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Ms. Wilamena Harback
Environmental Division Chief
Directorate of Public Works
9430 Jackson Loop, Building 1142
U.S. Army Garrison Fort Belvoir, VA 22060

Subject:
Final Preliminary Assessment/Site Inspection Report for Fort Belvoir, Virginia
Contract No: W912DR-18-D-0004
Delivery Order No: W912DR18F0685

Environment

Date:
13 October 2022

Contact:
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Our ref:
30001992.3DL10

Dear Ms. Harback:

Arcadis U.S., Inc. is pleased to provide the Final Preliminary Assessment/Site Inspection Report for per- and polyfluoroalkyl substances at Fort Belvoir. This document has gone through all the necessary reviews and is considered final. The accepted response to comments matrices from regulatory reviews are provided for reference.

Please call me at 410.332.4836 or Rhonda Stone at 610.563.6122 if you have any questions or comments.

Respectfully,

Afton Hess
Arcadis U.S., Inc.
Site Inspection Project Manager

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

Fort Belvoir, Virginia

Prepared For:
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October 2022

Final Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

Fort Belvoir, Virginia

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Prepared for:
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Contract No.: W912DR-18-D-0004
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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 United States Army Garrison Fort Belvoir (FTBL) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and The National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense policy and guidance.

FTBL is in southeastern Fairfax County, Virginia, approximately 18 miles southwest of Washington, DC and 95 miles north of Richmond, the Virginia state capital. It occupies approximately 8,500 acres comprised of the Main Post (approximately 7,700 acres) and the noncontiguous Fort Belvoir North Area (FBNA; formerly the Engineer Proving Ground) (approximately 804 acres) located 1.5 miles north of the Main Post.

The FTBL PA identified 17 AOPIs for investigation during the SI phase. SI sampling results from the 17 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 and/or groundwater at or downgradient of all 17 AOPIs; 12 of the 17 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. Based on the PA/SI results, the majority of OSD risk screening level exceedances at FTBL can be attributed to historical and present fire station management and firefighter training activity, as well as fire truck maintenance activities. The FTBL 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 FTBL, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SW	
FTBL-66	No	NS	No	No action at this time
FTBL-68	No	NS	NS	No action at this time
Davison Army Airfield Fire Station	Yes	No	NS	Further study in a remedial investigation

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SW	
FTBL-12	Yes	Yes	NS	Further study in a remedial investigation
Building 3121 (Army National Guard Hangar)	Yes	ND	NS	Further study in a remedial investigation
Hangar 3132[1]	Yes[2]	NS	NS	Further study in a remedial investigation
Hangar 3145	Yes[2]	ND	NS	Further study in a remedial investigation
Hangar 3151	Yes	ND	NS	Further study in a remedial investigation
Hangar 3232	Yes	NS	NS	Further study in a remedial investigation
Lewis Village Car Fire	No	ND	NS	No action at this time
Building 707 (Logistics Readiness Center)	Yes	NS	NS	Further study in a remedial investigation
Building 1436 (Logistics Readiness Center)	Yes	No	NS	Further study in a remedial investigation
1980s Plane Crash	No	ND	NS	No action at this time
Old and South Post Fire Stations	Yes	No	NS	Further study in a remedial investigation
North Post Fire Station	Yes	Yes	NS	Further study in a remedial investigation
Fort Belvoir North Area Fire Station	Yes	No	NS	Further study in a remedial investigation
Building 1495	NS[3]	No	NS	No action at this time

Notes:

[1] Hangar 3132 was reclassified as an AOPI after the SI field events (November and December 2020 and March 2021) were completed.

[2] Downgradient surrogate groundwater samples have detected concentration of PFOS and PFOA that exceed the associated OSD tap water risks screening levels.

[3] No groundwater sample was collected because there was no groundwater monitoring well located downgradient of this AOPI and there is no indication from the PA site visit interviews and/or document review that there had been a use of the AFFF-containing fire-suppression system or other PFOS, PFOA, and/or PFBS containing waste stored in Building 1495 to warrant drilling to groundwater and collecting a groundwater sample as part of the SI.

Light gray shading – detection greater than the OSD risk screening level

GW – groundwater

ND – non-detect

NS – not sampled

SO – soil

SW – surface water

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 U.S. Army Garrison Fort Belvoir (FTBL) 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 2018b). 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 FTBL 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 commercial 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. 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 potentially 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 FTBL, PA/SI development followed a similar process as described in **Sections 1.3.1** through **1.3.5** below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for FTBL. The PA and SI processes are documented in the PA/SI Quality Control Checklist included as **Appendix B**.

1.3.1 Pre-Site Visit

An installation kickoff teleconference was held between points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), FTBL, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 22 April 2019, 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 FTBL.

A read-ahead package was prepared and submitted to the appropriate POCs 2 weeks before the site visit. The read-ahead package contained the following information:

- The Installation Management Command (IMCOM) 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 04 to 06 June 2019. 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 FTBL. 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 consisted 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, were also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. Photo documentation of the preliminary locations was collected, and access limitations or advantages related to potential future sampling activities were noted.

An exit briefing was provided 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 exit briefing was conducted on 06 June 2019 with the installation to discuss the areas visited, outstanding data needs, and identified areas of use, storage, and/or disposal of PFAS-containing materials.

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. An SI kickoff teleconference was held between the Army PA team and FTBL on 03 January 2020.

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 (i.e., Virginia Department of Environmental Quality), requirements or preferences,
- identify overlapping unexploded ordnance (UXO) or cultural resource areas,
- discuss the installation's requirements for investigation-derived waste (IDW) handling and disposal,
- discuss whether there are any 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 on 04 March 2020 to obtain concurrence on the SI sampling plan from USAEC, USACE, and the installation. Additional discussion topics included:

- confirming regulatory involvement (Virginia Department of Environmental Quality) requirements or preferences,
- confirming the plan for IDW handling and disposal,
- confirming AOPI-specific access requirements and restrictions,
- 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 FTBL (Arcadis 2020a) in **Sections 6.1** through **6.3**.

Field planning and coordination with the installation and subcontractors was completed after finalization of the QAPP Addendum and SSHP. 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 DoD Environmental Laboratory Accreditation Program (ELAP)-accredited laboratory 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). Environmental samples were shipped to Pace Analytical located in West Columbia, South Carolina for analysis. Laboratory analytical results were validated and verified by a qualified 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 FTBL, 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

FTBL is located in southeastern Fairfax County, Virginia, approximately 18 miles southwest of Washington, D.C and eight miles southwest of the City of Alexandria, Virginia. FTBL is situated near Interstate 95, a primary east-coast transportation corridor (**Figure 2-1** and **Figure 2-2**). The installation occupies approximately 8,500 acres and is comprised of the Main Post (7,700 acres) and Fort Belvoir North Area (FBNA; 804 acres) located approximately 1.5 miles apart. The Main Post is bisected by U.S. Route 1 into the North Post and the South Post/Southwest Training Areas.

2.2 Mission and Brief Site History

In 1912, the installation was established on 1,500-acres as Camp A.A. Humphreys to provide training grounds for Army engineers stationed in the Washington Barracks at Fort McNair. In 1917, Congress approved the official transfer of the U.S. Army Engineer School to the post. Through 1920, an additional 4,800 acres (mainly north of U.S. Route 1) were acquired by the government. In honor of the historic Belvoir plantation, Camp A.A. Humphreys was designated as FTBL by 1935. The installation trained engineers until 1988, when the Engineer School was officially moved to Fort Leonard Wood, Missouri. In 2006, FTBL was transferred from the Military District of Washington to the IMCOM. Under the Base Realignment and Closure Act of 1988, FTBL was developed as the principal administrative, housing, and logistics center of the U.S. Army in the National Capital Region. Under the Base Realignment and Closure Act of 2005, FTBL's on-post military/civilian working population increased from 29,978 to more than 40,000 in 2017 (FTBL 2018).

FTBL's mission is to provide installation base support to enable readiness. FTBL garrison organizations operate and maintain the installation; provide quality installation support and services to its customers; and plan, maintain, and execute mobilization readiness, military operations, and contingency missions. The emphasis of FTBL's mission has shifted from training to providing logistical and administrative support to its tenants since the departure of the Engineer School in 1988 (FTBL 2018).

2.3 Current and Projected Land Use

FTBL functions as an intelligence, medical, community, administrative, operational, family housing, and logistics support center. The installation has over 500 buildings. Military training at FTBL consists of occupation-specific training for the units assigned to the installation. As of 2017, FTBL had a residential population of 7,500, a working population of 40,000, and supported a regional population of approximately 140,000 (FTBL 2018). Projected land use is anticipated to remain consistent with current land use.

Most of FTBL Main Post is undeveloped and extensive areas are forested, particularly in the Southwest Training Areas (approximately 2,100 acres). The South Post area is the most densely developed part of FTBL. However, open space is present throughout the developed area. As of 2017, only 16 percent (%) of the installation is covered by impervious surfaces (FTBL 2018).

The western half of FBNA is primarily undeveloped and forested. Mission-related and administrative buildings are present on the eastern half of FBNA. There is no residential housing at FBNA.

2.4 Climate

Virginia is classified as a “Moist Mid-Latitude Climate”, subtype “Humid Subtropical” by the Köppen Climate Classification System. This climate subtype is characterized by mild winters and hot, humid summers with the absence of an annual dry season. The average annual temperature for the region (data provided for Alexandria, Virginia) is approximately 65.8 degrees Fahrenheit with the coldest average monthly temperatures in January (approximately 35 degrees Fahrenheit) with the warmest average monthly temperatures in July (approximately 78 degrees Fahrenheit) (Climate-Data.org 2021). However, average high temperatures in the summer months often exceed 85 degrees Fahrenheit, and late-afternoon rain/thunderstorms are common. The annual average rainfall is approximately 42 inches. Precipitation is fairly evenly distributed across the months with February and November averaging the least precipitation (approximately 2.8 inches) and September the most precipitation (approximately 4.1 inches) (Climate-Data.org 2021).

Storm systems generally move from west to east across the state but may also approach from the southwest paralleling the coast and the Gulf Stream. Precipitation from these storms tends to be greater in the mountain areas (to the west of FTBL) than in the eastern part of Virginia (National Oceanic and Atmospheric Administration 2010).

2.5 Topography

The Main Post portion of the installation is located on a peninsula between Gunston Cove and the Potomac River (Plexus Scientific Corporation [Plexus] 2021). The ground-surface elevation across the Main Post portion varies from approximately sea level along the Potomac River to approximately 230 feet above mean sea level near the intersection of Beulah Street and Woodland Road in the northern portion of Main Post and 240 feet above mean sea level in FBNA (**Figure 2-3**). Much of the inland portion of FTBL-South Post is dominated by uplands and plateaus. From the upland areas, the ground surface slopes steeply either towards gently sloped lowlands or directly into the Potomac River, Pohick Bay, or Accotink Bay (Malcolm Pirnie, Inc. 2008).

