgs, respectively) at HAAF WWTP (HAAF-WWTP-GW-01 and HAAF-WWTP-GW-02; **Figure 7-8**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

Additionally, one groundwater sample was collected from an existing monitoring well upgradient of the HAAF WWTP; HMW-MW-05B (HAAF-MW-05B; **Figure 7-8**). The groundwater sample was collected mid-screen (20.0 ft bgs) from the monitoring well. The screen interval at HMW-MW-05B is between 15.0 to 25.0 ft bgs, and the groundwater sample was collected mid-screen (20.0 ft bgs) from the monitoring well. The monitoring well is downgradient of Hangar 805 and was also included in results presented in **Section 7.13**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at monitoring well MW-05B (1,800 J ng/L). Additionally, groundwater grab samples results showed PFOS concentrations above the OSD tap water risk screening level at HAAF-WWTP-GW-01 (250 ng/L) and HAAF-WWTP-GW-02 (680 ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at monitoring well MW-05B (120 ng/L). Groundwater grab samples results showed PFOA concentrations above the OSD tap water risk screening level at HAAF-WWTP-GW-01 (310 ng/L) and below the OSD tap water risk screening level at HAAF-WWTP-GW-02 (39 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at monitoring well MW-05B (25 ng/L), as well as groundwater grab sample locations HAAF-WWTP-GW-01 (43 ng/L) and HAAF-WWTP-GW-02 (27 ng/L).

7.10 Vehicle Fire 02

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Vehicle Fire 02.

7.10.1 Groundwater

One boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (15.0 feet bgs) at the Vehicle Fire 02 (HAAF-VF02-GW-01; **Figure 7-9**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected below the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-VF02-GW-01 (20 ng/L).

PFOA was not detected at sample location HAAF-VF02-GW-01.

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-VF02-GW-01 (1.9 J ng/L).

7.10.2 Soil

One soil sample was collected from the Vehicle Fire 02 (HAAF-VF02-SO-01; **Figure 7-9**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, and PFBS were not detected at soil sample location HAAF-VF02-SO-01.

7.11 Vehicle Fire 04

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Vehicle Fire 04.

7.11.1 Groundwater

One boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (8.0 feet bgs) at the Vehicle Fire 04 (HAAF-VF04-GW-01; **Figure 7-10**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-VF04-GW-01 (110 J+ ng/L).

PFOA was detected below the OSD tap water risk screening level (40 ng/L) at groundwater grab sample location HAAF-VF04-GW-01 (24 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at groundwater grab sample location HAAF-VF04-GW-01 (16 ng/L).

7.11.2 Soil

One soil boring was collected from the Vehicle Fire 04. The boring included a surface soil sample collected from 0 to 2 feet bgs (HAAF-VF04-SO-01; **Figure 7-10**). A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, and PFBS were not detected at soil sample location HAAF-VF04-SO-01.

7.12 Vehicle Fire 05

The subsections below summarize the soil and groundwater PFOS, PFOA, and PFBS analytical results associated with the Vehicle Fire 05.

7.12.1 Groundwater

One boring was advanced via DPT drill rig to collect a shallow groundwater grab sample at first encountered groundwater (11.0 feet bgs) at Vehicle Fire 05 (HAAF-VF05-GW-01; **Figure 7-11**). A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, or PFBS were not detected at groundwater sample location HAAF-VF05-GW-01.

7.12.2 Soil

One soil sample was collected from the Vehicle Fire 05 (HAAF-VF05-SO-01; **Figure 7-11**). The boring included a surface soil sample collected from 0 to 2 feet bgs. A summary of PFOS, PFOA, and PFBS soil analytical results is provided in **Table 7-2**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS, PFOA, or PFBS were not detected at soil sample location HAAF-VF05-SO-01.

7.13 Hangar 805

Sampling was not conducted at the Hangar 805 location due to the AFFF release on record being contained on a thick concrete surface, with the runoff going to drains inside and outside the hangar. The runoff to the drains goes to the oil/water separator and subsequently to HAAF WWTP (AECOM 2020).

Sample results from downgradient monitoring well HAAF-MW-05B were considered potentially indicative of downgradient impacts related to releases at Hangar 805. PFOS and PFOA were detected in groundwater above the OSD risk screening levels. Results relative to impacts at WWTP impacts are described in Section 7.9 of this report.

The ARNG PA Report (AECOM 2020) also noted that the drain in the storage area may been connected to the storm sewer system prior to being connected to the sanitary sewer system.

7.13.1 Groundwater

One grab groundwater sample was collected from an existing monitoring well HAAF-MW-05B (**Figure 7-12**). The screen interval at HMW-MW-05B is between 15.0 to 25.0 feet bgs, and the groundwater sample was collected mid-screen (20.0 feet bgs) from the monitoring well. A summary of PFOS, PFOA, and PFBS groundwater analytical results is provided in **Table 7-1**. The full suite of analytical PFAS results is included in **Appendix P**.

PFOS was detected above the OSD tap water risk screening level (40 ng/L) at monitoring well MW-05B (1,800 J ng/L).

PFOA was detected above the OSD tap water risk screening level (40 ng/L) at monitoring well HMW-MW-05B (120 ng/L).

PFBS was detected below the OSD tap water risk screening level (600 ng/L) at monitoring well HMW-MW-05B (25 ng/L).

7.14 Investigation-Derived Waste

A composite sample of the purge and decontamination wastewater was collected from the 55-gallon drum stored at the Hazardous Waste Storage Area. A composite sample was also collected from the soil IDW in the 55-gallon drum also stored at the Hazardous Waste Storage Area. PFOS, PFOA, and PFBS were not detected in either sample.

The wastewater sample was also analyzed for ignitability (SW-846 Method 1010A), pH (SW-846 Method 9045D), volatile organic compounds (USEPA Method 8260D), semivolatile organic compounds (USEPA Method 8270E) and arsenic, chromium and iron (USEPA Method 6010D). None of the results indicated a hazardous waste.

The soil sample was analyzed for ignitability (SW-846 Method 1010A), pH (SW-846 Method 9045D), and semivolatile organic compounds (USEPA Method 8270E). None of the results indicated a hazardous waste.

7.15 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data as they may be useful in future fate and transport studies. The TOC in the soil samples ranged from 1,190 to 18,200 mg/kg. The TOC at this installation was within range for typical organic content in topsoil (5,000 to 30,000 mg/kg). The combined percentage of fines in soils at HAAF ranged from 6.3 to 77.3% with an average of 15.46%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The percent moisture of the soil, 8.51 %, was typical for sandy soil (0 to 10%). The pH of the soil was slightly acidic (4 to 6 standard units). Based on the geochemical data obtained during the SI at HAAF, PFAS constituents may be relatively more mobile than in soils with more fines and relatively greater TOC content.

7.16 Blank Samples

PFOS, PFOA, and/or PFBS were not detected in any of the QA/QC samples collected during the SI work.

The full analytical results for blank samples collected during the SI are included in **Appendix P**.

7.17 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-13** through **7-21** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

Many of the PFAS constituents found in AFFF are surfactants (which do not volatilize) and are found in a charged or ionic state at environmentally-relevant pH (i.e., pH 5 to 9 standard units). PFOS, PFOA, and PFBS are each negatively charged at environmentally-relevant pH. The media potentially affected by PFOS, PFOA, and/or PFBS releases at Army installations are soil, groundwater, surface water, and sediment. Once released to the environment, a primary factor that inhibits the movement of PFAS constituents is the presence of organic matter and organic co-constituents in soils and sediments. Generally, PFAS constituents are mobile in the potentially affected media, and they are not known to be fully broken down by natural processes.

Based on the use, storage, and/or disposal of PFAS-containing materials at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and sediment.

Release and transport mechanisms include dissolution/desorption from soil to groundwater, transport via sediment carried in and dissolution to stormwater and surface water, discharge/recharge between groundwater and surface water, and adsorption/desorption between surface water and sediment. Generic categories of potential human receptors and their associated exposure scenarios that are typically evaluated in a CERCLA human health risk assessment were considered and include on-installation site workers (e.g., industrial/commercial workers, utility workers, or future construction workers who could be exposed to chemicals in soil at an AOPI or to chemicals in tap water in an industrial/commercial building), on-installation residents (e.g., adults and children who could be exposed to chemicals in tap water in a residence), and on-installation recreational users (e.g., hikers or hunters who could be exposed to

chemicals in waterways at an installation). Off-installation receptor types could include drinking water receptors (i.e., commercial/industrial workers or residents) and recreational users.

Human exposure pathways are shown as “complete”, “potentially complete”, or “incomplete” on the CSM figures. A complete exposure pathway consists of a constituent source and release mechanism, a transport or retention medium, an exposure point where human contact with the contaminated medium could occur, and an exposure route at the exposure point. If any of these elements is missing, the exposure pathway is incomplete. Pathways are “potentially complete” where data are insufficient to conclude the pathway is either “complete” or “incomplete”. Additionally, the CSMs do not include ecological receptors and exposure pathways. The potential for ecological exposures to PFOS, PFOA, and PFBS may be evaluated at a future date if those pathways warrant further consideration.

CSMs were developed for each individual AOPI and were combined where source media, potential migration pathways and exposure media, and human exposure pathway determinations are congruent.

Figure 7-13 shows the CSM for Fire Station 02 where AFFF releases historically occurred to the building’s interior floor drains. The floor drains discharge to the sanitary sewer system which then goes to the HAAF WWTP. PFOS, PFOA, and/or PFBS may have migrated to subsurface soil and subsequently groundwater via leaks and cracks in the sanitary sewer. The HAAF WWTP is a separate AOPI, and potential exposure pathways associated with the HAAF WWTP are shown on **Figure 7-20**.

- PFOS, PFOA, and/or PFBS were detected in a surface soil sample at Fire Station 02. PFOS, PFOA, and/or PFBS may also be present in subsurface soil at this AOPI, and site workers (e.g., future construction workers) could contact constituents in subsurface soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the subsurface soil exposure pathway for on-installation site workers is potentially complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at Fire Station 02. This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater during outdoor recreational activities. Therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPI flows off-post through the installation’s southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- Shallow groundwater could discharge to nearby downgradient surface water. Surface water and sediment were not sampled at Fire Station 02. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment.

Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.

- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-14 shows the CSM for Hangar 830, where a leak from the AFFF suppression system occurred in 2015. The interior of the hangar contains floor drains that connect to a large UST that potentially leaked.

- PFOS, PFOA, and/or PFBS were detected in subsurface soil at Hanger 830. Site workers (e.g., future construction workers) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of particulates released during intrusive activities. Therefore, the soil exposure pathway for on-installation site workers is complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at Hangar 830. This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPI flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- Shallow groundwater could discharge to nearby downgradient surface water. Surface water and sediment were not sampled at Hangar 830. Tributaries of the Little Ogeechee River on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.

- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee River through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-15 shows the CSM for the Fire Station 04, Vehicle Fire 03, Nozzle Testing Area, and Hangars 7901 and 7902. AFFF was historically released to soil and/or paved surfaces in these areas.

- PFOS, PFOA, and/or PFBS were detected in soil at Fire Station 04, Vehicle Fire 03, Nozzle Testing Area, and Hangars 7901 and 7902. Site workers (e.g., installation personnel) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust; therefore, the soil exposure pathway for on-installation site workers is complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at Fire Station 04, Nozzle Testing Area, Vehicle Fire 03, and Hangars 7901 and 7902. These AOPIs are not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water and sediment at a stormwater outfall west of Hangars 7901 and 7902 that may be indicative of impacts from the hangars. The surface water at the outfall likely reflects shallow groundwater that discharges to nearby downgradient surface water. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Due to the detections in surface water and sediment samples collected for the SI, the surface water and sediment exposure pathways for on-installation recreational users are complete.

- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-16 shows the CSM for the Fire Training Site (HAA-01). AFFF was historically released to soil and/or paved surfaces in this area.

- PFOS, PFOA, and/or PFBS were detected in soil at the Fire Training Site (HAA-01). Site workers (e.g., installation personnel) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust; therefore, the soil exposure pathway for on-installation site workers is complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the Fire Training Site (HAA-01). This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water at Fire Training Site (HAA-01), and sediment samples were not collected at this AOPI. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Due to the detections in surface water samples collected for the SI, the surface water exposure pathway for on-installation recreational users is complete, and because PFOS, PFOA, and/or PFBS may also be present in sediment, the sediment exposure pathways for on-installation recreational users are potentially complete.
- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be

used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-17 shows the CSM for Hangar 7911, where a high expansion foam release occurred in 2019. AFFF was historically released to paved surfaces and drains, and to any soil exposed through previous cracks in concrete or pipes, in this area.

- Soil samples were not collected at this AOPI since the documented release was contained on impervious surfaces and in drains. Site workers (e.g., installation personnel or construction workers) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust if soil was impacted through historical cracks in concrete or pipes. Therefore, the soil exposure pathway for on-installation site workers is potentially complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA and/or PFBS were detected in groundwater downgradient of Hangar 7911. This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water and sediment at a stormwater outfall northwest of Hangar 7911 that may be indicative of impacts from areas around Hangar 7911. The surface water at this outfall is likely reflective of groundwater and is located downgradient of Hangar 7911. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Due to the detections in surface water and sediment samples collected for the SI, the surface water and sediment exposure pathways for on-installation recreational users are complete.
- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be

used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-18 shows the CSM for Sleepy Hollow FTA, Vehicle Fire 02, and Vehicle Fire 04. AFFF was historically released to soil and/or paved surfaces in these areas.