FBNA is an approximately 804-acre area of land bisected by the southward-flowing Accotink Creek. The majority of FBNA has a gently rolling topography, cut by steep slopes associated with the narrow stream valley of Accotink Creek. Land elevations across FBNA are approximately between 150 and 300 feet above mean sea level (Dewberry and Davis, LLC 2002).

2.6 Geology

FTBL spans the eastern part of the Piedmont Province and the upper (western) part of the Atlantic Coastal Plain Province (from west to east) and, as such, exhibits characteristics of both provinces. The Fall Line, which runs north to south through Virginia, and bisects Fairfax County at approximately the Interstate-95 corridor, is a physiographic barrier between the resistant, igneous, and metamorphic rock of the Piedmont (approximately the western half of the county) and the softer sediments and sedimentary rocks of the Atlantic Coastal Plain Province (approximately the eastern half of the county) (FTBL 2018, Plexus 2021).

The Atlantic Coastal Plain Province in the vicinity of FTBL is comprised of several geologic formations, including the Potomac Formation, Bacons Castle Formation, and Shirley Formation. These formations are characterized by unconsolidated sand, silt, and clay underlain by residual soil and weathered crystalline rocks. The majority of FTBL (Main Post) is underlain by the Potomac Formation of the Coastal Plain Province. The Potomac Formation is characterized by lens-shaped deposits of interbedded sand, silt, clay, and gravel primarily of nonmarine origin (FTBL 2018).

The Fall Line is irregular and, as a result, FBNA is underlain by rock formations from both the Piedmont Province and the Atlantic Coastal Plain Province (TriEco Tetra Tech, Joint Venture. 2019). A finger of Piedmont Upland Province bedrock extends from north to south along Accotink Creek. The geology of the Piedmont Plateau Province is characterized by hard, crystalline, igneous and metamorphic formations with some areas of sedimentary rocks and with saprolite deposits overlying the bedrock (FTBL 2018). Piedmont Province bedrock outcrops along Accotink Creek form the bed and adjacent slopes of the creek. Most of the more gently sloping areas to the east and west of the creek consist of unconsolidated deposits from the Atlantic Coastal Plain Province (FTBL 2018).

2.7 Hydrogeology

FTBL is located within the Northern Atlantic Coastal Plain aquifer system. There are several aquifers of the Northern Atlantic Coastal Plain aquifer system located in the region, but only the Potomac Aquifer underlies Fort Belvoir (Plexus 2021). The Potomac Aquifer is found within unconsolidated gravel and sand of the lower Potomac Formation and the Potomac Formation aquifers consist of unconsolidated sediments characteristic of the Atlantic Coastal Plain Province (Shaw 2012, Plexus 2021). The Potomac Aquifer is comprised of three separate aquifers: Lower Potomac, Middle Potomac, and the Bacons Castle Formation.

The Bacons Castle Formation is the shallowest aquifer of the three, and it consists of gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay. These sand, gravel, silt, and clay of the Bacon's Castle Formation are subdivided into two members: Tb1, massive to thick-bedded pebble and cobble gravel grading upward into cross-bedded, pebbly sand and sandy and clayey silt, and Tb2, predominantly thin-bedded and laminated clayey silt and silty fine-grained sand (Plexus 2021). The Bacon's Castle Formation is recharged from and discharges to water bodies on the installation. The water table in the Main Post lies approximately 10 to 35 feet below ground surface (bgs), except within and directly adjoining wetland and floodplain areas.

The Middle Potomac aquifer is situated below the Bacons Castle aquifer and consists of interbedded lenses of differing thicknesses of sand, silt, and clay. However, its confining unit is not present beneath the installation(Shaw 2012, Plexus 2021).

The Lower Potomac aquifer, the primary aquifer in eastern Fairfax County, underlies the Bacons Castle Formation and contains potable water. The aquifer is approximately 100 feet thick at and in the vicinity of FTBL and is located approximately 100 feet bgs in the Main Post area (Shaw 2012). The aquifer lies between a clay wedge containing sandy clays and interbedded layers of sand, and crystalline bedrock (Shaw 2021, Plexus 2021). The aquifer is recharged by surface infiltration north and west of FTBL, and regional flow is to the southeast (Shaw 2012, Plexus 2021).

The water-bearing zone at FTBL historically is encountered at approximately 97 to 102 feet bgs, and the depth to bedrock is greater than 250 feet bgs (Plexus 2021). The surficial aquifer (water-table aquifer), where it is present, receives recharge from and discharges to surface drainage channels on the installation. The water table and shallow groundwater flow patterns are generally assumed to follow surficial water drainage/topography. However, local groundwater flow patterns could be affected by the heterogeneous nature of the unconsolidated fluvial, deltaic deposits (Shaw 2012, Plexus 2021). Groundwater may become perched in lenses within the unconsolidated Coastal Plain Province sediments (TriEco Tetra Tech, Joint Venture 2019). Some areas of FTBL have perched, very shallow water tables (e.g., 2 to 4 feet bgs) resulting from groundwater trapped in strata overlying impermeable clays (Shaw 2012).

2.8 Surface Water Hydrology

FTBL is located within the Lower Potomac River watershed, a sub watershed of the greater Chesapeake Bay watershed. Most water resources found in this region exhibit characteristics of the upper Coastal Plain and lower Piedmont with resources typically occurring within a drainage network. The larger tributaries to the Potomac River at FTBL are Accotink Creek, Dogue Creek, and Pohick Creek, and they tend to have wide areas of tidal wetlands (marsh and mudflats) at their outfalls. Surface water flow is towards the Potomac River, either directly or via its tributaries in the Pohick Creek Watershed, Accotink Creek Watershed, or the Dogue Creek Watershed (AECOM Technical Services, Inc. [AECOM] 2020). Upstream from the mouths of these tributaries, the marsh wetland habitats transition to a floodplain/bottomland hardwood forest ecosystem within a riparian zone. This forested area tends to be wider in the lower reaches where the tidally influenced floodplain spreads over the wide and low topography and diminishes in extent further upstream concurrent with the narrowing of the floodplain. This narrowing of the floodplain results in a concentration of numerous water resources. Further upstream, smaller headwater streams and seeps occur. FTBL is located on the western shore of the Potomac River, approximately 75 miles upstream of the Chesapeake Bay. The installation has more than 12 miles of freshwater shoreline, 1,085 acres of wetland areas, and 5,396 acres of forested areas (FTBL 2018).

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 FTBL.

2.9.1 Stormwater Management System Description

FTBL owns and operates a stormwater sewer system that consists of closed and open drainage and is managed primarily by stormwater best management practice controls (FTBL 2018).

On FBNA, there are storm culverts and open drainages primarily in locations that are not occupied by built structures and all along the western boundary. There are underground storm lines that drain stormwater away from the built structures located in the approximate center of FBNA as well as near the southeastern boundary. Underground stormwater lines are also located along or under some of the FBNA roads and major roadways bordering FBNA, including Interstate-95.

On the Main Post, open drainages and stormwater culverts are primarily located on the periphery of built areas, draining or channeling stormwater runoff into adjacent forested areas or to natural drainage features and, for culverts, under roadways. There are also open drainages present to the western, undeveloped portion of the Main Post. Underground storm lines are present throughout the developed portions of the Main Post directing stormwater runoff away from buildings, parking lots, and roadways. In many locations, these stormwater lines join up with open drainages.

For both FBNA and the Main Post, runoff that does not infiltrate is directed to the Potomac River from Accotink Creek, Pohick Creek, Dogue Creek, or one of the many other small water drainage features.

2.9.2 Sewer System Description

Treatment of raw sewage on FTBL was discontinued in 1980. FTBL purchases sanitary sewer treatment services from Fairfax County's Noman M. Cole, Jr. Pollution Control Plant, located on the southwestern Main Post boundary. The Noman M. Cole, Jr. Pollution Control Plant discharges treated effluent to Pohick Creek, which flows to Pohick Bay on the Potomac River. Prior to 1980, FTBL operated two treatment facilities, one on Dogue Creek and the other on Gunston Cove; they now operate as the main pumping stations (FTBL 2018).

There are almost 44 miles of sanitary sewer main and 47 sewer lift stations at FTBL. Most of the sanitary sewer system on FTBL is owned and operated by American Water under a 50-year Utilities Privatization contract awarded in 2009 to provide water and wastewater infrastructure services. Following award of the Utilities Privatization contract in 2009, American Water completed several system upgrades, including replacing or relining 12.7 miles of inadequate or failing sewer pipes (FTBL 2018).

Those portions of the sanitary sewer system not owned and operated by American Water as part of this contract remain under government control. The government also owns and operates a septic tank without a septic field at the Golf Course Maintenance Facility (FTBL 2018).

2.10 Potable Water Supply and Drinking Water Receptors

FTBL purchases potable water from the Fairfax County Water Authority (Fairfax Water), which operates two water treatment facilities in Fairfax County (the James J. Corbalis, Jr. treatment plant at the northern tip of Fairfax County in Herndon and the Frederick P. Griffith, Jr. treatment plant at the southern border of Fairfax County in Lorton). Water distributed to FTBL is sourced from surface water intakes on the Occoquan Reservoir and Potomac River (Fairfax Water 2021). These surface water intakes are more than 5 miles away from FTBL. There are no on-post water-treatment facilities or groundwater wells supplying potable water at FTBL. FTBL has a land-use control in place that prohibits use of on-post groundwater as a potable water source. However, groundwater is used to irrigate the FTBL golf course (North Post Golf Course) via wells located at the golf course. Historically, there was a well at the FTBL Horse Barn (Old Guard/Caisson Stables) that was used to supply water to the horses. The Horse Barn is located in the southwest training area south of Richmond Highway/U.S. Route 1 and east of Old Colchester Road/Virginia State Route 611. However, the Horse Barn has used water provided by Fairfax Water (public water supply) since at least 2012 when a water line was installed at the Horse Barn and connected to the public water supply by drilling a connection under U.S. Route 1.

Approximately half of the water distribution system on the Main Post is owned and operated by American Water under the same Utilities Privatization contract referenced above where American Water owns and operates the majority of FTBL's sanitary sewer system. The four wells used for irrigation at the on-post golf course, water assets (drinking water distribution pipes) installed by the Base Realignment and Closure Division between 2009 and 2013, in some housing areas, and at FBNA are under government control (FTBL 2018). Regardless of ownership, drinking water is sourced from Fairfax Water.

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 FTBL and identifies several off-post wells within a 5-mile radius of the installation. The EDR data, along with state and county GIS data provided by the installation and via a 2020 Freedom of Information Act request to the Virginia Department of Environmental Quality, identified several off-post public and private wells, as well as other well types, within 5 miles of the installation boundary (**Figure 2-4**). The EDR report providing the well search results is provided as **Appendix E**. The EDR report did not identify any privately-owned water wells downgradient of any of the identified AOPIs. It must be noted that the EDR report does not capture private wells surrounding FTBL as these wells are not catalogued and managed in an electronic database. One off-post installation well (identified as public water system well VA6059450, "Fort Belvoir-Environmental Off") was identified in the EDR report (Appendix E) as being located downgradient of FBNA and upgradient of the Main Post. However, this "well" is not a well. It is an installation public water supply sampling port operated by American Water. Several potential privately-owned wells were identified downstream of FTBL along the Potomac River and potentially across the river from FTBL. An assessment of the drinking water sources utilized by the downstream municipal water providers in Prince William County, Virginia, and Charles County, Maryland, indicated that there are no known off-installation public drinking water system wells or surface water intakes for drinking water located downgradient of or downstream from (including the Potomac River) any of the identified AOPIs (Fairfax Water 2021; Prince William County Service Authority 2021; Charles County, Maryland 2020; WSSC Water 2019). No assessment was made of wells identified downstream of FTBL to determine their use, whether they are active, and if they have been assessed for PFAS.

2.11 Ecological Receptors

The PA team obtained 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.

Native vegetation in terms of size, diversity, and position at FTBL is significant when compared to the surrounding off-installation areas (FTBL 2018). The majority of FTBL is undeveloped and extensive areas are forested, particularly in the Southwest Training Areas. There are four general habitat types found at FTBL: forested wetland, upland forest, open grassland, and early successional scrub-shrub (FTBL 2018). These habitats are home to 43 species of mammals, 278 species of birds, 32 species of reptiles, 27 species of amphibians (12 frogs, three toads and 12 salamanders) and 65 species of fish (FTBL 2018).

FTBL utilizes an ecosystem approach for managing species and their habitats (FTBL 2018). This ecological approach uses indicator species to monitor and measure environmental conditions. FTBL selected four species of birds to serve as "indicator species" for its fish and wildlife conservation efforts: prothonotary warbler (*Protonotaria citrea*), wood thrush (*Hylocichla mustelina*), grasshopper sparrow (*Ammodramus savannarum*), and prairie warbler (*Setophaga discolor*) (FTBL 2018). There is one federal threatened species (northern long-eared bat [*Myotis septentrionalis*]), two state endangered species (little brown bat [*Myotis lucificus*] and tricolored bat [*Perimyotis subflavis*]), and three state threatened species (northern long-eared bat, wood turtle [*Glyptemys insculpta*], and peregrine falcon [*Falco peregrinus*]) found at FTBL (FTBL 2018).

2.12 Previous PFAS Investigations

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

In response to the third Unregulated Contaminant Monitoring Rule (UCMR3), sampling was conducted in October 2013 on the post-treatment drinking water purchased by FTBL from Fairfax Water at a drinking water sampling port near the intersection of Telegraph and Beulah Roads and at the point of entry for the water distribution system at the two water treatment facilities. PFOS and PFOA were not detected at or above the minimum reportable level (40 ng/L and 20 ng/L, respectively) in any of the samples (analytical method is unknown; Army 2018a). Subsequent UCMR3 samples were collected from the drinking water sampling port near the intersection of Telegraph and Beulah Roads in April, July, and October 2014 and in January 2015 and analyzed for PFBS, perfluoroheptanoic acid, perfluorohexanesulfonic acid, perfluorononanoic acid, PFOS, and PFOA. None of these chemicals was detected at or above the minimum reportable levels (analytical method[s] is unknown; American Water Works 2016). The laboratory(ies) which analyzed samples under UCMR3 met the USEPA's UCMR3 Laboratory Approval Program application and Proficiency Testing criteria for USEPA Method 537 Version 1.1. The sampling results are presented in **Table 2-1**. As previously discussed in **Section 2.10**, water distributed to FTBL is sourced from surface water intakes on the Occoquan Reservoir and Potomac River, both of which are upstream of and more than 5 miles away from FTBL.

PFAS compounds were detected in samples collected from five monitoring wells within the boundary of the FTBL-66 AOPI during groundwater sampling as part of an information gap investigation in January

2017 (these five wells are highlighted on **Figure 7-2** and the sampling results are presented in **Table 2-1**). The maximum detected concentrations of PFOS, PFOA, and PFBS were 8 ng/L, 12 ng/L, and 5 ng/L, respectively (TriEco Tetra Tech, Joint Venture 2019). These samples were analyzed using USEPA Method 537, Revision 1.1. These results are below the OSD risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) of 40 ng/L, 40 ng/L, and 600 ng/L, respectively.

UCMR3 results for off-post wells within a 5-mile radius of FTBL indicate a single PFAS compound (perfluoroheptanoic acid) was detected at a concentration of 12 ng/L in a sample collected on 17 November 2014. This sample was collected from a surface drinking water source for the Prince William County Service Authority. Prince William County Service Authority provides drinking water to residents and businesses in three zip codes (22125, 22191, and 22192) located within a 5-mile radius of FTBL and in Prince William County to the west and southwest of FTBL. The source for drinking water provided by the Prince William County Service Authority to residents and businesses in these three zip codes is the Occoquan Reservoir (Prince William County Service Authority 2021). The Occoquan Reservoir is located more than 5 miles away from and upgradient of FTBL and is one of the two sources of drinking water provided to FTBL by Fairfax Water. Other than to the south, west, and northwest of the three zip codes identified above with a detection, the USEPA UCMR3 data indicate that PFOS and/or PFOA were not detected in Virginia public water systems above the USEPA lifetime health advisory within a 20-mile radius of the installation.

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 FTBL, data were 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 photos (**Appendix H**) and site reconnaissance logs (**Appendix I**) during the PA process for FTBL 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, FTBL Fire Department documents, FTBL Directorate of Public Works (DPW) 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 FTBL is provided in **Appendix F**.

3.2 Personnel Interviews

All interviews were conducted during the site visit. Additional correspondence may have taken place with some of the interviewees via e-mail or phone after the site visit to obtain clarification or additional documentation.

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

- Environmental Chief, DPW - Environmental
- Environmental Compliance Chief, DPW - Environmental
- Wastewater, Drinking Water Coordinator, DPW - Environmental
- Restoration - Military Munitions Response Program Manager, DPW - Environmental
- Restoration - IRP Manager, DPW - Environmental
- IRP/ Military Munitions Response Program Support Contractor, DPW - Environmental

- Spill Response Manager, DPW - Environmental
- Pesticide/Herbicide Manager, DPW - Environmental
- Airfield Safety Manager, Davison Army Airfield (DAAF)
- Historian, DAAF
- Deputy Fire Chief, FTBL Fire Department
- Assistant Fire Chief, FTBL Fire Department
- Fire Chief/Fire Training Coordinator, FTBL Fire Department
- Maintenance Supervisor, Logistics Readiness Center (LRC)
- Coordinator, Research, Development, and Engineering Command
- Coordinator, Aerospace Data Facility – East
- General Engineer, U.S. Army Aviation Brigade
- Fire Marshal, FTBL Fire Department

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 FTBL during the records review process, the installation in-brief meeting, and/or during the installation personnel interviews. A photo log from the site reconnaissance is provided in **Appendix H**; photos were used to assist in verification of qualitative data collected in the field. The site reconnaissance logs are provided in **Appendix I**.

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

FTBL was evaluated for 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% 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, within aircraft rescue and firefighting engine (on vehicle) tanks, or at firehouses.

FTBL has four current fire stations (DAAF Fire Station, South Post Fire Station, FBNA Fire Station, and North Post Fire Station) and one former fire station (Old South Post Fire Station). FTBL Fire Department staff indicated during site visit interviews that the FTBL fire department uses 3% and/or 6% alcohol resistant AFFF and C-8 Ansulite® 3% AFFF in their fire engines. While the fire stations do not keep additional stores of AFFF within the stations as a matter of practice, there occasionally may be one or two 5-gallon buckets of AFFF stored in a fire station bay to refill the engine reservoirs. There are no documented spills; however, incidental spills are likely. There is also the possibility of AFFF tank leaks to the bay floor. The FTBL Fire Department currently performs nozzle testing with water only and performs no training with AFFF at the fire stations. However, it is likely that AFFF historically was used in training and/or equipment testing activities at some of the fire stations – particularly at the DAAF Fire Station and the former Old South Post Fire Station, since their operation start dates are unknown.

Fire-training activities with AFFF are known to have taken place in two locations at FTBL: FTBL-66 and FTBL-12. FTBL-66 (IRP identification [ID] FTBL-66; Headquarters Army Environmental System [HQAES] 51105.1070) is comprised of several designated former fire training areas (FTAs) and was used in the 1960s. The extent of firefighter training activities, media used, and the amounts of AFFF use are unknown. FTBL Fire Department personnel reported during the PA site visit interview that carbon tetrachloride was used as a flame suppressant, but it is possible that fluorosurfactant-containing protein foam or AFFF was also used. The FTBL-12 (Fire Fighting Training/Burn Area; IRP ID FTBL-12/HQAES ID: 51105.1011) FTA is located behind (south of) the DAAF Fire Station. The FTBL-12 FTA has been in operation since the 1940s and FTBL Fire Department personnel stated that AFFF was used here

historically. Current FTBL Fire Department training procedures call for using only water. Fires are started with Class A materials (pallets/straw), and water is used to put them out. However, fire engines with AFFF reservoirs are used during training, and accidental uses of AFFF have occurred. It was reported during the PA site visit that fire training with water occurs annually at the end of the DAAF runway.

There are five hangars at DAAF that have fire-suppression systems that utilize AFFF: Hangar 3132, Hangar 3145, Hangar 3151, Hangar 3232, and Building 3121 (Army National Guard [ARNG] Hangar). Hangar 3140 has a fire-suppression system that utilizes a high-expansion foam (Jet-Ex) that does not contain PFAS. The Jet-Ex fire-suppression system was installed in approximately 2011. Prior to its installation, Hangar 3140 was equipped with a water deluge only fire-suppression system (FTBL 2022). Jet-Ex is a newer type of non-PFAS-containing high-expansion foam. Building 1495, the hazardous waste 90-day storage facility, also has a fire-suppression system that utilizes AFFF.

All FTBL Fire Department AFFF stock that is not in fire engine AFFF reservoirs is stored in Building 1436 (LRC) in 55-gallon drums (Ansulite® 3% AFFF [Ansul 2010] and Chemguard 3% AFFF were identified during the PA site visit). However, occasionally there may be 5-gallon buckets of AFFF stored within fire station bays to top off the AFFF reservoirs in the fire engines. It was reported by the FTBL Environmental Chief in the IMCOM AFFF Inventory record dated 07 November 2017 that FTBL has a total AFFF inventory of somewhere between 440 and 500 gallons (Army 2017). A small amount (less than 1 gallon) of heat-resistant, PFAS-containing lubricants are kept within Building 1436 (LRC). These include "AST-RV silicon adhesive/instant gasket Hi temp red" and “TFE pipe thread sealant with PTFE.” Fire engine AFFF reservoir refilling occurs mainly at Building 1436 (LRC), but buckets may occasionally be brought back to a fire station to refill an engine reservoir.