- PFOS, PFOA, and/or PFBS were not detected in soil at Sleepy Hollow FTA, Vehicle Fire 02, and Vehicle Fire 04. Based on the SI sample results, the soil exposure pathways are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at Sleepy Hollow FTA, Vehicle Fire 02, and Vehicle Fire 04. These AOPIs are not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- Stormwater/surface runoff and shallow groundwater may discharge to nearby downgradient surface water. Surface water and sediment were not sampled at these AOPIs. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.
- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-19 shows the CSM for Vehicle Fire 05. AFFF was historically released to soil and/or paved surfaces in this area.

- PFOS, PFOA, and/or PFBS were not detected in soil at Vehicle Fire 05. Therefore, the soil exposure pathways for all on-installation and off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were not detected in groundwater at Vehicle Fire 05. Therefore, the groundwater exposure pathways for all on-installation and off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were not detected in soil or groundwater at Vehicle Fire 05, indicating there is no PFAS source medium at Vehicle Fire 05. The surface water and sediment exposure pathways for all on-installation and off-installation receptors are incomplete.

Figure 7-20 shows the CSM for HAAF WWTP, where waste drainage from Fire Station 02 and Hangar 830 was treated. Biosolids were applied to drying beds, then bed drainage was sent back through the HAAF WWTP. A belt-press is now used to dry solids instead of the drying beds. HAAF WWTP effluent eventually discharges to the Savannah River.

- Site workers (e.g., future construction workers) could contact constituents in soil (soil/sludge in historical drying beds and current belt presses) via incidental ingestion, dermal contact and inhalation of dust; therefore, the soil exposure pathway for on-installation site workers is potentially complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the WWTP. This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- Treated water from the HAAF WWTP and the Wilshire WWTP (run by the City of Savannah) eventually discharges to the Savannah River located off-post. The surface water and sediment exposure pathways for on-installation site workers, residents, and recreational users are incomplete. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in the Savannah River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-21 shows the CSM for Hangar 805. AFFF was historically released to paved surfaces and drains, and to any soil exposed through previous cracks in concrete or pipes, in this area.

- Soil was not sampled at Hangar 805 since the documented release was contained on paved surfaces and in drains. Site workers (e.g., installation personnel or construction workers) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust if soil was impacted through historical cracks in concrete or pipes. Therefore, the soil exposure pathway for on-installation site workers is potentially complete. The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- Groundwater was sampled in a monitoring well downgradient of Hangar 805. This AOPI is not likely to affect drinking water wells currently used to supply potable water at HAAF, as the potable wells are installed in the deep Floridan aquifer which is separated from the surficial aquifer and Brunswick aquifer by confining units consisting of silty clay and dense phosphatic dolomite. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater in a shallower aquifer. Recreational users are not likely to contact groundwater; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater originating at the AOPIs flows off-post through the installation's southwestern boundary. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is potentially complete.
- Storm sewer drains and shallow groundwater may discharge to nearby downgradient surface water. Surface water and sediment were not sampled at Hangar 805. Tributaries of the Little Ogeechee and Vernon Rivers on-post are not used for drinking water; therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers and residents is incomplete. On-installation site workers and residents are not likely to otherwise contact surface water and sediment. Therefore, the exposure pathways via incidental ingestion and dermal contact with surface water and sediment are also incomplete. While unlikely, recreational users could contact constituents in tributaries of the Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.
- Surface water bodies flow off-post to the Little Ogeechee and Vernon Rivers. Surface water is not used as drinking water off-installation within 5 miles of the installation boundary and is not likely to be used as drinking water in the future. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Recreational users off-post could contact constituents in Little Ogeechee and Vernon Rivers through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Following the SI sampling, 13 out of the 14 AOPIs were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

8 OFF-POST PRIVATE POTABLE WELL INVESTIGATION

Based on SI sampling results, off-post private potable wells were identified as part of the PA/SI investigation at HAAF to determine whether there are potential off-post impacts to drinking water due to Army operations.

An off-post well survey was completed for an area 1-mile downgradient using readily available information from the Georgia water well database. County records were reviewed to identify wells that may not be included in the state database, and relevant parcels were reviewed to compile a list of property owners. Finally, available groundwater modeling reports (i.e., United States Geological Survey reports or other) were reviewed for the area.

Select off-post private potable wells may be recommended for future sampling based on the understanding of the relationship between on- and off-post hydrogeological conditions. If such wells are identified for future sampling, community outreach and notification will be coordinated between the Army PA/SI team, HAAF, Headquarters of the Department of the Army, and USAEC Divisions. If off-post private potable well sampling occurs, the results of the event will be presented in a letter report that will be included in a subsequent addendum.

9 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA/SI included two distinct efforts. The PA identified AOPIs at HAAF based on the use, storage, and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release of PFOS, PFOA, and PFBS to the environment occurred.

OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at HAAF. Following the evaluation, 14 AOPIs were identified. PFAS compounds were not detected in on-post water supply wells during sampling in 2014, 2016 and 2019.

Fourteen AOPIs were sampled during the SI at HAAF to identify presence or absence of PFOS, PFOA, and PFBS at each AOPI. The SI scope of work was completed in accordance with the Final PQAPP (Arcadis 2019) and the HAAF QAPP Addendum (Arcadis 2020).

Thirteen AOPIs had detections of PFOS, PFOA, and/or PFBS in soil, groundwater, surface water, and/or sediment samples and 12 AOPIs exceeded OSD risk screening levels.

PFOS and/or PFOA were detected in groundwater above the OSD risk screening level (40 ng/L, ppt) at 12 of the 14 sampled AOPIs. PFOS and/or PFOA exceedances were not identified at Vehicle Fire 02 and Vehicle Fire 05. The maximum PFOS and PFOA detections were at the Fire Station 04 at concentrations of 2,100,000 J ng/L and 27,000 J ng/L, respectively. PFBS exceeded the OSD risk screening level (600 ng/L) at 2 AOPIs, Fire Station 04 and Fire Training Site (HAA-01). The maximum PFBS detection was at the Fire Station 04 at a concentration of 9,700 J ng/L.

PFOS, PFOA, and/or PFBS were detected in surface soil (0 to 2 feet bgs) samples at seven of the 11 AOPIs sampled for soil. PFOS, PFOA, and/or PFBS were not detected at the Sleepy Hollow FTA, Vehicle Fire 02, Vehicle Fire 04, and Vehicle Fire 05. For soil samples collected from 0 to 2 feet bgs, PFOS was detected above the residential OSD risk screening level (0.13 mg/kg, ppm) at two AOPIs [Fire Training Site (HAA-01) and Fire Station 04]. PFOS was detected above the industrial/commercial OSD risk screening level (1.6 mg/kg) at one AOPI (Fire Station 04). The maximum PFOS detection was at the Fire Station 04 at a concentration of 5.6 J mg/kg. The maximum PFOA detection (0.077 J mg/kg; Fire Station 04) was below the residential OSD risk screening level (0.13 mg/kg). PFBS was detected at two AOPIs [Fire Station 04; 0.15 J mg/kg and Fire Training Site (HAA-01); 0.003 mg/kg] at concentrations below the residential OSD risk screening level (1.9 mg/kg).

One subsurface (greater than 2 feet bgs) soil sample was collected during the SI, at Hangar 830. PFOS was detected at a concentration of 0.0067 mg/kg, which is below the residential and industrial/commercial OSD risk screening levels (0.13 mg/kg and 1.6 mg/kg, respectively). PFOA and PFBS were not detected.

PFOS, PFOA, and/or PFBS were detected at both AOPIs [FTA (HAA-01) and Hangars 7901, 7902, and 7911] sampled for surface water. PFOS and PFOA were detected above the OSD tap water risk screening level (40 ng/L) at the two AOPI locations. The maximum PFOS and PFOA detections were at

the Fire Training Site (HAA-01) at concentrations 4,100 J ng/L and 620 ng/L, respectively. PFBS did not exceed the OSD risk screening levels (600 ng/L) in any surface water sample. The maximum PFBS detection was at the outfall sampling location proximate to Hangars 7901, 7902, and 7911 at a concentration of 370 ng/L.

PFOS was detected at the one AOPI location sampled for sediment (Hangars 7901, 7902, and 7911) at a concentration of 0.0037 ng/L, which is below the OSD risk screening level (0.13 mg/kg). PFOA and PFBS were not detected in the sediment sample.

Following the SI sampling, 13 out of the 14 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways for one or more potential exposure media.

The following exposure pathways are complete or potentially complete:

- The soil exposure pathways for on-installation site workers are complete at six AOPIs where PFOS, PFOA, and/or PFBS compounds were detected.
- The soil exposure pathways for on-installation site workers are potentially complete at seven AOPIs where soil was not sampled or where PFOS, PFOA, and/or PFBS compounds were not detected but presence or absence of PFAS-containing materials in soil is uncertain due to limited sampling.
- The groundwater exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for on-installation site workers and residents and off-installation receptors at 13 AOPIs.
- The surface water exposure pathways (via incidental ingestion and dermal contact) are complete for on-installation recreational users at two AOPIs and potentially complete for on-installation recreational users at 10 AOPIs. The sediment exposure pathways (via incidental ingestion and dermal contact) are complete for on-installation recreational users at one AOPI and potentially complete for on-installation recreational users at 11 AOPIs.
- The surface water and sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for off-installation recreational users at 13 AOPIs.

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for future study in a remedial investigation or no action at this time is based on the comparison of SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 9-1** below summarizes the AOPIs identified at HAAF; PFOS, PFOA, and PFBS sampling; and recommendations for each AOPI. Further investigation is warranted at HAAF. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 9-1 Summary of AOPIs Identified during the PA, PFOS, PFOA, and PFBS Sampling at HAAF, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)				Recommendation
	GW	SO	SW	SE	
Fire Training Site (HAA-01)	Yes	Yes	Yes	NS	Further study in a remedial investigation
Fire Station 04	Yes	Yes	NS	NS	Further study in a remedial investigation
Sleepy Hollow FTA	Yes	ND	NS	NS	Further study in a remedial investigation
Fire Station 02	Yes	No	NS	NS	Further study in a remedial investigation
Vehicle Fire 03	Yes	No	NS	NS	Further study in a remedial investigation
Nozzle Testing Area	Yes	No	NS	NS	Further study in a remedial investigation
Hangar 830	Yes	No	NS	NS	Further study in a remedial investigation
Hangars 7901 and 7902	Yes	No	Yes	No	Further study in a remedial investigation
Hangar 7911	Yes	NS	Yes	No	Further study in a remedial investigation
HAAF WWTP	Yes	NS	NS	NS	Further study in a remedial investigation
Vehicle Fire 02	No	ND	NS	NS	No action at this time
Vehicle Fire 04	Yes	ND	NS	NS	Further study in a remedial investigation
Vehicle Fire 05	ND	ND	NS	NS	No action at this time
Hangar 805	Yes	NS	NS	NS	Further study in a remedial investigation

Notes:
Light gray shading – detection greater than the OSD risk screening level
FTA – Fire Training Area
GW – groundwater
ND – not detected
NS – not sampled
SE – sediment
SO – soil
SW – surface water
WWTP – wastewater treatment plant

Data collected during the PA (**Sections 3** through **5**) and SI (**Sections 6** through **8**) were sufficient to draw conclusions and recommendations summarized above. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at HAAF are discussed below.

Records gathered for the use, storage and/or disposal of PFAS-containing materials were reviewed during the PA process. Documentation specific to AFFF may have been limited (e.g., each AFFF use; procurement records, documentation of AFFF used during crash responses or fire training activities) due to lack of recordkeeping requirements for the full timeline of common AFFF practices. Anecdotal accounts of AFFF use (and therefore likely PFOS, PFOA, and PFBS use) were limited to available installation personnel, whose knowledge of AFFF use may have been restricted by their time spent at the installation or previous roles held that limited their relevant knowledge of potential AFFF (or other PFAS-containing material) use.

A comprehensive well survey was not completed as part of this PA; therefore, the information reviewed regarding off-post wells is limited to what is contained in the off post well search results (**Appendix E**).

The searches for ecological receptors and off-post PFOS, PFOA, and PFBS sources were not exhaustive and were limited to easily identifiable and readily available information evaluated during the relevant documents research, installation personnel interviews, and site reconnaissance.

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to results from historical PFOS, PFOA, and PFBS sampling for on-post potable water wells, and SI sampling results including three on-post monitoring water wells; soil samples at each AOPI except Hangar 7911, HAAF WWTP, and Hangar 805; and groundwater samples at each AOPI. Surface water samples were collected at two AOPIs [Fire Training Site (HAA-01) and Hangar 7911]. Available data, including PFOS, PFOA, and PFBS, is listed in **Appendix P**, which were analyzed per the selected analytical method.

Results from this PA/SI indicate further study in a remedial investigation is warranted at HAAF in accordance with the guidance provided by the OSD.

REFERENCES

AECOM. 2020. Final Preliminary Assessment Report, Hunter Army Aviation Support Facility, Savannah, Georgia. Prepared for Army National Guard Bureau. August.

Arcadis U.S., Inc. (Arcadis). 2018. Accident Prevention Plan: A-E Services, PFASs Contamination in the Cleanup/Restoration Programs at Active Army Installations – Nationwide. Prepared for USACE, Baltimore District. March.

Arcadis. 2019. Final Programmatic Uniform Federal Policy Quality Assurance Project Plan, USAEC PFAS PA/SI, Active Army Installations, Nationwide, USA. October.