Fire engine maintenance has been conducted at Building 1436 (LRC) since 2014. Prior to 2014, fire engine maintenance took place at Building 707 (LRC). Building 707 has been undergoing renovation since 2014 and was still undergoing renovation during the June 2019 PA site visit. The current status of the Building 707 (LRC) renovation is unknown. Fire engine maintenance activities are anticipated to transfer back to Building 707 once its renovation is complete. Fire engine maintenance activities include cleaning out the AFFF reservoir and associated piping whenever the AFFF solidified in the tank and, more recently, cleaning out the AFFF reservoir tank(s) on each engine every 3 years to prevent it from solidifying in the tank(s). Prior to 2014, nozzle testing was conducted at Building 707; however, no nozzle testing has been conducted since 2014. No spills of AFFF are known/recorded to have occurred at Building 707 (LRC); there are two known spills of AFFF at Building 1436 (LRC) in 2017.

There are two documented on-post firefighting responses and a likely third on-post firefighting response: FTBL-68, the 1980s plane crash, and the Lewis Village Car Fire. The general FTBL-68 (IRP ID FTBL-68/HQAES 51105.1072) area was the site of a petroleum fire in 1968 that destroyed an overpass and burned several acres. The source of the petroleum release was a large volume storage tank on the FBNA that was reported to have been ignited beneath an overpass. The precise location of the fire is not documented. The type of foam and amount used to extinguish the fire is unknown. Due to the period of use, it is possible that either animal protein foam containing PFAS or AFFF was used. In 1983 or 1984, a plane crashed at the southeast end of the DAAF runway, north of U.S. Route 1 (the runway at the time was shorter than the current runway) as reported by the FTBL DAAF historian during the PA site visit interview. It is suspected that a fuel fire accompanied this plane crash and, therefore, the fire response most likely included use of AFFF. The Lewis Village Car Fire occurred when a car hit a non-

polychlorinated biphenyl mineral fuel transformer behind a townhouse and caught fire on 27 April 2019. Approximately 5 to 10 gallons of AFFF along with approximately 250 gallons of water were discharged during this firefighting activity (Fort Belvoir 2019c).

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

Following document research, personnel interviews, and site reconnaissance at FTBL, metal plating operations, pesticide management areas, photo-processing areas, commercial car wash facilities, wastewater treatment plants, landfills/dumps, and stormwater management conveyances were also identified as preliminary locations for use, storage, and/or disposal of PFAS-containing materials. 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**.

Potential PFAS use associated with metal plating activities may also be relevant to Army installations. During metal plating operations, a metal surface may be treated with a layer of electrochemically deposited metals in an acid bath. PFAS, specifically PFOS, have been used in metal plating operations as surface tension-reducing wetting agents to mitigate the release of aerosolized chemicals into a working environment. Hard chromium plating is one type of metal plating operation where PFAS-containing mist suppressants were commonly used. Historically, it was common for spent plating baths from metal plating operations to be disposed of in a lined or unlined pit or into a sanitary or storm sewer. Therefore, PFAS present in mist suppressants during the metal plating process could be released to the environment. Electroplating activities were conducted for 20 years from approximately 1960 until 1980 at FTBL in Building 363, Room B114. Electroplating operations ceased before PFAS-containing mist suppressants (for chrome plating) started being used. The use of PFAS-containing mist suppressants during plating activities was uncommon before the mid-1990s.

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 and insecticides used at and/or stored at Army installations and did not identify FTBL 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 (Fort Belvoir 2019a). According to installation personnel, FTBL's available pesticide-related records go back to 2010. There are eight identified current and historical buildings used for mixing and/or storing pesticides or cleaning out the associated equipment and containers.

Five current and historical buildings were identified as being used for photo processing and four current and historical buildings were identified as having x-ray processing laboratories. It is not known whether PFAS-containing materials were historically utilized to process the photos/x-ray films.

PFAS-containing materials or wastes requiring disposal are stored in Building 1495, a hazardous waste 90-day storage facility, prior to removal and disposal off installation.

There is a current commercial car wash (MRW car wash, Building 2318) present at FTBL (the year it began operation is not known) and one known, historical commercial car wash (Building 187) that began

operation in 1982 (the year operation ceased is not known). The PA team obtained six safety data sheets (SDSs) for the chemicals used in the current commercial car wash. All six SDS list a "proprietary surfactant blend." It is not known whether PFAS-containing surfactants or waxes have ever been used at the current or former commercial car washes. There are also approximately 14 current and historical wash racks used for cleaning Army equipment.

A total of 24 current and historical landfills and dumps were identified at FTBL. It is unknown whether PFAS-containing materials historically were disposed in any of the currently operating or historical landfills/dumps. However, many commercial materials/products and construction and demolition wastes contain PFAS that can be present in leachate (e.g., from carpets, roofing materials, floor tiles).

FTBL has two former sewage treatment plants, both of which ceased operation as treatment plants in 1980 or 1981. While it is possible that the two former sewage treatment plants received PFAS-containing liquid wastes via the sanitary sewer, there are no known, historical, documented instances of disposal.

Underground storm lines are present throughout the developed portions of the Main Post directing stormwater runoff away from buildings, parking lots, and roadways. In many locations, these stormwater lines join up with open drainages. There are no known, historical, documented uses or disposal of PFAS-containing materials, including AFFF, to portions of the installation's stormwater drainage system.

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**.

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 FTBL) was 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.

There are several fire stations within a 5-mile radius of FTBL. The closest upgradient or side-gradient stations are:

- The Fairfax County Fire and Rescue Kingstowne Fire Station No. 37 is located on the northern boundary of Main Post at 7936 Telegraph Road in Alexandria, Virginia.
- The Lorton Volunteer Fire Department is located almost 0.6 mile northwest of the southwestern Main Post boundary at 7701 Armistead Road in Lorton, Virginia. The Noman M. Cole, Jr., Pollution Control Plant is located between the Lorton Volunteer Fire Department and the Main Post boundary.
- The Fairfax County Fire and Rescue Department Woodlawn Fire Station No. 24 is located approximately 0.9 mile (at its closest) from the east-central boundary of Main Post at 8701 Lukens Lane in Alexandria, Virginia.

There is a metal finisher (Alexandria Metal Finishers) located approximately 1.2 miles west-northwest of the southwestern Main Post boundary at 9418 Gunston Cove Road in Lorton, Virginia. According to its website, it provides metal-finishing services to the aerospace, telecommunications, electronics, medical, packaging, defense, and commercial industries.

SICPA Securink Corporation is a chemical plant located approximately 0.46 mile south of the southern boundary of FBNA and 1.5 miles northwest of the northern boundary of the Main Post at 8000 Research Way in Springfield, Virginia. It is identified as a printing ink manufacturer and a potential user of PFAS-containing materials by the Environmental Working Group (EWG), a non-profit corporation (EWG no date).

Master Print, a Vomela Specialty Company, is located approximately 0.57 mile northwest of northern boundary of the Main Post (near DAAF) at 8401 Terminal Road in Newington, Virginia. It is identified as a commercial printing company and a potential user of PFAS-containing materials by the EWG), a non-profit corporation (EWG no date).

Q Card 400 – Quarles Petroleum is located approximately 0.64 mile northwest of the northern boundary of the Main Post (near DAAF) at 8219 Terminal Road in Lorton, Virginia. It is identified as a petroleum bulk station and terminal and a user of PFAS-containing materials user by the EWG), a non-profit corporation (EWG no date).

Kinder Morgan Newington Terminal #1 and Kinder Morgan Southeast Terminals are located approximately 0.75 to 0.83 mile northwest of the northern boundary of the Main Post (near DAAF) at 8200 Terminal Road and 8206 Terminal Road, respectively, in Lorton, Virginia. They are identified as petroleum bulk station and terminals and potential users of PFAS-containing materials by the EWG), a non-profit corporation (EWG no date).

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage and/or disposal of PFAS-containing materials at FTBL 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, 17 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

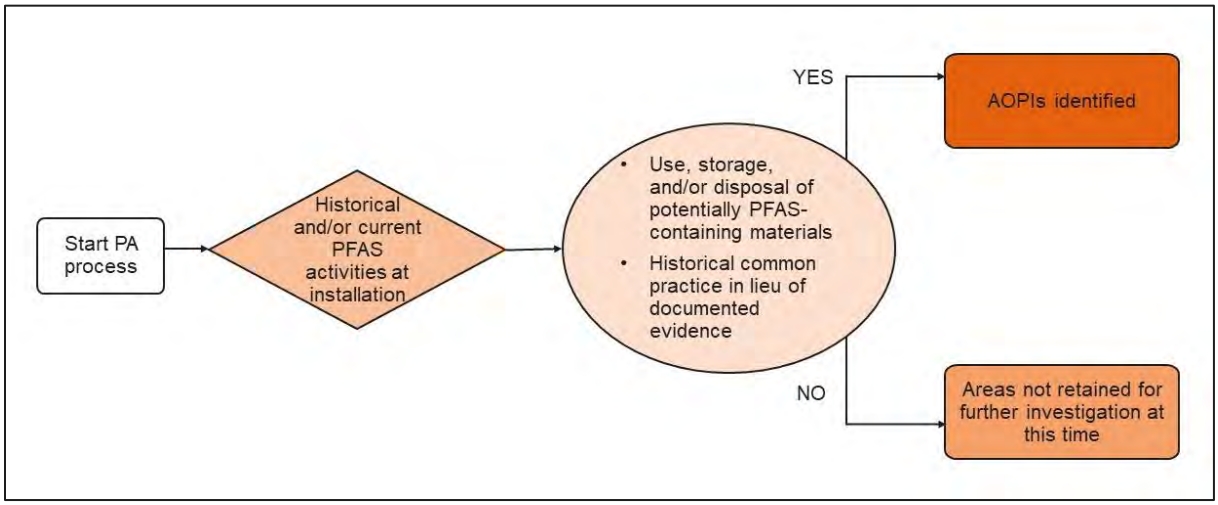

Figure 5-1: AOPI Decision Flowchart

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

Data limitations for this PA/SI at FTBL are presented in **Section 8**.

5.1 Areas Not Retained for Further Investigation

Through the evaluation of information obtained during records review, personnel interviews, and/or site reconnaissance, the areas described below were categorized as areas not retained for further investigation at this time. While the operations and facility types noted below can sometimes involve use, storage, and/or disposal of PFAS-containing material, information obtained during the PA (i.e., personnel interviews and/or records) regarding the associated materials did not indicate that PFAS-containing materials were used, stored, or disposed.

A brief site history and rationale for areas 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
Building 3125	Unknown	Building 3125 is adjacent to and on the south side of Building 3121. It was identified as an ARNG hangar and was included as an "Off-Installation Potential PFAS Area" in the PFAS Post-Site Visit Teleconference presentation discussed on 05 November 2019 (Arcadis 2020a). The PFAS Post-Site Visit Teleconference presentation (presented the AOPIs and areas not retained for further investigation identified following the PA site visit) on 15 November 2019 erroneously assigned characteristics of the adjacent Building 3121 (ARNG Hangar) AOPI to Building 3125. There is no indication of AFFF use or storage, currently or historically, in Building 3125.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Hangar 3126 (Night Vision)	Unknown to present	The hangar currently (and historically) has a water-only fire-suppression system.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
Hangar 3140 (Lakota/O'Neil Hangar)	Spill: 2018 Hangar use: 1950s to present	This hangar has been in use since the 1950s. The FTBL Fire Department Fire Marshal communicated that the hangar transitioned to Jet-Ex 2% high-expansion foam in approximately 2011. Suppression system plumbing and a storage tank for the Jet-Ex foam concentrate were installed as part of the transition. Prior to this transition, the hangar utilized a water deluge only fire-suppression system. No other type of fire-suppression system has ever been utilized in this hangar (FTBL 2022). A large release (300 gallons) of non-AFFF 2% Jet-Ex high-expansion foam concentrate occurred on 18 May 2018 (Fort Belvoir Fire and Emergency Service 2018). Approximately 12,550 gallons of Jet-Ex foam and water were disposed on 30 May 2018 [HEPACO 2018]). Jet-Ex does not contain PFAS (Ansul 2017). Grassy areas and a French drain surrounding the hangar were impacted. There are no other known uses of Jet-Ex or AFFF.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 363, Room B114 **Former Electroplating Room**	1960 to 1980	Room B114 was used for electroplating activities for approximately 20 years. It is unknown whether chromium metal plating was conducted. The room contained duct work for controlling fumes. Wastes from the electroplating operations drained to a holding tank located under Room B114, were neutralized, and discharged to the sanitary sewer (A.T. Kearney, Inc. [Kearney] 1988).	Operations ceased before PFAS-containing mist suppressants (for chrome plating) started being used. Use of PFAS-containing mist suppressants during plating activities was uncommon until the mid-1990s. No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 2318 **MWR Car Wash**	Unknown to present	Self-service, three-bay, commercial car wash facility with soaps and waxes. Current chemical SDSs do not explicitly contain PFAS. The types of solvents that were historically used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 187 **Former Car Wash Rack**	1982 to unknown	This former, likely commercial, car wash was an indoor mechanical car wash where the vehicle drove onto a track and the track moved the car through the wash system. Wash water traveled through floor drains to	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
		an oil-water separator (A.T. Kearney, Inc. [Kearney] 1988).	
Wash racks (various)	Various	There are (or were) several non-commercial wash racks at FTBL used to clean military vehicles: Roads and Grounds/Land Management Wash Rack, Building 187 Outdoor Wash Rack, Building 1356 Wash Rack, Building 1338 Wash Rack, Building 1357 Wash Rack, Building 1338 Wash Rack, Base Wash Rack Area, Building 2585 Inactive Wash Rack, Building 1119 Heavy Equipment Wash Rack, Building 715 Wash Rack, and Building 1938 Wash Rack (Kearney 1988). Historically (prior to 1982, unknown whether this is still the case), wash water from 10 of the wash racks at FTBL drained untreated to storm drains. The remaining four wash racks had an oil-water separator and were connected to the sanitary sewer system.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 1496 Pesticide Mixing Drum Storage Area	Unknown	Location where pesticides were stored and mixed.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Buildings T-1113, 739, and 745 Pesticide Mixing and Storage Areas	Unknown to early 1980s	Locations where pesticides historically were stored and mixed.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 1490 Pesticide Mixing and Storage Area	Early 1980s to present	Location where pesticides are stored and mixed.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building T-1113 Pesticide Equipment Wash Pad	Unknown	Gravel area next to Building T-1113 used for washing pesticide application equipment.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 2505 Waste Pesticide Storage	Unknown	Location where granulated pesticide materials were stored.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.

Area Description	Dates of Operation	Relevant Site History	Rationale
Building 2504 Pesticide Mixing and Storage Area	Unknown	Location where fertilizers and fungicides for the golf course were stored and mixed.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Buildings S-214, 221, 268, 320, and 462 **Photo Processing Labs**	Unknown	Buildings contain or contained a photographic processing lab(s). Wastes are understood to have gone to one of the on-post sewage treatment plants before these plants closed in 1981. Building 320 also housed a former walk-in freezer that began use in 1988 to store waste/out-of-date photographic chemicals (Kearney 1988).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Former Building 808 **Former DeWitt Army Community Hospital, Photo Processing Lab**	1954 to 2011/2012	The former DeWitt Army Community Hospital ceased operation in 2011 or 2012 and subsequently was demolished. This building contained an x-ray operation that used liquid developers to process the imagery. PFAS might have been used in x-ray and/or photo processing; however, the solvents used have not been confirmed. The location is currently an open field.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 1230 **Fort Belvoir Community Hospital** **Photo Processing Lab(s)**	2011 to present	The Fort Belvoir Community Hospital may have contained a photographic processing lab(s).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 1220 **Logan Dental Clinic** **Photo Processing Lab(s)**	Unknown to present	The Dental Clinic contains or contained a photographic processing lab.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 610 **Fort Belvoir Veterinary Center** **Photo Processing Lab(s)**	Unknown to present	Building contains or contained a photographic processing lab.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Buildings 320, 1809, 2593, and 2595		Silver recovery units are used in photographic laboratories to collect metallic silver from spent photographic solutions. After extracting the metallic silver, the spent	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at these locations.

Area Description	Dates of Operation	Relevant Site History	Rationale
Silver Recovery Units		photographic solution is discharged to the sanitary sewer (Kearney 1988). Note that there are (or were) silver recovery units identified in Buildings 1809, 2593, and 2595, but these buildings were not identified as containing photographic laboratories.	
Building 363, Room 111 **Waste Paint Storage Area**	Prior to 1986 to unknown	This area in Room 111 was used to store waste paints and related materials for up to six weeks before being removed to the Building 363 Satellite Storage Area (Kearney 1988)	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at these locations.
Landfills (various)	Various	A total of 24 current and historical landfills and dumps were identified: Cullum Woods Landfill, Theote Road Debris Landfill, DRMO Stump Dump, Kingman Road Landfill, Mulligan Road Landfill, George Washington Village Landfill, Markham School Landfill, Lacey Pit Dump Landfill, Poe Road Landfill, Accotink Landfill, DRMO Spoil Fill, Suspected Sanitary/Debris Landfill A, Suspected Sanitary Landfill B, Suspected Sanitary Landfill C, Non-Authorized Debris Fill, and Mason Pit Debris Fill (Kearney 1988).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at these locations.
CC-L45 Sewage Treatment Plant (STP) 1	1919 to 1981 (Currently operates as a pumping station. Building 687 began use as a lift station in 1982.)	Operated as a primary STP until 1980. Accepted hazardous constituents during its operational history. Solids and effluent discharged into the Potomac River. Sludge accumulated in clarifiers was withdrawn daily and taken to open tanks to digest for a year, and then to STP 2 and placed into primary digestor.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
FTBL-24 Sewage Treatment Plant 2	1940s to 1981 (Currently operates as a pumping station.)	Operated as a primary STP until 1958 when it was updated to a secondary treatment plant. Accepted hazardous constituents throughout its operational history, but the specifics are unknown. A vacuum filter plant provided sludge digestion. After treatment, sludge soils were composted. Some undigested sludge was discharged to Dogue Creek and the Potomac River with the effluent.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Stormwater Drainage System	Unknown to present	Underground storm lines are present throughout the developed portions of the	No evidence of PFOS, PFOA, or PFBS containing materials

Area Description	Dates of Operation	Relevant Site History	Rationale
		Main Post directing stormwater runoff away from buildings, parking lots, and roadways. In many locations, these stormwater lines join up with open drainages.	used, stored, and/or disposed of at this location.

In addition to installation areas not retained for further investigation, the PA identified three off-installation potential instances of the use, storage, and/or disposal of PFAS-containing material.

- Washington Dulles International Airport (located approximately 23 miles to the northwest of FTBL): In 2009 or 2010, the FTBL fire department participated in a large, one-time training event at the airport, along with other fire departments in the region. As part of the training, foam was sprayed from FTBL's large AFFF foam fire engine unit.
- Helipad at Joint Base Myer-Henderson Hall (located approximately 11 miles to the north-northeast of FTBL): FTBL operates one concrete pad and four grass pads at Joint Base Myer-Henderson Hall. The pads are located on top of a building (or buildings). It is unknown how long these pads have been present and how long they have been operated by FTBL. The FTBL fire department staff interviewed do not recall any instances of AFFF use at these pads. It is unknown whether PFAS-containing aviation fire extinguishers (or another type of extinguisher) are staged at these pads.
- Pentagon (located approximately 12 miles to the north-northeast of FTBL): In response to the 11 September 2001, attack on the Pentagon, the FTBL fire department, along with many other fire departments across the region, was part of the massive fire-fighting response. The FTBL fire department confirmed that they deployed AFFF foam, and that the other fire departments in the region responding to the fire also deployed AFFF foam.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Three of the AOPIs overlap with FTBL IRP sites and/or HQAES sites: FTBL-66 AOPI, FTBL-68 AOPI, and FTBL-12 AOPI (**Figure 5-2**). The AOPI, overlapping IRP site identifier, HQAES number, and current site status are discussed within each AOPI subsection presented below. At the time of this PA, only one of the FTBL IRP sites (FTBL-66) has historically been investigated or is currently being investigated for the possible presence of PFOS, PFOA, and/or PFBS. The analytical results of the 2017 groundwater investigation at FTBL-66 are presented in **Table 2-1**.

The AOPI locations are shown on **Figure 5-2**. Aerial photographs of each AOPI that also show the approximate extent of AFFF use (if applicable) are presented on **Figures 5-3** through **5-13** and include active monitoring wells in the vicinity of each AOPI.