Arcadis. 2020. Final UFP QAPP Addendum, Revision 0, USAEC PFAS PA/SI, Hunter Army Airfield, Georgia. October.

Army. 2018. Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances. September Available online at: https://www.fedcenter.gov/admin/itemattachment.cfm?attachmentid=1150.

Department of Defense (DoD). 2017. Fact Sheet: Detection and Quantitation – What Project Managers and Data Users Need to Know. Data Quality Working Group. October.

DoD and Department of Energy. 2019. Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.3. May.

DoD. 2019. Environmental Data Quality Working Group: Final General Data Validation Guidelines. November 4.

DoD. 2020. Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15. May.

DoD and Department of Energy. 2019. Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.3. May.

Environmental Science and Engineering, Inc (ESE). 1993. Final Significance of Contamination Report. Hunter Army Airfield Fire Training Area, Fort Stewart, Savannah, Georgia. June.

Gerard J. Gonthier and Clarke, John S. (Gonthier and Clarke), 2013. Hydrogeology and Water Quality of the Floridan Aquifer System and Effect of Lower Floridan Aquifer Withdrawals on the Upper Floridan Aquifer. Chatham County, Georgia.

Interstate Technology Regulatory Council. 2017. History and Use of Per-and Polyfluoroalkyl Substances (PFAS). November. Available online at: https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use__11_13_17.pdf

Interstate Technology Regulatory Council. 2020. Section 3.1 Firefighting Foams. Updated April 14. Available online at: https://pfas-1.itrcweb.org/3-firefighting-foams/#3_1

Malcolm Pirnie. 2006. Draft Final Operational Range Phase I Qualitative Assessment Report HAAF Savannah, Georgia, October.

The Nature Conservancy. 1995. Health Care Facilities Waste Management Study No. 37-08-2593-95 Fort Stewart, Georgia, February.

OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.

U.S. Army Toxic and Hazardous Materials Agency. 1983. Installation Assessment of Headquarters 24th Infantry Division and Fort Stewart, GA. Report No. 334, October.

USACE. 2005. Environmental Quality: Guidance for Evaluating Performance-Based Chemical Data, Engineer Manual 200-1-10, CEMP-RA/CECW-E, June 30.

USACE. 2012. Environmental Quality: Conceptual Site Models, Engineer Manual 200-1-12, CEMP-CE, December 28.

U.S. Army Environmental Hygiene Agency. 1987. Hazardous Waste Study No. 37-26-0127-88 Investigation of Soil Contamination.

USEPA. 1991. Guidance for Performing Preliminary Assessments Under CERCLA. EPA/540/G-91/013. September. Available online at: https://semspub.epa.gov/work/11/157081.pdf.

USEPA. 2016. Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate. EPA-HQ-OW-2014-0138; FRL-9946-91-OW. Federal Register/ Vol. 81. No. 101. May 25. Available online at: https://www.govinfo.gov/content/pkg/FR-2016-05-25/pdf/2016-12361.pdf.

USEPA. 2021. Human Health Toxicity Values for Perfluorobutane Sulfonic Acid (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3). EPA/600/R-20/345F. Center for Public Health and Environmental Assessment, Office of Research and Development, Washington DC. April.

U.S. Climate Data. 2021. U.S. Climate online database. URL: https://www.usclimatedata.com/climate/savannah/georgia/united-states/usga1191

United States Fish and Wildlife Service (USFWS). 2019. Endangered Species Program online database. URL: http://www.fws.gov/endangered/

United States Geological Survey. 1990. Geology and Groundwater Resources of the Coastal Area of Georgia, Atlanta, Georgia. November.

ACRONYMS

°F	degrees Fahrenheit
%	percent
AECOM	Architecture Engineering Construction Operations and Management
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FTA	fire training area
GIS	geographic information system
HAAF	Hunter Army Airfield
IDW	investigation-derived waste
IMCOM	Installation Management Command
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram (parts per million)
ng/L	nanograms per liter (parts per trillion)

OSD	Office of the Secretary of Defense
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
PWS	public water systems
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RSL	Regional Screening Level
SI	site inspection
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
TGI	technical guidance instruction
TOC	total organic carbon
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
WWTP	wastewater treatment plant

TABLES

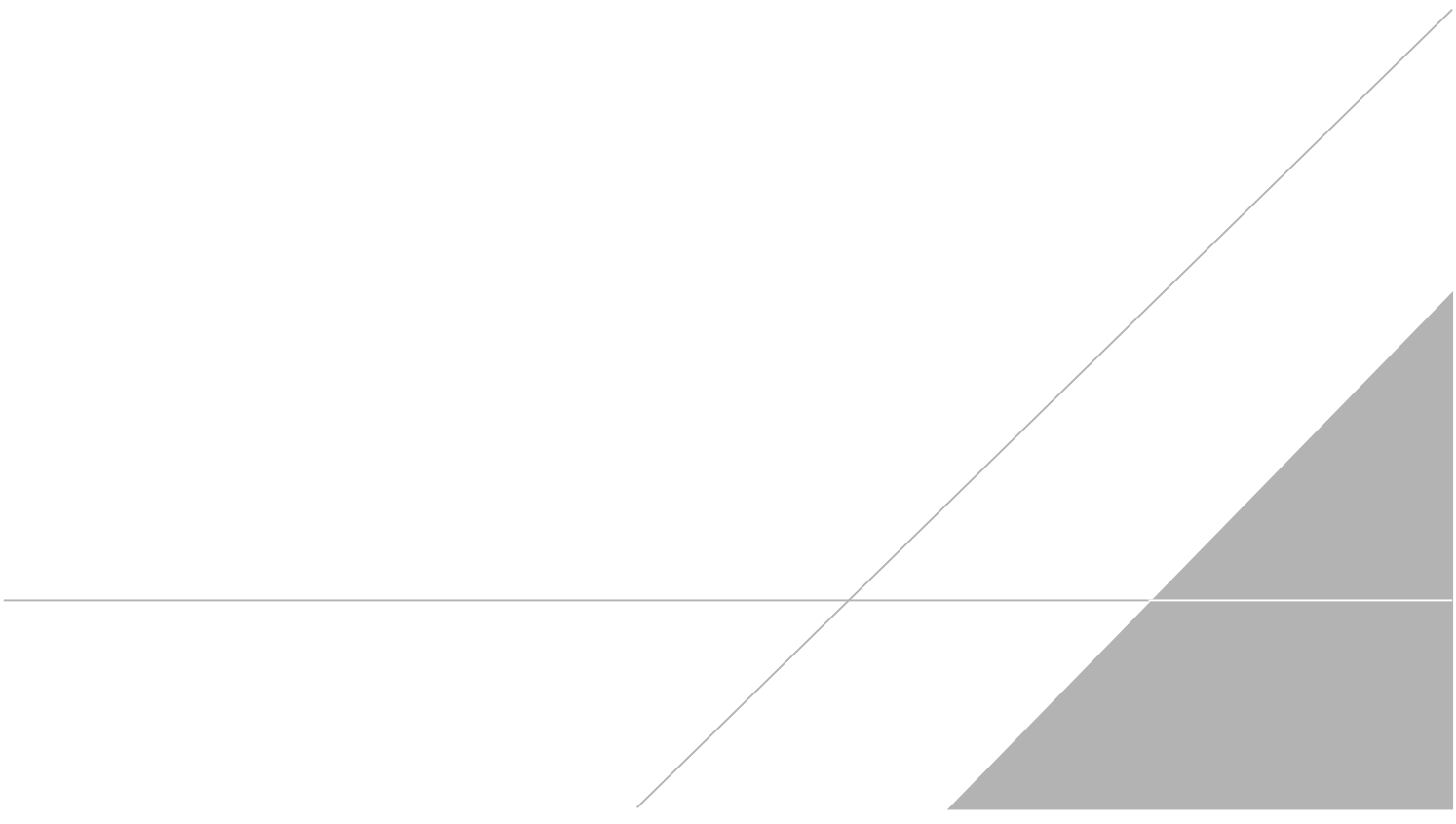


Table 2-1 - On-Post Potable Water Wells
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Georgia

HAAF Well ID	Well Depth (ft bgs)	Sample Date	PFOS/PFOA Concentration (see Note 2)
HAAF Main Well #1	550	9/28/2016	ND
HAAF Main Well #2	550	9/28/2016	ND
HAAF Main Well #3 (Outdoor Rec)	360	9/28/2016	ND
HAAF Main Well #4a (see Note 3)	--	N/A	N/A
HAAF Main Well #5 (see Note 3)	--	N/A	N/A
HAAF Main Well #7 (Lotts Island) (see Note 3)	450	9/28/2016	ND
HAAF Main Well #8	375	9/28/2016	ND
HAAF Main Well #9	425	9/28/2016	ND
HAAF Main Well #10 (see Note 3)	--	N/A	N/A
HAAF Main Well #11	--	9/28/2016	ND

Notes:

1) Information provided by Fort Stewart indicated that the listed wells were also sampled in December 2019 and all PFAS results were ND. Lab reports were not provided.

2) Minimum Reportable Level for 2016 PFOS/PFOA Results is 2 ng/L.

3) Well #4a is currently not in use. Wells #5, #7, and #10 have been abandoned.

ft bgs = feet below ground surface
HAAF = Hunter Army Airfield
ID = Identification
ND = non-detect
N/A = not applicable, well not sampled
ng/L = nanograms per liter
PFAS = per- and polyfluoroalkyl substances
PFOS = perfluorooctane sulfonate
PFOA = perfluorooctanoic acid
-- = data not available

Area of Potential Interest	Well ID	Depth to Water (ft btoc)	Well Diameter (inches)	Well Placed In Service Date	Well Construction Material	Total Well Depth (ft bgs)	TOC Elevation (ft amsl)	Screened Interval (ft bgs)	Dedicated Equipment (Y/N)
HAA-01	HMW-06	8.63	2	3/1990	PVC	15	31.53	3-13	N
	HMW-08	8.65	2	3/1992	PVC	15	27.5	3-13	N
HAAF WWTP and Hangar 805	MW-05B	8.10	2	4/1/2010	PVC	25	18.72	15-25	N

Notes:
amsl = above mean sea level
bgs = below ground surface
btoc = below top of casing
ft = feet
HAAF = Hunter Army Airfield
ID - Identification
PVC = polyvinyl chloride
WWTP = wastewater treatment plant

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

AOPI	Location Type	Location	Sample ID / Parent Sample ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
					OSD Tapwater Risk Screening Level	40		40		600	
					Sample Type	Result	Qual	Result	Qual	Result	Qual
Fire Training Site (HAA-01)	Grab	HAAF-HAA01-01	HAAF-FD-GW-01-100520 / HAAF-HAA01-GW-01-100520	10/05/2020	FD	7,100	J	1,700	J	38	
			HAAF-HAA01-GW-01-100520	10/05/2020	N	7,100	J	1,800	J	47	J-
	Grab	HAAF-HAA01-02	HAAF-HAA01-GW-02-100520	10/05/2020	N	74,000	J	7,500	J	2,000	J
	Monitoring Well	HAAF-HMW-06	HAAF-HMW-06-100520	10/05/2020	N	1,800	J	300		260	
	Monitoring Well	HAAF-HMW-08	HAAF-HMW-08-100520	10/05/2020	N	8,900	J	2,800	J	72	
Fire Station 04	Grab	HAAF-FS04-01	HAAF-FS04-GW-01-100620	10/06/2020	N	2,100,000	J	27,000	J	9,700	J
Sleepy Hollow FTA	Grab	HAAF-FTA-01	HAAF-FTA-GW-01-100520	10/05/2020	N	94	J+	6.8		91	
Fire Station 02 and Vehicle Fire 03	Grab	HAAF-FS02-01	HAAF-FS02-GW-01-100820	10/08/2020	N	1,700	J	160		69	
Hangar 830	Grab	HAAF-H830-01	HAAF-H830-GW-01-100720	10/07/2020	N	410		63		130	
Hangars 7901 and 7902	Grab	HAAF-7901-01	HAAF-7901-GW-01-100720	10/07/2020	N	240		37		22	
Hangars 7901 and 7901; Hangar 7911	Grab	HAAF-7901-02	HAAF-7901-GW-02-100720	10/07/2020	N	31,000	J	340	J	350	J
Nozzle Testing Area	Grab	HAAF-NTA-01	HAAF-NTA-GW-01-100820	10/08/2020	N	8,100	J	65		56	
HAAF WWTP; Hangar 805	Monitoring Well	HAAF-MW-05B	HAAF-MW-05B-100620	10/06/2020	N	1,800	J	120		25	
HAAF WWTP	Grab	HAAF-WWTP-01	HAAF-WWTP-GW-01-100620	10/06/2020	N	250		310		43	
	Grab	HAAF-WWTP-02	HAAF-WWTP-GW-02-100620	10/06/2020	N	680		39		27	
Vehicle Fire 02	Grab	HAAF-VF02-01	HAAF-VF02-GW-01-100720	10/07/2020	N	20		3.5	U	1.9	J
Vehicle Fire 04	Grab	HAAF-VF04-01	HAAF-VF04-GW-01-100620	10/06/2020	N	110	J+	24		16	
Vehicle Fire 05	Grab	HAAF-VF05-01	HAAF-VF05-GW-01-100520	10/05/2020	N	3.5	U	3.5	U	3.5	U

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection

2. Gray shaded values indicate the result was detected greater than the 2021 Office of the Secretary of Defense (OSD) tapwater risk screening levels (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).