5.2.1 FTBL-66

FTBL-66 1 is identified as an AOPI following record reviews, personnel interviews, and site reconnaissance due to historical firefighter training activities with AFFF. FTBL-66 (IRP ID/HQAES 51105.1070; active IRP site) is located within the larger FTBL-005-R-01 Munitions Response Area at FBNA (**Figure 5-3**). Several designated former FTAs and co-located, related areas of potential concern (AOPCs; M-07 [Inactive Fire Equipment Test Area], M-18 [fuel storage area for M-07], and 20 [Contaminated Soil and Groundwater]) were used in the 1960s for firefighter training activities. The specific locations and extent of historical firefighter training activities, media used, and the amounts of AFFF used, stored, and disposed are unknown. FTBL Fire Department personnel reported during the PA interview that carbon tetrachloride was used as a flame suppressant, but it is possible that animal protein foam containing PFAS or AFFF was also used. The site is currently a forested/wetland area and is an active cleanup site with on-going groundwater monitoring. There is also an unnamed stream or drainage channel in the eastern half of the AOPI. This unnamed stream or drainage channel appears to receive overflow from a retention basin (Pond 8) located nearby to the west, forming a wetland area within the channel (TriEco Tetra Tech, Joint Venture 2019). The unnamed stream or drainage channel proceeds to skirt the northern boundary of the FTBL-68 AOPI and then discharge to Accotink Creek outside of the FTBL-66 and FTBL-68 AOPI boundaries but within the FBNA installation boundary.

PFOS, PFOA, and PFBS were detected in five wells within the boundary of the FTBL-66 AOPI during groundwater sampling conducted as part of an information gap investigation in January 2017 (these five wells are highlighted on **Figure 7-2**). The maximum detected concentrations of PFOS, PFOA, and PFBS were 8 ng/L, 12 ng/L, and 5 ng/L, respectively (TriEco Tetra Tech, Joint Venture 2019). These results were below the OSD risk screening levels for PFOS, PFOA, and PFBS in groundwater (tap water) of 40 ng/L, 40 ng/L, and 600 ng/L, respectively (**Table 2-1**).

Since the known IRP site contamination is related to fire-training activities, the potential source of PFOS, PFOA, and PFBS is related to the known IRP site contamination. The AOPI boundary corresponds to the FTBL-66 land-use-control site boundary.

5.2.2 FTBL-68

FTBL-68 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to a historical fire response with AFFF to extinguish a petroleum fire on a highway overpass. The FTBL-68 AOPI overlaps with the FTBL-68 active IRP site (IRP ID/HQAES 51105.1072) and is also located within the larger FTBL-005-R-01 Munitions Response Area at FBNA. The general FTBL-68 area was the source of a 1968 petroleum release that was ignited and destroyed an overpass and burned several acres; the exact location of the fire is undocumented (**Figure 5-3**). The type of foam and amount used to extinguish the fire is unknown; due to the period of use, it is possible that either animal protein foam containing PFAS or AFFF was used. Aerials from the 1960s of the area were reviewed. The three probable locations of the historical overpass were identified. These locations overlap the southern end of the FTBL-66 IRP site; however, the actual location of the fire is unconfirmed, and the fire covered several acres, so the impacted area may fall within FTBL-68 as stated by FTBL personnel in an interview during the PA site visit.

The FTBL-68 site consists of the Hydrocarbon Spill Area (Solid Waste Management Unit M-26) and the Former Above Ground Tank Site. The site is currently a forested/wetland area and is an active cleanup site with groundwater monitoring. Several monitoring wells exist on-site.

The known IRP contamination (hydrocarbons) is not related to the potential PFAS contamination at this site. The AOPI boundary corresponds to the FTBL-68 land-use control site boundary.

5.2.3 DAAF Fire Station

The DAAF Fire Station is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the storage and accidental use of AFFF. Based on installation-provided metadata and historical aerial imagery, the southern half of the DAAF Fire Station was constructed in 2003 and the northern half (closest to Gavin Road) was added sometime between 2012 and 2014. An accidental use of approximately 5 to 10 gallons of foam (less than 1 gallon of 3% Chemguard C306-MS-C AFFF mixed with water) occurred in front of the DAAF Fire Station on 11 April 2017. The accidental use occurred on the concrete apron in front of the station and flowed in the direction of the topography of the area into the road and adjoining grassy areas/ditches (these use areas are noted on **Figure 5-4**). Due to the small amount of foam, the Virginia Department of Environmental Quality advised FTBL DPW personnel to sweep and spread the foam onto the roadway and let it evaporate/dissipate (Fort Belvoir 2017d).

5.2.4 FTBL-12

FTBL-12 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its role as an FTA that historically used AFFF in training activities. FTBL-12 (Fire Fighting Training/Burn Area; IRP ID/HQAES 51105.1011; closed IRP site) FTA is located behind the DAAF Fire Station and the AOPI boundary may include the former Solid Waste Management Units (SWMU) K-1 through K-5 (**Figure 5-4**).

- **K-1**: The fire control training area ditch received liquid (water) discharge from the oil/water separator (SWMU D-2) that received the oil and water mixture that was drained from the burn pit following fire-quenching training activities; K-1 itself drained to Accotink Creek (Kearney 1988; CH2M Hill 1992).
- **K-2**: The fire control training area sludge pile was located behind an above-ground fuel tank in a clearing close to a wooded area and consisted of the remnants of what was burned during fire-quenching training activities in the burn pit; the sludge pile was removed in 1988 or 1989 and its location was not identified during the August 1991 reconnaissance activities (Kearney 1988; CH2M Hill 1992).
- **K-3**: Fire control training area consisting of the 50-foot diameter concrete pit (i.e., the "burn pit"). During August 1991 reconnaissance activities, the burn pit was found to contain a mixture of black liquid and sludge (Kearney 1988; CH2M Hill 1992).
- **K-4**: The fire control training area underground waste oil tank (600 gallons) contained the oil waste from the oil/water separator (SWMU D-2) and was emptied as necessary.
- **K-5**: The Fire Control Training Area Open Burn Area reportedly consisted of a 15-foot-diameter area of bare soil and was used to burn classified wastes on an occasional basis (Kearney 1988). The fire control training area open burn area identified as being at or near FTBL-12 could not be identified

during the August 1991 reconnaissance activities and was unknown to the current FTBL Fire Chief (CH2M Hill 1992).

The restoration site is closed, but the FTA has been in operation since the 1940s and FTBL Fire Department personnel stated that AFFF was used here historically. From historical aerial imagery, what appears to be a circular firefighting training pit (identified by an interviewee as a "burn pit") was constructed at FTBL-12 sometime between 1963 and 1979. The "burn pit" (SWMU K-3) was a concrete-lined circular pit that was 50 feet in diameter and was enclosed by a 1.5-foot-tall earthen berm (Kearney 1988). A 2-foot-tall concrete berm was identified as encircling the burn pit during reconnaissance activities in August 1991 (CH2M Hill 1992). Therefore, the earthen berm was replaced or with a 2-foot-tall concrete berm sometime between 1988 and 1992. The footprint of the former burn pit is shown on **Figure 5-4**. Use of the burn pit began in 1983 (Kearney 1988), and it was utilized approximately two to three times a month. The burn pit was flooded with water and then fuel was applied to the top of the water using sprinklers, and then the fuel was ignited. After the fire was quenched, the resulting oil and water mixture was drained into the oil/water separator (Kearney 1988). Fire-quenching training activities at the burn pit ceased in 1990 (CH2M Hill 1992).The pit was removed from FTBL-12 sometime between 1994 and 2002. FTBL-12 currently consists of concrete pads and structures.

Current FTBL Fire Department training procedures use water only. Fires are started with Class A materials (pallets/straw), and only water is intended for training use. However, fire engines with AFFF reservoirs are used during training, and accidental uses of AFFF have occurred. Two accidental uses of AFFF occurred on 25 April and 28 April 2019. The 25 April 2019 use consisted of approximately 10 to 20 gallons of Ansulite® 3% AFFF (AFC-3-A; Ansul 2010) on the cracked concrete pad associated with the FTA as well as some grassy areas adjoining the FTA (use areas are shown on **Figure 5-4**). AFFF was removed and containerized for disposal, then the top 2 inches of sod were removed. Backfill was not applied (Fort Belvoir 2019d). The 28 April 2019 use consisted of 25 gallons of Ansulite® 3% or 6% ARC mixed with 500 gallons of water in the same areas as the previous uses. AFFF was identified in surface water downstream from the use area. As a result, sod and stormwater were removed from the stormwater drainage feature that fed the affected surface water body, and the excavated areas were backfilled and reseeded (Fort Belvoir 2019b). The excavated material was containerized and stored at Building 1495 (90-day hazardous waste storage building) pending off-installation disposal.

Since the known IRP contamination is related to firefighting training activities, the potential PFAS source is related to the known IRP contamination.

5.2.5 Hangar 3132

Hangar 3132 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the presence of AFFF in the fire-suppression system.[1] Hangar 3132, one of the two Night Vision hangars at DAAF, was built in 2009 and outfitted with an AFFF-containing fire-suppression system (Ansulite® 3% AFFF [Ansul 2010]) (**Figure 5-5**). (Note: Hangar 3132 was erroneously identified in the QAPP Addendum (Arcadis 2020a) as being constructed and becoming

[1] Hangar 3132 was reclassified as an AOPI after the SI field events (November and December 2020 and March 2021) were completed because PFOS, PFOA, or PFBS containing materials are stored at this location but was overlooked in the previous effort to identify locations where AFFF is or was historically stored.

operational in 2017.) The hangar has a concrete floor and no apparent floor drain. The AFFF-containing fire-suppression system is tested annually with a PFAS-free product, Planet Safe®. Airfield personnel stated that, to their knowledge, the system has never been used (i.e., no documented deployments of the system and no spills or leaks). However, initial acceptance testing of the hangar (before it was occupied) likely would have involved use of the AFFF fire-suppression system, resulting in an AFFF use.

5.2.6 Hangar 3145

Hangar 3145 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the historical presence of AFFF in the former fire-suppression system. Hangar 3145 is located at DAAF and has been in use since 1995 (**Figure 5-5**). The hangar has internal drains, and there is no oil-water separator associated directly with this hangar.

Historically, AFFF was used in the hangar's fire-suppression system. There are no confirmed historical uses of the AFFF stored within the fire-suppression system (i.e., no documented deployments of the system and no spills or leaks). However, initial acceptance testing of the hangar (before it was occupied) likely would have involved use of the AFFF fire-suppression system, resulting in an AFFF use.

The current fire-suppression system (understood to have been installed in late 2019 or 2020) does not contain AFFF.

5.2.7 Hangar 3151

Hangar 3151 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the historical presence of AFFF in the former fire-suppression system. Hangar 3151 is located at DAAF and has been in use since 1995 (**Figure 5-5**). There is an oil-water separator associated with this hangar and it is located adjacent to the northwest side of the building.

Historically, AFFF was used in the hangar's fire-suppression system. There are no confirmed historical uses of the AFFF stored in within the fire-suppression system (i.e., no documented deployments of the system and no spills or leaks). However, initial acceptance testing of the hangar (before it is occupied) likely would have involved use of the AFFF fire-suppression system, resulting in an AFFF use.

The hangar was remodeled in approximately 2018 and a non-AFFF fire-suppression system was installed. The AFFF that had been stored in the AFFF tank was removed and disposed of through the DPW (off-post disposal). suppression system.