Acronyms/Abbreviations:

-- = not applicable
AOPI = Area of Potential Interest
FD = field duplicate sample
FTA = Fire Training Area
GW = Groundwater
HAAF = Hunter Army Airfield
ID = identification
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
WWTP = Wastewater treatment plant

Qualifiers:

J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
J+ = The result is an estimated quantity; the result may be biased high.
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

AOPI	Location	Sample ID / Parent Sample ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	1.6		1.6		25	
				OSD Residential Risk Screening Level	0.13		0.13		1.9	
				Sample Type	Result	Qual	Result	Qual	Result	Qual
Fire Training Site (HAA-01)	HAAF-HAA01-01	HAAF-FD-SO-01-100520 / HAAF-HAA01-SO-01-100520	10/05/2020	FD	**0.009**		**0.0039**		0.00092	U
		HAAF-HAA01-SO-01-100520	10/05/2020	N	**0.01**		**0.0048**		0.00092	U
	HAAF-HAA01-02	HAAF-HAA01-SO-02-100520	10/05/2020	N	**0.53**	J	**0.0011**	J-	0.00099	U
	HAAF-HAA01-03	HAAF-HAA01-SO-03-100520	10/05/2020	N	**0.94**	J	**0.048**		**0.003**	
Fire Station 04	HAAF-FS04-01	HAAF-FS04-SO-01-100620	10/06/2020	N	***5.6***	J	**0.077**	J	**0.15**	J
Sleepy Hollow FTA	HAAF-FTA-01	HAAF-FTA-SO-01-100520	10/05/2020	N	0.0011	U	0.0011	U	0.0011	U
Fire Station 02 and Vehicle Fire 03	HAAF-FS02-01	HAAF-FS02-SO-01-100820	10/08/2020	N	**0.0024**		**0.0018**		0.0010	U
Hangar 830	HAAF-H830-01	HAAF-H830-SO-01-100720	10/07/2020	N	**0.0067**		0.0010	U	0.0010	U
Hangars 7901 and 7902	HAAF-7901-01	HAAF-7901-SO-01-100720	10/07/2020	N	**0.012**		0.0012	U	0.0012	U
	HAAF-7901-02	HAAF-7901-SO-02-100720	10/07/2020	N	**0.0046**		0.0012	U	0.0012	U
Nozzle Testing Area	HAAF-NTA-01	HAAF-NTA-SO-01-100820	10/08/2020	N	**0.028**		0.00093	U	0.00093	U
Vehicle Fire 02	HAAF-VF02-01	HAAF-VF02-SO-01-100720	10/07/2020	N	0.00093	U	0.00093	U	0.00093	U
Vehicle Fire 04	HAAF-VF04-01	HAAF-VF04-SO-01-100620	10/06/2020	N	0.0013	U	0.0013	U	0.0013	U
Vehicle Fire 05	HAAF-VF05-01	HAAF-VF05-SO-01-100520	10/05/2020	N	0.0011	U	0.0011	U	0.0011	U

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

Notes:

1. Bolded values indicate the result was detected greater than the limit of detection
2. All laboratory reported results in nanograms per gram (ng/g) were converted to milligrams per kilogram (mg/kg).
3. Data are compared to the 2021 Office of the Secretary of Defense (OSD) risk screening levels for the residential and commercial/industrial scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).
4. Soil samples collected from greater than two ft, but less than 15 ft bgs are compared to the Industrial/Commercial risk screening levels only .
5. Gray shaded values indicate the result was detected greater than the OSD risk screening level for the residential scenario. Italicized values indicate the result was detected greater than the OSD risk screening level for the industrial/commercial and residential scenario.

Acronyms/Abbreviations:

AOPI = Area of Potential Interest
FD = field duplicate sample
FTA = Fire Training Area
ID = identification
HAAF = Hunter Army Airfield
N = primary sample
mg/kg = milligrams per kilogram (parts per million)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutane sulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
Qual = qualifier
SO = Soil

Qualifiers:

J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

Table 7-3 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

AOPI	Location Type	Location	Sample ID / Parent Sample ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
					OSD Tapwater Risk Sceening Level	40		40		600	
					Sample Type	Result	Qual	Result	Qual	Result	Qual
Fire Training Site (HAA-01)	Surface Water/Seep	HAAF-HAA01-SW-01	HAAF-HAA01-SW-01-100520	10/05/2020	N	**4,100**	J	**620**		**170**	
Hangar 7911	Surface Water/Seep	HAAF-7911-SW-01	HAAF-7911-SW-01-100720	10/07/2020	N	**2,600**	J	**190**		**370**	

Table 7-3 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection

2. Gray shaded values indicate the result was detected greater than the 2021 Office of the Secretary of Defense (OSD) risk screening levels (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.). Only applicable if surface water is an expression of groundwater or if surface water is used as a drinking water source nearby.

Acronyms/Abbreviations:

-- = not applicable
AOPI = Area of Potential Interest
FD = field duplicate sample
HAAF = Hunter Army Airfield
ID = identification
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SW = Surface water

Qualifiers:

J = The analyte was positively identified; however the associated numerical value is an estimated concentration only

Table 7-4 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

AOPI	Location Type	Location	Sample ID / Parent Sample ID	Analyte		PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Hangar 7911	Sediment	HAAF-7911-SE-01	HAAF-7911-SE-01-100720	10/07/2020	N	**0.0037**		0.0013	U	0.0013	U

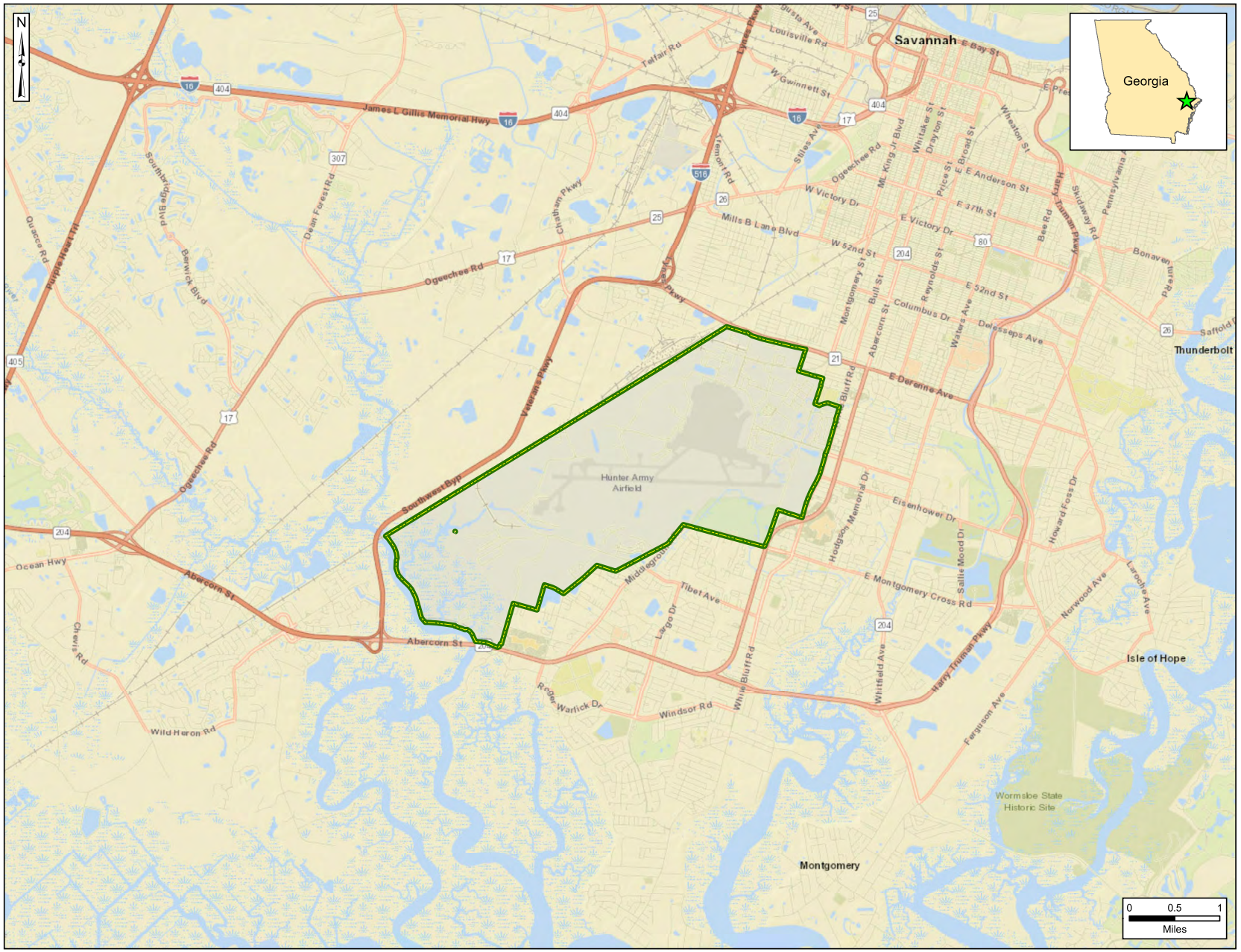
Table 7-4 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Hunter Army Airfield, Savannah, Georgia

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection
2. All laboratory reported results in nanograms per gram (ng/g) were converted to milligrams per kilogram (mg/kg).

Acronyms/Abbreviations:
-- = not applicable/not analyzed
AOPI = Area of Potential Interest
HAAF = Hunter Army Airfield
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutane sulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
Qual = qualifier
SE = Sediment

Qualifiers:
U = The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).

FIGURES



USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 2-1
Site Location

Legend

Installation Boundary

Data Sources:
USAEC, GIS Data, 2002
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 2-2
Site Layout

Legend

- Installation Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Water Body
- Installation Drinking Water Well
- Installation Drinking Water Well (Abandoned)

Data Sources:
USAEC, GIS Data, 2002
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

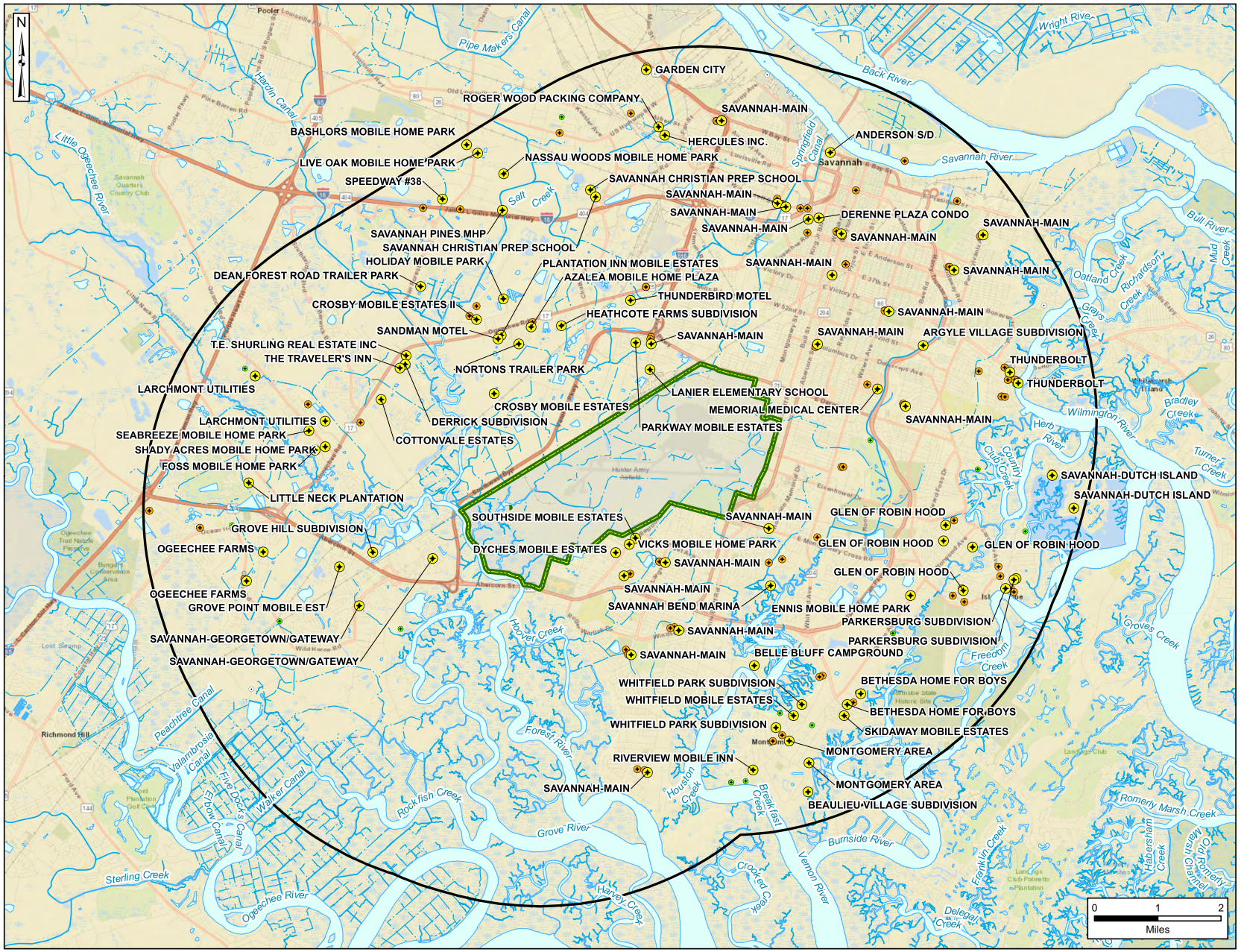
Figure 2-3
Site Topography

Legend

- Installation Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Elevation Contour (feet)

Data Sources:
USAEC, GIS Data, 2005
USGS, NHD Data, 2019
ESRI ArcGIS Online, USA Topo Maps

Coordinate System:
WGS 1984, UTM Zone 17 North



USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 2-4
Off-Post Potable Wells

Legend

- Installation Boundary
- 5-Mile Radius
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Water Body
- Public Water Supply System Well
- Other Public Supply Well
- Domestic Well
- Other Designated Use Water Well

Notes:

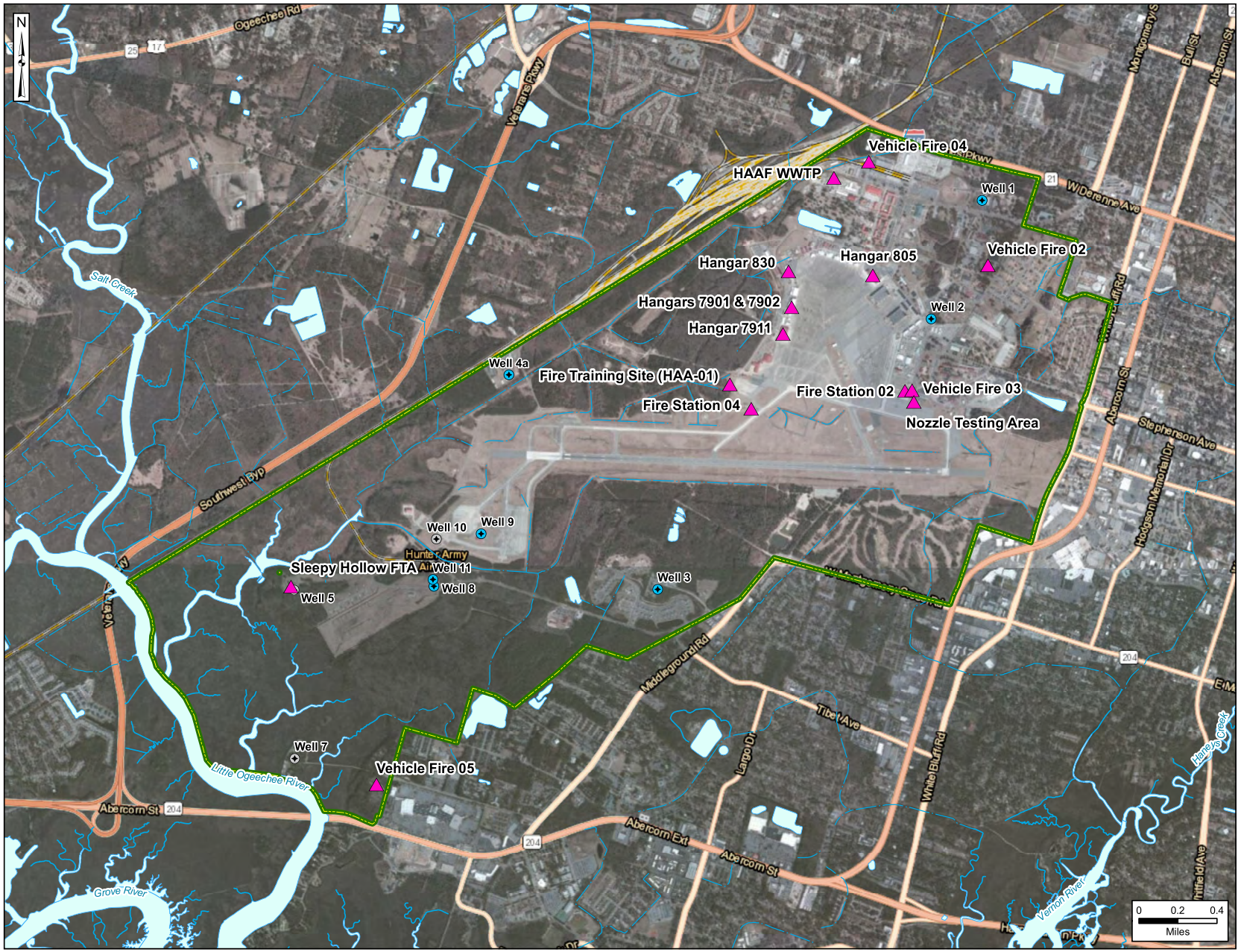
Public Water Supply System Well data from the Federal Reporting Data System and includes water systems which provides water to at least 25 people for at least 60 days annually.

Other public supply wells include institutional and municipal wells.

Other designated use wells include irrigation wells, as well as wells with unknown use.

Data Sources:
USAEC, GIS Data, 2002
EDR, Well Data, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, StreetMap Data

Coordinate System:
WGS 1984, UTM Zone 17 North



USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-2
AOPI Locations

Legend

- Installation Boundary
- AOPI Location
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Water Body
- Installation Drinking Water Well
- Installation Drinking Water Well (Abandoned)

AOPI = area of potential interest
FTA = Fire Training Area
HAA/HAAF = Hunter Army Airfield
WWTP = Wastewater Treatment Plant

Data Sources:
USAEC, GIS Data, 2002
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-3
Aerial Photo of
Fire Station 04 and
Fire Training Site (HAA-01)

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Monitoring Well

HAA = Hunter Army Airfield

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-4
Aerial Photo of
Sleepy Hollow FTA

Legend

- Installation Boundary
- Area of Potential Interest
- River/Stream (Perennial)
- Approximate Groundwater Flow Direction
- Installation Drinking Water Well

FTA = Fire Training Area

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-5
Aerial Photo of
Fire Station 02, Vehicle Fire 03, and Nozzle Testing Area

Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction

Note: The location of Vehicle Fire 03 is estimated.

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-6
Aerial Photo of Hangar 830

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-7
Aerial Photo of
Hangars 7901 & 7902

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-8
Aerial Photo of Hangar 7911

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-9
Aerial Photo of HAAF WWTP

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Monitoring Well

HAAF = Hunter Army Airfield
WWTP = Wastewater Treatment Plant

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-10
Aerial Photo of Vehicle Fire 02

Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction

Data Sources:
Google Earth, Aerial Imagery, 2018

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-11
Aerial Photo of Vehicle Fire 04

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction

Data Sources:
USGS, NHD Data, 2019
Google Earth, Aerial Imagery, 2019

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-12
Aerial Photo of
Vehicle Fire 05

Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction

Data Sources:
USAEC, GIS Data, 2002
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 5-13
Aerial Photo of Hangar 805

Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction

Data Sources:
USAEC, GIS Data, 2002
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-1
AOPI Locations and OSD Risk Screening Level Exceedances

Legend

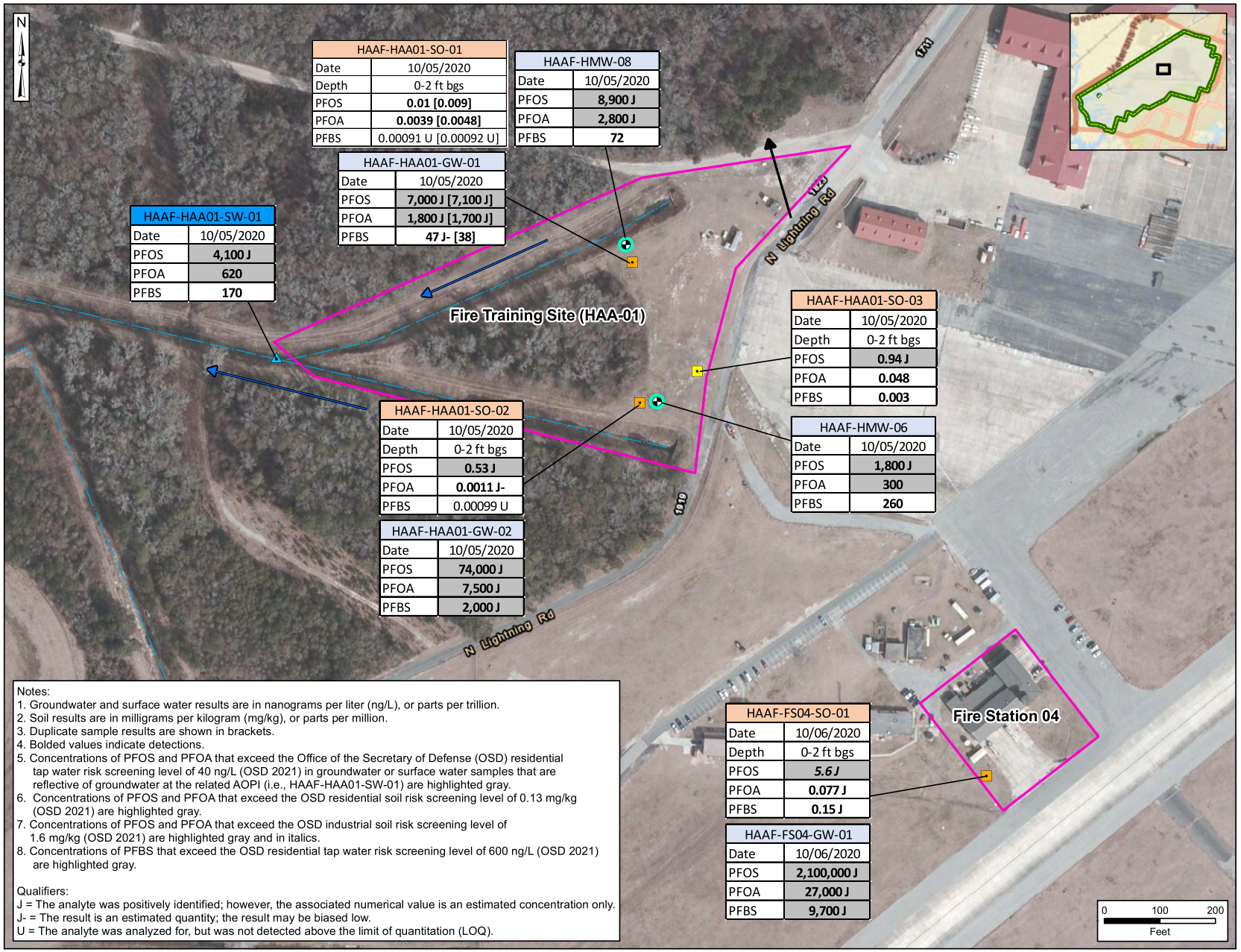
- Installation Boundary
- AOPI Location
- AOPI Location with OSD Risk Screening Level Exceedance *
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Water Body
- Installation Drinking Water Well
- Installation Drinking Water Well (Abandoned)

AOPI = area of potential interest
FTA = Fire Training Area
HAA/HAAF = Hunter Army Airfield
OSD = Office of the Secretary of Defense
WWTP = Wastewater Treatment Plant

* Exceedance for Hangar 805 is based on HAAF WTTP results.

Data Sources:
USAEC, GIS Data, 2002
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) in groundwater or surface water samples that are reflective of groundwater at the related AOPI (i.e., HAAF-HAA01-SW-01) are highlighted gray.
6. Concentrations of PFOS and PFOA that exceed the OSD residential soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray.
7. Concentrations of PFOS and PFOA that exceed the OSD industrial soil risk screening level of 1.6 mg/kg (OSD 2021) are highlighted gray and in italics.
8. Concentrations of PFBS that exceed the OSD residential tap water risk screening level of 600 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
J- = The result is an estimated quantity; the result may be biased low.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS Preliminary Assessment / Site Inspection Hunter Army Airfield, GA

ARCADIS

Figure 7-2
Fire Station 04 and Fire Training Site (HAA-01) PFOS, PFOA, and PFBS Analytical Results