5.2.8 Hangar 3232

Hangar 3232 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the potential, historical use, and storage of AFFF as part of the hangar's fire-suppression system prior to 2019 (i.e., whether it historically utilized water only or if it also had an AFFF component). Hangar 3232 is located at DAAF and has been in use since 1960 (**Figure 5-5**). The hangar has internal drains, but there is no oil-water separator associated directly with this hangar.

During the PA site visit, the DAAF Airfield Safety Manager indicated that an upgrade or replacement of the hangar's fire-suppression system was planned. Follow-up e-mail correspondence with FTBL fire department and DAAF personnel in October 2021 (after completion of the SI field events) confirmed that

a new fire-suppression system that utilizes a high-expansion foam was installed sometime in the latter half of 2019 (after the PA site visit) (FTBL 2021a). The FTBL fire marshal confirmed that a water-only deluge fire-suppression system was present in the hangar since the building became operational (1960) until it was replaced in 2019 (FTBL 2021b). The system's new foam tank contains Ansul Jet-X 2% foam concentrate. Jet-X does not include PFAS-containing materials.

5.2.9 Building 3121 (ARNG Hangar)

Building 3121 (ARNG Hangar) is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the presence of AFFF in the fire-suppression system. Building 3121 is a 47,000-square foot maintenance hangar (**Figure 5-5**) located on the DAAF and occupied by the ARNG. The hangar was constructed in 1981 and was later expanded in 1985 (AECOM 2020). The northwestern portion of the hangar contains fixed-wing aircraft, and the southeastern portion contains rotary aircraft. Both portions are connected to an AFFF fire-suppression system, which interviewees indicate was installed during the original building construction. The fire-suppression system at Building 3121 is housed in a tank room that includes two 300-gallon AFFF tanks that have never been refilled. The type of AFFF contained within the two tanks is unknown. The tanks are known to be leaking AFFF and each tank is marked with dates indicating the levels in the tanks to estimate the volume of AFFF lost to leakage. Based on the markings, approximately 50 gallons of AFFF leaked from each tank between August 2012 and June 2014 (AECOM 2020). The leaked AFFF was captured using absorbent mats placed underneath the two tanks; the disposal method for the absorbent mats is unknown. The leaks were caused by a corroded valve, and the valve was repaired in 2014 (AECOM 2020). Weekly inspections of the AFFF fire-suppression system are performed by a state technician, and monthly inspections are performed by DAAF Fire Station personnel (AECOM 2020). There also have been several repairs to the fire pump and piping due to water leaks. The Final Preliminary Assessment Report, Army Aviation Support Facility, prepared by AECOM, indicated that the most recent repair to the fire suppression system AFFF tank(s) occurred in August 2019 (AECOM 2020). It is not known whether further repairs have been undertaken since.

Three Purple K dry chemical, wheeled aircraft fire extinguishers (that do not contain AFFF) are stored (staged) on the aircraft ramp attached to Building 3121.The aircraft ramp is used for training personnel on how to use the Purple K dry chemical fire extinguishers. Fourteen Tri-Max™ fire extinguishers, which potentially contained PFAS-containing materials, were stored on the aircraft ramp prior to their replacement with the Purple K fire extinguishers in 2012 (AECOM 2020). Staff knowledge about Building 3121 extends back to 1989, and there is no recollection of the Tri-Max™ fire extinguishers ever being used, or the contents spilled. However, if Tri-Max™ fire extinguishers did contain PFAS-containing materials and there had been a use of any of these fire extinguishers stored on the aircraft ramp, the potential use(s) would have occurred primarily on paved surfaces but may have run off into unpaved surfaces and into the soil. The DAAF Fire Station was responsible for maintaining the Tri-Max™ fire extinguishers (AECOM 2020).

At the request of the USAEC, Building 3121, an ARNG hangar, was added as an AOPI for SI sampling after the PA site visit and after the QAPP Addendum was submitted in September 2020 (Arcadis 2020a). The preliminary assessment of Building 3121 was completed by AECOM (AECOM 2020).

5.2.10 Lewis Village Car Fire

The Lewis Village Car Fire is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the use of AFFF to extinguish a car fire. A car fire occurred when a car hit a non-polychlorinated biphenyl mineral fuel transformer behind a townhouse and caught fire on 27 April 2019 (**Figure 5-6**). Approximately 5 to 10 gallons of AFFF (Ansulite® ARC 3% or 6%) along with approximately 250 gallons of water were discharged during this firefighting activity onto cracked concrete/asphalt and an adjoining grassy area. Soil around the transformer was excavated, and then re-seeded and strawed. The AFFF use reached a nearby storm sewer that drains into a wet pond. No foam was observed in the wet pond when inspected approximately 20 hours after the AFFF use took place (FTBL 2019c). During the site visit, the pond area was dry.

5.2.11 Building 707 (LRC)

Building 707 (LRC) is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its historical use for the maintenance/repair activities on AFFF-carrying fire trucks and AFFF storage. Building 707 is the permanent LRC building; however, it has been under renovation since 2014 (still undergoing renovation during the 2019 PA site visit; the current status of the renovation is unknown) (**Figure 5-7**). The LRC contains indoor bays with drains where fire engines would have been serviced. The drains are generally blocked to prevent receiving drainage from spills. Building 707 was constructed in 1935. It is unknown when fire engine maintenance began at this facility. Current maintenance personnel have been at FTBL for less than 5 years (at the time of the PA site visit) and never worked in this facility. Therefore, there is no information available on the historical use or potential storage of AFFF.

FTBL Fire Department personnel stated during the PA site visit interviews that most engines have issues with AFFF solidifying in the tank; therefore, the LRC cleans out the AFFF reservoirs and associated piping on each engine carrying AFFF approximately every 3 years. The LRC staff reported during the PA site visit interview that regular practice would be to containerize AFFF and submit the containers to FTBL Hazardous Waste for off-post disposal.

The FTBL LRC is responsible for fire engine maintenance for several Army installations in the region. The FTBL Wastewater, Drinking Water Coordinator confirmed that Building 707 (LRC) was also used to maintain fire engines from Fort A.P. Hill, located near Bowling Green, Virginia. Therefore, there may be instances of AFFF use at this facility that are not associated with FTBL Fire Department vehicles.

5.2.12 Building 1436 (LRC)

Building 1436 (LRC) is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its use for maintenance/repair activities on AFFF-carrying fire trucks and AFFF storage. Since 2014, Building 1436 has been the temporary LRC where fire engine maintenance is currently performed (**Figure 5-8**). The LRC cleans out the AFFF reservoirs and associated piping on each engine carrying AFFF approximately every 3 years to prevent the AFFF from solidifying in the tank. Building 1436 is the official location of AFFF storage (55-gallon drums of Ansulite® 3% AFFF [Ansul 2010] and Chemguard AFFF 3% were present during the June 2019 PA site visit). Fire engines are brought to this building for AFFF tank refilling and are refilled using a pump.

Two accidental AFFF uses (spills) occurred here in 2017, one inside the facility and the other outside on asphalt/concrete adjacent to the bay doors. The accidental interior use consisted of about 5 gallons of Ansulite® 3% AFFF, and it was contained with a drain block and absorbent material (FTBL 2017a). The accidental exterior use occurred during maintenance on a Joint Base Myer-Henderson Hall fire engine and involved 10 to 15 gallons of AFFF concentrate being applied to cracked asphalt. The spilled AFFF was collected into drums and submitted to FTBL Hazardous Waste for off-post disposal (FTBL 2017c). According to installation personnel, no additional uses are known to have occurred since Building 1436 became operational for fire engine maintenance in 2014.

All FTBL Fire Department AFFF stock that is not in fire engine AFFF reservoirs is stored in Building 1436 (LRC) in 55-gallon drums (Ansulite® 3% AFFF [Ansul 2010] and Chemguard 3% AFFF were identified during the PA site visit). Fire engines are brought to this building for AFFF tank refilling and are refilled using a pump. However, there occasionally may be a few 5-gallon buckets of AFFF stored within fire station bays to top off the AFFF reservoirs in the fire engines. A small amount (less than 1 gallon) of heat-resistant lubricants containing PFAS are kept within the Building 1436. These include "AST-RV silicon adhesive/instant gasket Hi temp red" and “TFE pipe thread sealant with PTFE.” Fire engine AFFF reservoir refilling occurs mainly at Building 1436, but 5-gallon buckets of AFFF may occasionally be brought back to a fire station to refill an engine reservoir.

The FTBL LRC is responsible for fire engine maintenance for several Army installations in the region, Fort U.S. Army Garrison Fort A.P. Hill, Fort Detrick, U.S. Army Garrison Fort Lee, and Joint Base Myer-Henderson Hall were identified. Therefore, there may be instances of AFFF use at this facility that are not associated with FTBL Fire Department vehicles.

In May 2019, twelve 55-gallon drums of AFFF and residual liquid and twenty-eight 55-gallon drums of AFFF and residual solids were removed and disposed offsite via incineration. In September 2019, seven 55-gallon drums of AFFF and residual liquid were removed and disposed offsite via incineration in (FTBL 2019e).

5.2.13 1980s Plane Crash

The 1980s Plane Crash is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the potential use of AFFF during the crash response. A plane crash occurred in 1983 or 1984 at the southeast end of the DAAF runway, north of U.S. Route 1 (**Figure 5-9**). The existing runway at the time of the crash was shorter than the current runway as reported by the FTBL DAAF historian during the PA site visit interview. It is suspected that a fuel fire accompanied this plane crash and, therefore, the fire response most likely used AFFF to extinguish the fire. Due to the limited knowledge of this event, the fire engine staging location(s) and spray directions are unknown. If AFFF was used, it was sprayed to the paved runway surface and soil (or flowed to soil) during the fire response at the southeast end of the DAAF runway (the runway at the time was shorter than the current runway) as reported by the DAAF Airfield Safety Manager and/or the Airfield Historian during the PA site visit.

5.2.14 Old and New South Post Fire Stations

The Old and New South Post Fire Stations are identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the storage of AFFF in fire trucks and potentially in 5-gallon

pails of AFFF, and, at the Old South Post Fire Station, the potential historical use of AFFF. The Old South Post Fire Station ceased operation in 2016 when the new South Post Fire Station was built and became operational (**Figure 5-10**). It is unknown when the Old South Post Fire Station became operational; however, the building was constructed in 1934. Aerial imagery indicates the building, in its current configuration, has been present since at least 1953. Historical information on the use and storage of AFFF at the former fire station are unknown.

The New South Post Fire Station is located north-northeast of and across the street from the Old South Post Fire Station (**Figure 5-10**) and became operational in 2016.[2] It currently houses two engines with AFFF tanks (30 gallons each). AFFF refilling principally occurs at Building 1436, but buckets may occasionally be brought back to station to refill the AFFF tanks on the two engines with a pump. There are no recorded uses (i.e., spills or leaks from AFFF stored in the station's two engines or an incidental 5-gallon pail of AFFF stored in the bays); however, incidental spills are possible.