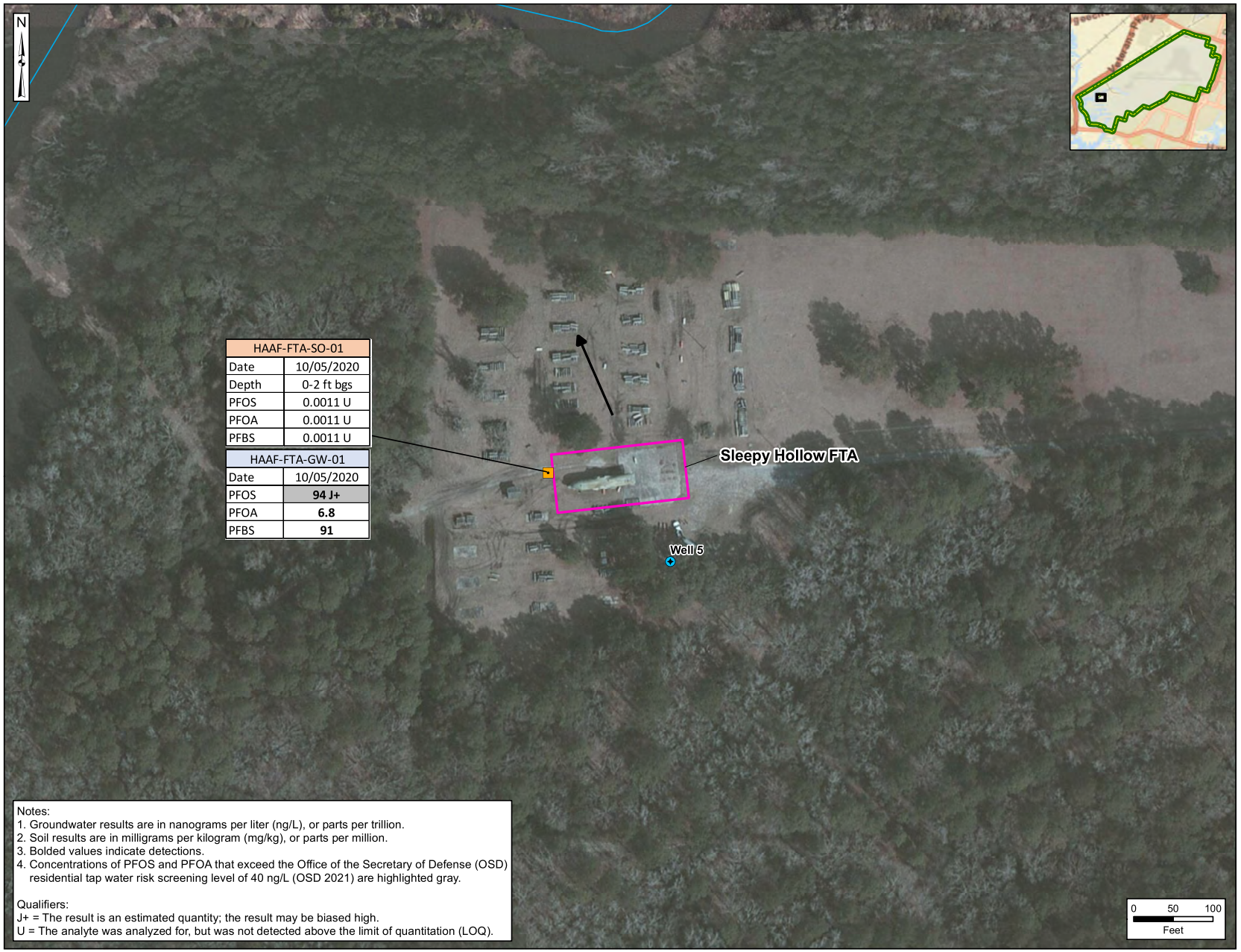
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Monitoring Well
- Shallow Soil and Grab Groundwater Sampling Location
- Shallow Soil Sampling Location
- Surface Water Sampling Location
- Groundwater Sampling Location (Existing Well)

ft bgs = feet below ground surface
GW = groundwater
HAA = Hunter Army Airfield
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil
SW = surface water

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J+ = The result is an estimated quantity; the result may be biased high.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

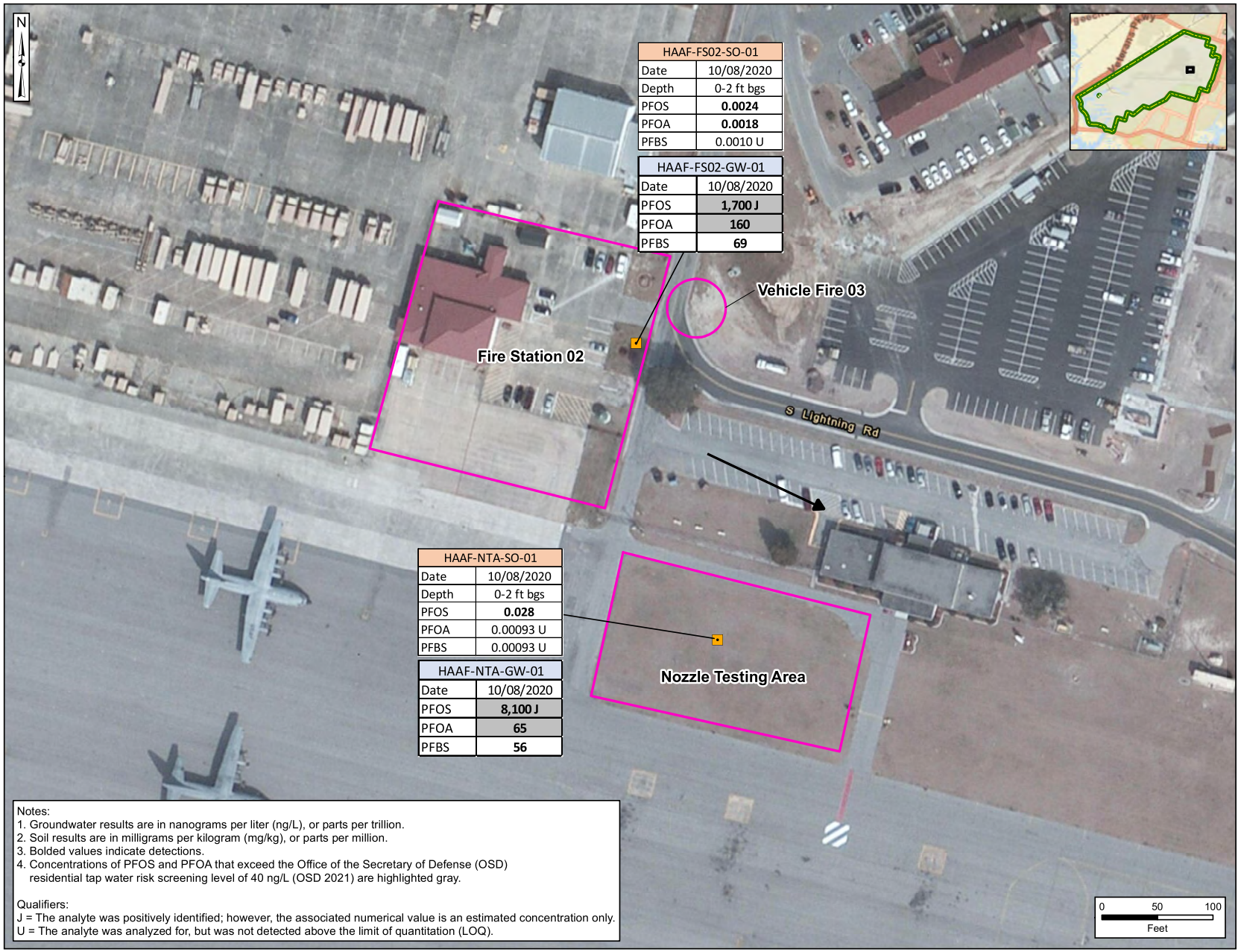
Figure 7-3
Sleepy Hollow FTA
PFOS, PFOA, and PFBS Analytical Results

Legend
- Installation Boundary
- Area of Potential Interest
- River/Stream (Perennial)
- Approximate Groundwater Flow Direction
- Installation Drinking Water Well
- Shallow Soil and Grab Groundwater Sampling Location

FTA = Fire Training Area
ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-4
Fire Station 02, Vehicle Fire 03, and Nozzle Testing Area PFOS, PFOA, and PFBS Analytical Results

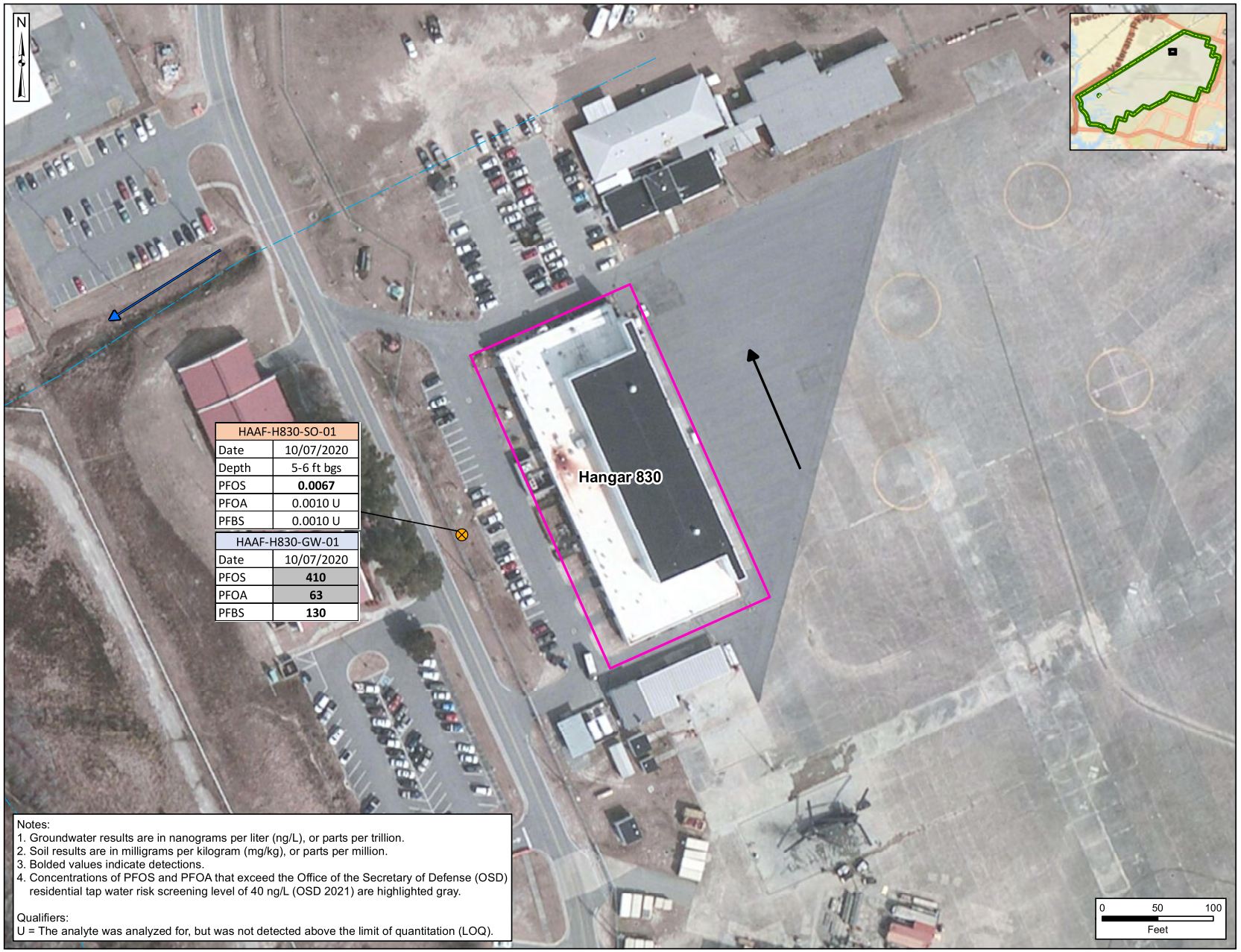
Legend
- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction
- Shallow Soil and Grab Groundwater Sampling Location

Note: The location of Vehicle Fire 03 is estimated.

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-5
Hangar 830
PFOS, PFOA, and PFBS Analytical Results

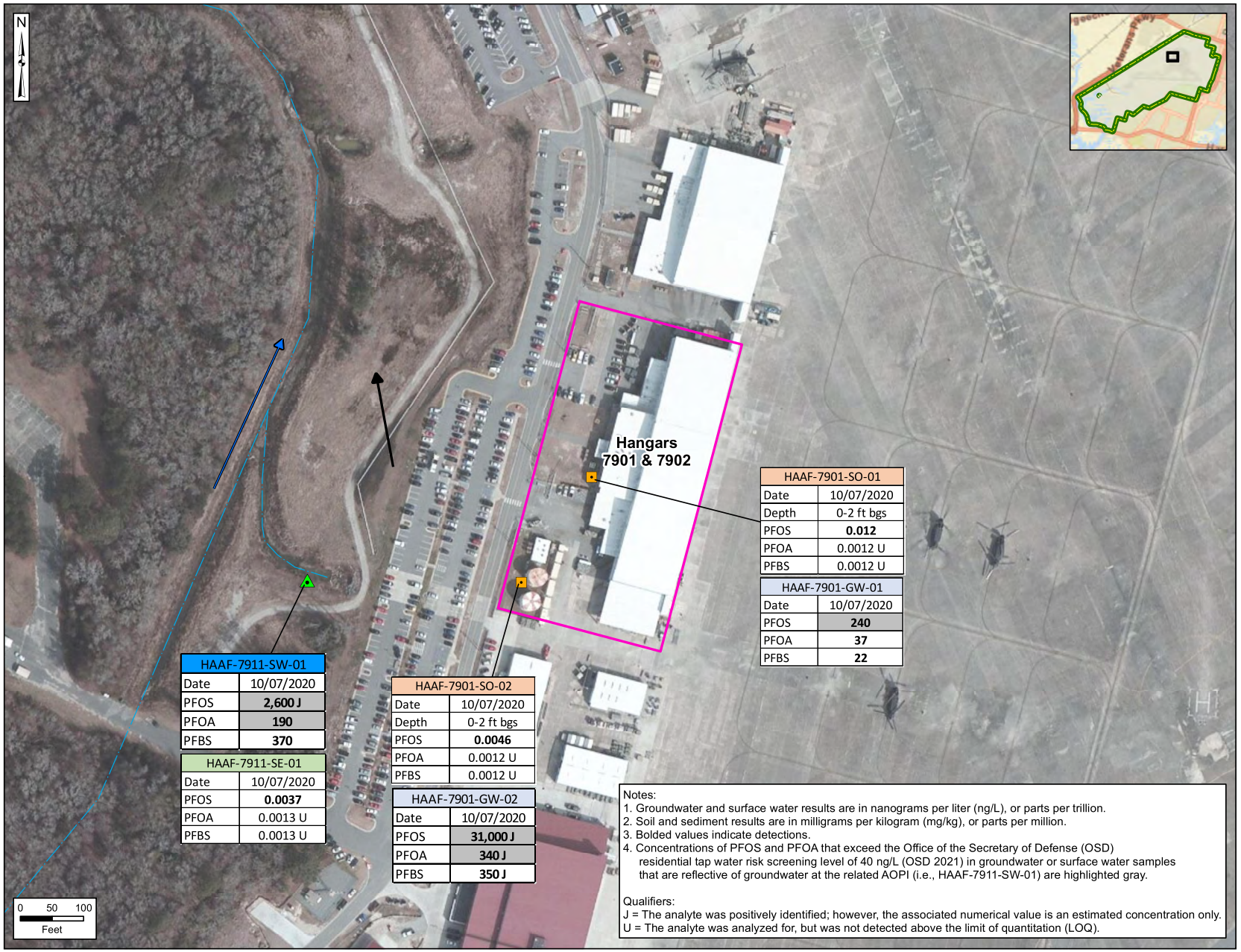
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Subsurface Soil and Grab Groundwater Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil and sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) in groundwater or surface water samples that are reflective of groundwater at the related AOPI (i.e., HAAF-7911-SW-01) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS Preliminary Assessment / Site Inspection Hunter Army Airfield, GA

ARCADIS

Figure 7-6 Hangars 7901 & 7902 PFOS, PFOA, and PFBS Analytical Results

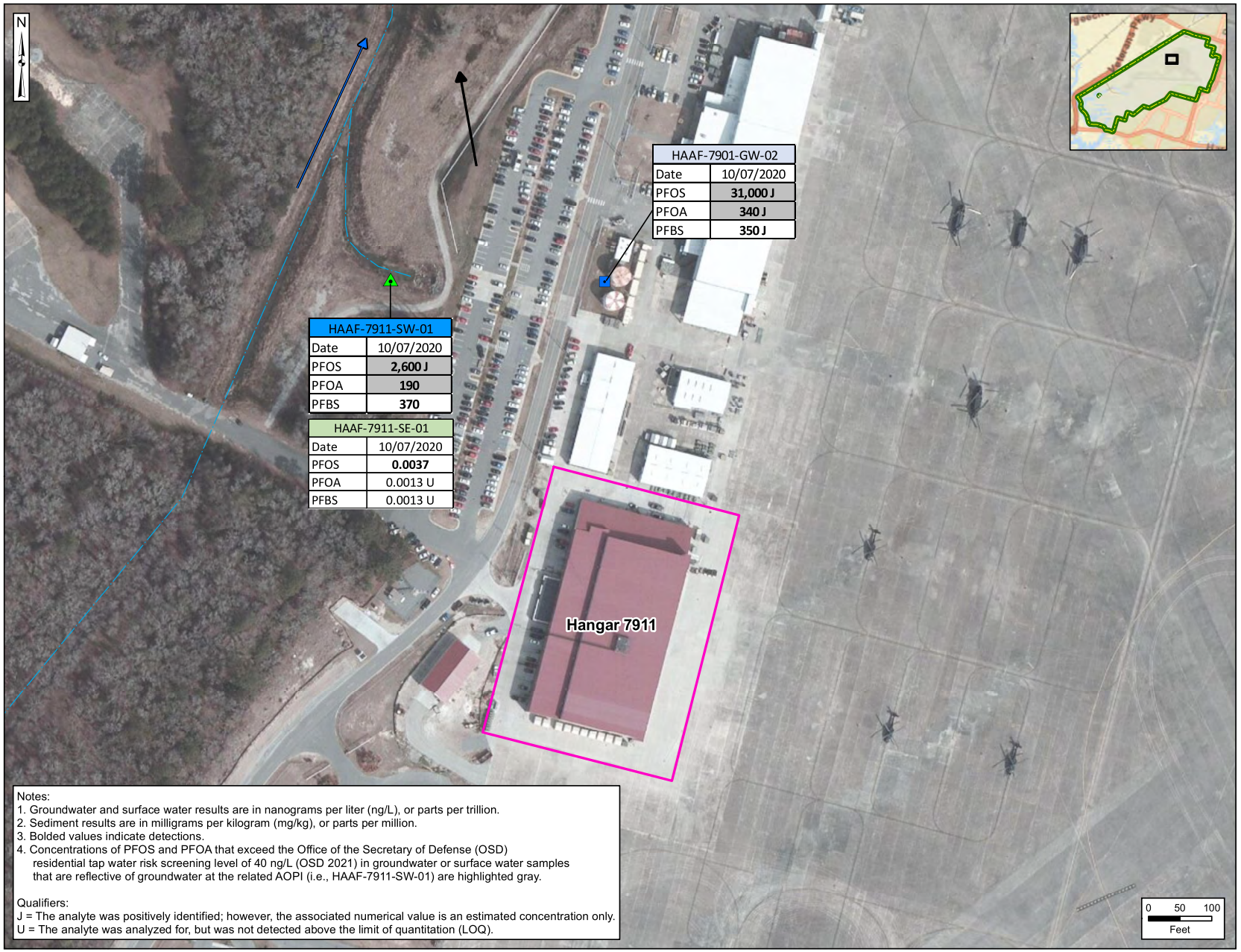
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Shallow Soil and Grab Groundwater Sampling Location
- Surface Water and Sediment Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SE = sediment
SO = soil
SW = surface water

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater and surface water results are in nanograms per liter (ng/L), or parts per trillion.
2. Sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) in groundwater or surface water samples that are reflective of groundwater at the related AOPI (i.e., HAAF-7911-SW-01) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS Preliminary Assessment / Site Inspection Hunter Army Airfield, GA

ARCADIS

Figure 7-7
Hangar 7911
PFOS, PFOA, and PFBS Analytical Results

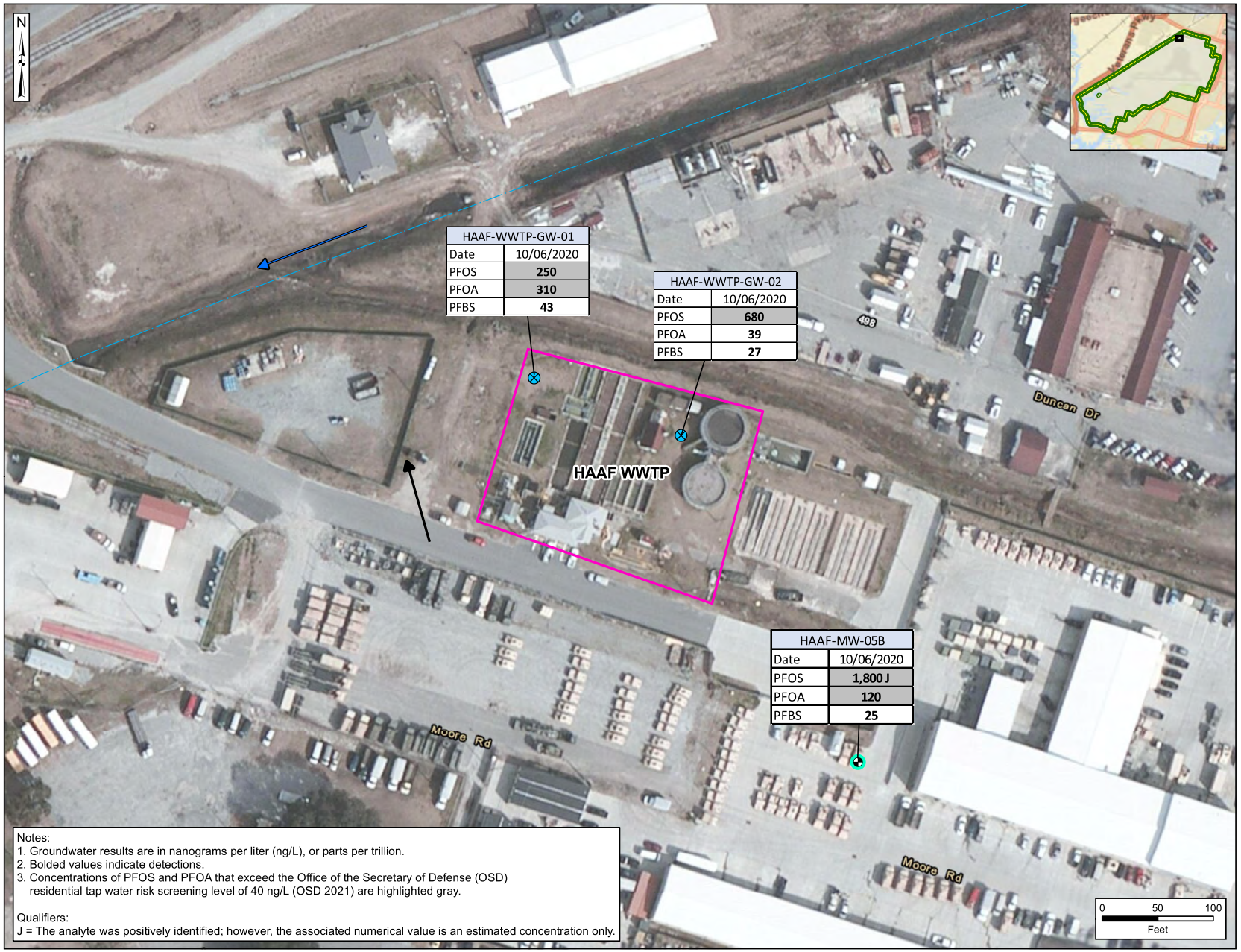
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Surface Water and Sediment Sampling Location
- Grab Groundwater Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SE = sediment
SW = surface water

Data Sources:
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.
3. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-8
HAAF WWTP
PFOS, PFOA, and PFBS Analytical Results

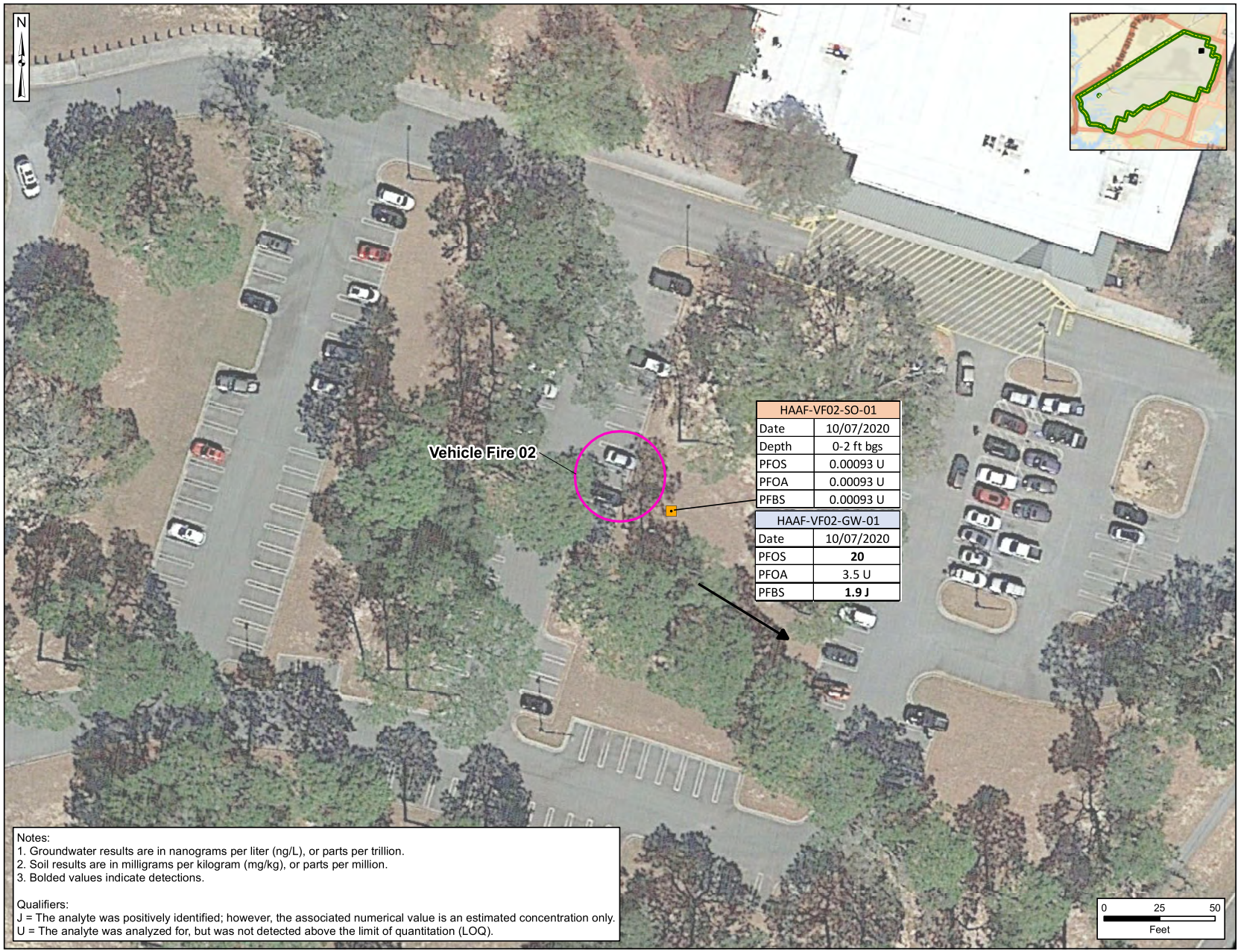
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Monitoring Well
- DPT Groundwater Sampling Location
- Groundwater Sampling Location (Existing Well)

DPT = direct push technology
GW = groundwater
HAAF = Hunter Army Airfield
MW = monitoring well
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
WWTP = Wastewater Treatment Plant

Data Sources:
Fort Stewart, Wells, 2018
USGS, NHD Data, 2019
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-9
Vehicle Fire 02
PFOS, PFOA, and PFBS Analytical Results

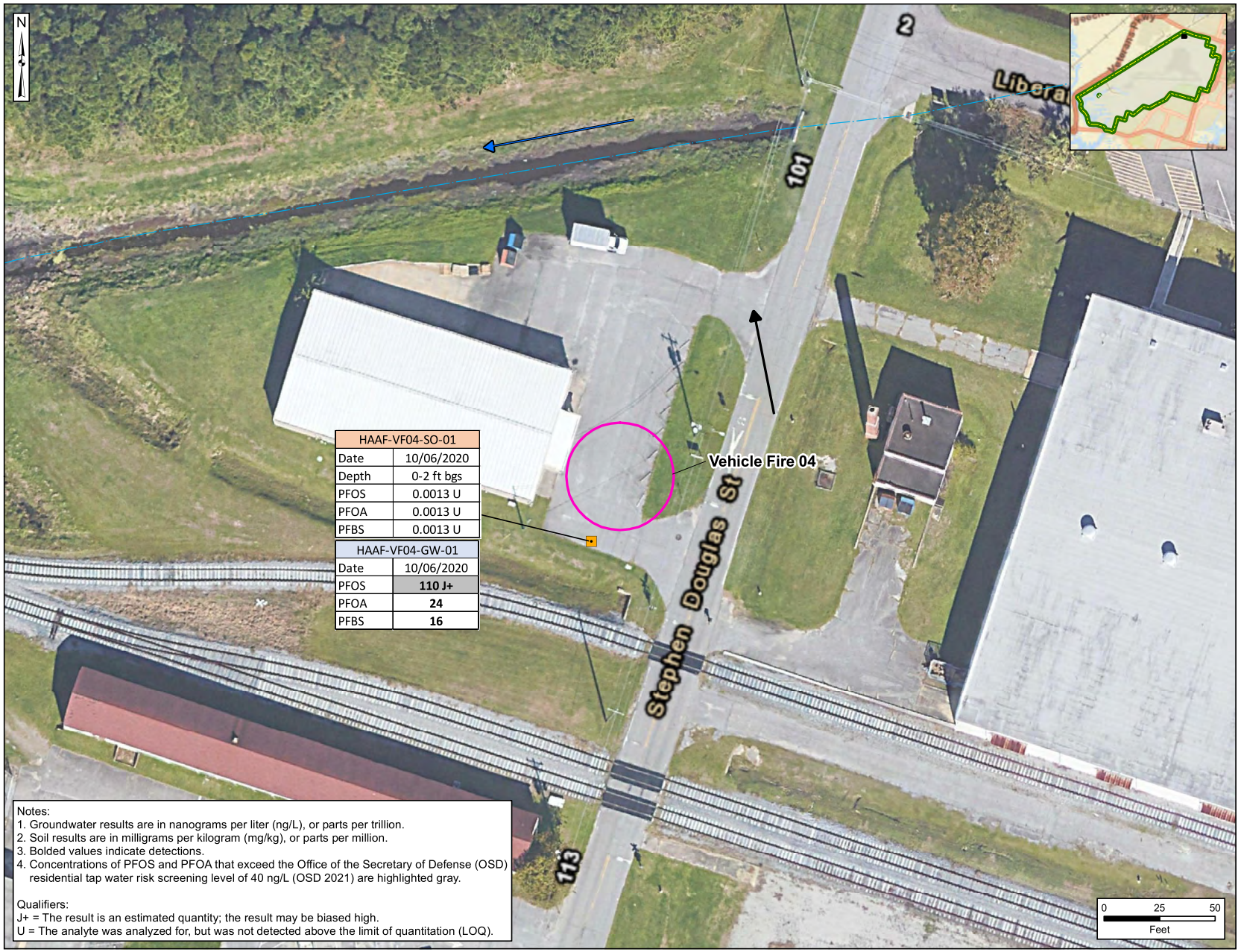
Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction
- Shallow Soil and Grab Groundwater Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
Google Earth, Aerial Imagery, 2018

Coordinate System:
WGS 1984, UTM Zone 17 North



HAAF-VF04-SO-01	
Date	10/06/2020
Depth	0-2 ft bgs
PFOS	0.0013 U
PFOA	0.0013 U
PFBS	0.0013 U

HAAF-VF04-GW-01	
Date	10/06/2020
PFOS	**110 J+**
PFOA	**24**
PFBS	**16**

Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J+ = The result is an estimated quantity; the result may be biased high.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-10
Vehicle Fire 04
PFOS, PFOA, and PFBS Analytical Results

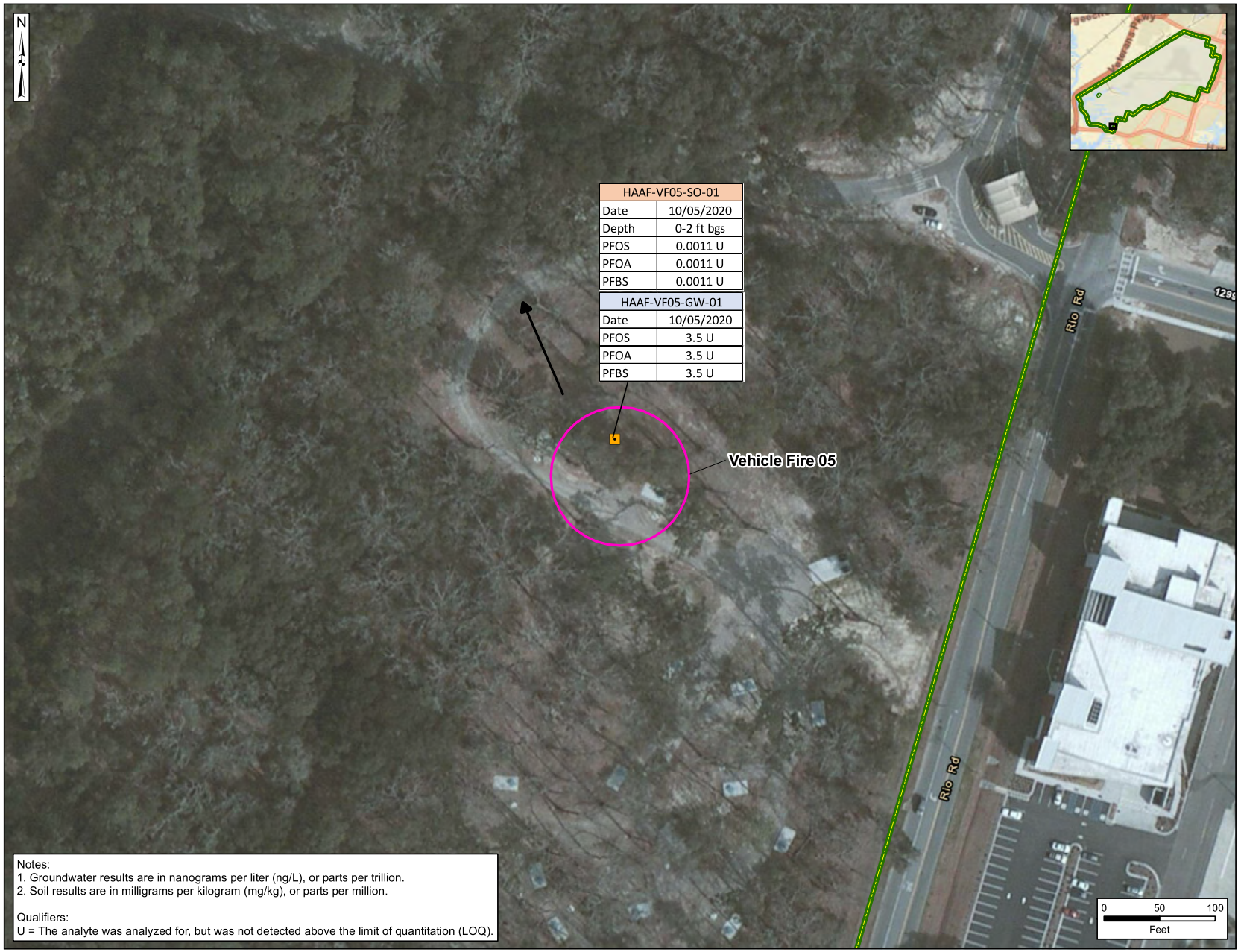
Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Surface Water Flow Direction
- Approximate Groundwater Flow Direction
- Shallow Soil and Grab Groundwater Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
USGS, NHD Data, 2019
Google Earth, Aerial Imagery, 2019

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.

Qualifiers:
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-11
Vehicle Fire 05
PFOS, PFOA, and PFBS Analytical Results

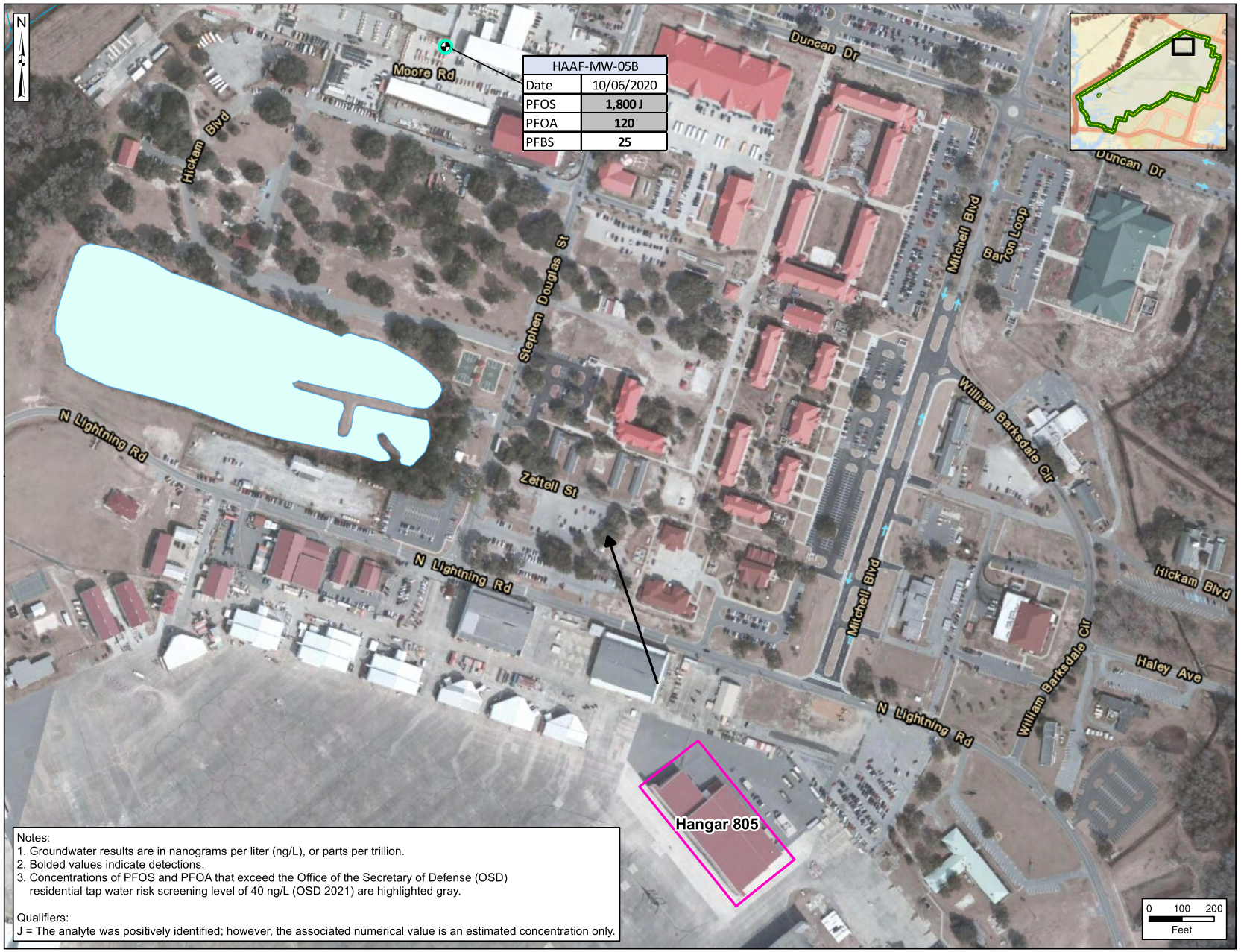
Legend

- Installation Boundary
- Area of Potential Interest
- Approximate Groundwater Flow Direction
- Shallow Soil and Grab Groundwater Sampling Location

ft bgs = feet below ground surface
GW = groundwater
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SO = soil

Data Sources:
USAEC, GIS Data, 2002
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North



Notes:
1. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.
3. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.

USAEC PFAS
Preliminary Assessment / Site Inspection
Hunter Army Airfield, GA

ARCADIS

Figure 7-12
Hangar 805
PFOS, PFOA, and PFBS Analytical Results

Legend

- Installation Boundary
- Area of Potential Interest
- Canal/Ditch
- Water Body
- Approximate Groundwater Flow Direction
- Monitoring Well
- Groundwater Sampling Location (Existing Well)

Data Sources:
USAEC, GIS Data, 2002
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 17 North

Arcadis U.S., Inc.

7550 Teague Road

Suite 210

Hanover, Maryland 21076

Tel 410 987 0032

Fax 410 987 4392

www.arcadis.com