5.2.15 North Post Fire Station

The North Post Fire Station is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its storage and potential use of AFFF. This fire station has been in operation since 2005 (**Figure 5-11**) and currently houses one engine with an AFFF tank (30 gallons). AFFF refilling occurs mainly at Building 1436, but buckets may occasionally be brought back to the station and used, via a pump, to fill a truck's AFFF reservoir (no recorded spills; however, incidental spills are possible). Historical FTBL Fire Department practices prior to 2006 are unknown; however, since the fire station became operational in 2005, the practices utilized in 2005 likely did not deviate from those utilized in 2006 onwards.

5.2.16 FBNA Fire Station

The FBNA Fire Station is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its storage and potential use of AFFF. This fire station has been in operation since 2010 (**Figure 5-12**) and currently houses one engine with an AFFF tank (30 gallons). AFFF refilling occurs mainly at Building 1436, but buckets may occasionally be brought back to the station and used, via a pump, to fill a truck's AFFF reservoir (no recorded spills; however, incidental spills are possible).

5.2.17 Building 1495

Building 1495 is identified as an AOPI following records review, personnel interviews, and site reconnaissance due to the presence of AFFF in the fire-suppression system and the potential storage of

[2] During the SI scoping call on 03 April 2020, it was agreed by representatives of USAEC and FTBL that the New South Post Fire Station would be removed as a preliminary AOPI and not sampled since the station was built and became operational in 2016 and installation staff were confident that there have been no releases. The criteria for SI sampling changed soon after April 2020 to include all locations of AFFF storage, but the New South Post Fire Station was overlooked. The New South Post Fire Station has been combined with the Old South Post Fire Station to create a single, larger AOPI footprint.

PFAS-containing materials pending disposal off post. Building 1495[3] was constructed in 1970 and currently operates as a 90-day hazardous waste storage facility (**Figure 5-13**). It is unknown when use of the building for hazardous waste storage began. Building 1495 is equipped with an AFFF fire-suppression system that includes a 55-gallon AFFF storage tank. Initial acceptance testing of the AFFF fire-suppression system likely occurred after the system was installed and before the building was occupied; however, this is not confirmed. The building was remodeled sometime around 2014 (FTBL 2017b). It is unknown whether the AFFF fire-suppression system was installed as part of the building remodel or if it was installed at an earlier date. Based on interviews during the PA site visit, there have been no known uses of the AFFF fire-suppression system, and the system does not undergo routine testing.

Building 1495 was also used to store 55-gallon drums of PFAS-containing waste in 2020 prior to removal and disposal offsite. PFAS-containing wastes may have been stored periodically in Building 1495 since the hazardous waste 90-day storage facility opened. There are no known or documented leaks or spills from PFAS-containing waste containers stored temporarily in Building 1495.

Building 1495, originally was a location not retained for further investigation. It was reevaluated and added as an AOPI for SI sampling after the PA site visit and after the QAPP Addendum was submitted in September 2020 (Arcadis 2020a). The Building 1495 AOPI was sampled during a second SI mobilization in March 2021.

[3] Building 1495, originally not retained for further investigation, was missed when previously categorized areas not retained for further investigation were reevaluated when the required scope for the SI was expanded to include AFFF storage locations. The Building 1495 AOPI was sampled during a second SI mobilization in March 2021.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at FTBL, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at FTBL at 17 AOPIs to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. As such, an installation-specific QAPP Addendum (Arcadis 2020a) 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 soil, groundwater, surface water, and 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 September and October 2020 and March 2021 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 2020a) 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 FTBL. 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 2020a), 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, and, at one AOPI, surface water for PFOS, PFOA, or PFBS presence and 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.

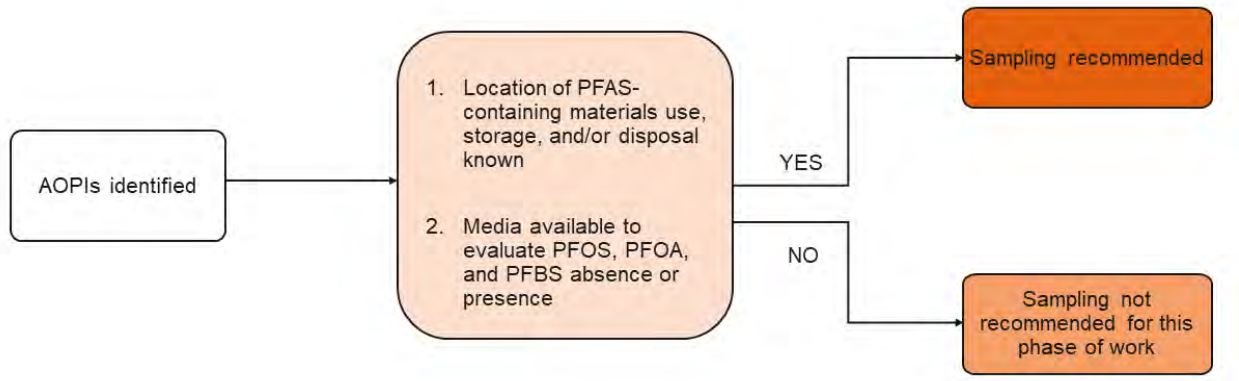

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at FTBL is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020a). To summarize, samples were collected from each AOPI to determine which areas and environmental media are confirmed to have detectable levels of PFOS, PFOA, and/or PFBS and refine the CSMs for each AOPI. For each of the 17 sampled AOPIs, samples were collected at locations of known or suspected use, storage, or disposal of PFAS-containing materials, surface runoff-collection points, and locations downgradient of known or suspected PFOS, PFOA, and/or PFBS source areas. Except for one AOPI, the approved sampling scope consisted of collecting samples from soil and groundwater media. Groundwater and soil were sampled to identify PFOS, PFOA, and/or PFBS presence, type, and concentrations. One soil sample collected per AOPI was also analyzed for total organic carbon (TOC), pH, and grain size. These additional soil data are collected as they may be useful in future fate and transport studies. The selected, targeted sampling areas are believed to have the potential for the greatest PFOS, PFOA, and/or PFBS concentrations closest to known locations of AFFF use, storage, and disposal.

Existing monitoring wells were sampled within the AOPIs where previous detections of PFOS, PFOA, and/or PFBS have occurred or where wells exist downgradient of historical FTAs, inadvertent spills, or use of AFFF in fire responses. Surface water sampling was conducted at one AOPI downstream of historical FTAs within the AOPI boundary. Soil sampling was conducted near documented AFFF spill or release areas, and in the vicinity of oil-water separators, as well as where surface runoff could have acted as a transport mechanism.

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 (if available) for the existing wells and temporary wells sampled during the SI.

The detailed rationale for the sampling scope at each AOPI is provided in the QAPP Addendum (Arcadis 2020a). As noted above, except for one AOPI (FTBL-66), the approved sampling scope for each AOPI was comprised of soil and groundwater sampling. As noted on Worksheet #17 of the QAPP Addendum, "Surface water and/or sediment samples are not planned at all AOPIs where the CSMs show surface water and/or sediment pathways potentially complete since surface water impact is expected primarily based on groundwater discharge. Therefore, groundwater is considered the primary medium in these scenarios, and the groundwater samples are sufficient to establish absence or presence of [PFOS,

PFOA, and/or PFBS]" (Arcadis 2020a). The following identify and provide a rationale for those AOPIs where soil or groundwater samples were not collected and, for one AOPI, the rationale for collecting a surface water sample.

- Soil samples were not collected at the FTBL-66 and FTBL-68 AOPIs, because the locations of historical AFFF uses are numerous and their exact locations are unknown, making it difficult to pinpoint appropriate soil sampling locations. Soil samples would be recommended for further characterization in a remedial investigation, if necessary. This approach was agreed upon by USAEC and the installation during the SI Scoping Teleconference on 04 March 2020 (Arcadis 2020a).
- A surface water sample was collected from the wetland area within the FTBL-66 AOPI at a location that is downgradient of historical FTAs. The exact locations of these historical areas where AFFF or other fluorinated fire-suppressing foam may have been sprayed are not known. This surface water sample was collected at this specific location because, during the SI Scoping Teleconference on 04 March 2020, the installation Military Munitions Response Program Manager noted that the Virginia Department of Environmental Quality historically has expressed an interest in surface water sampling in this area and recommended that a surface water sample was collected (Arcadis 2020a).
- Remobilization to collect soil and groundwater samples at Hangar 3132 (reclassified as an AOPI after the two SI field events were completed) was determined to be unnecessary because there are previously collected downgradient, surrogate groundwater samples with detections of PFOS and PFOA that exceed the associated OSD drinking water risk screening levels.
- Soil samples were not collected from the Hangar 3232 AOPI, because there are no known historical uses of the AFFF stored in the fire-suppression system, and the building has no oil-water separator. This approach was agreed upon by USAEC and the installation during the SI Scoping Teleconference on 04 March 2020 (Arcadis 2020a).
- Soil samples were not collected from the Building 707 (LRC) AOPI, because the current fire engine maintenance staff has no knowledge of where congealed AFFF historically was cleaned out of the foam reservoirs, what was done with the removed material, and whether or where the foam systems on the fire engines may have been tested after completion of repairs or maintenance. Building 707 (LRC) has been closed and under renovation since 2014.
- Groundwater samples were not included in the approved SI scope (see the summary of the approved scope in **Section 6.3.3** and in FCR Log FCR-FTBL-03 provided in **Appendix L**) for the Building 1495 AOPI, because there was no indication from installation interviews and available documentation that the AFFF stored in the building's fire-suppression system has ever been used or that there has ever been an accidental spill/leak of PFAS-containing waste stored temporarily within Building 1495. There are no existing monitoring wells adjacent to or downgradient of the building. If PFOS, PFOA, and/or PFBS was detected in any of the collected soil samples at a concentration(s) above the OSD residential risk screening level, then the AOPI would be recommended for inclusion in a remedial investigation.

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 2020a), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020b). 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 2020a). 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, and tailgate health and safety forms documenting the SI sampling activities) are included in **Appendices J** and **K**, respectively.

6.3.1 Field Methods

6.3.1.1 Groundwater Sampling

Groundwater samples were collected to inform the investigation of potential PFOS, PFOA, and/or PFBS presence at biased locations within 15 AOPIs and to update the individual AOPI CSMs.

Grab groundwater samples were collected via a direct-push technology (DPT) drilling rig from 19 discrete direct push points, resulting in a total of 19 DPT groundwater sampling points at 13 of the AOPIs described in **Section 5.2**: DAAF Fire Station, FTBL-12, Hangar 3145, Hangar 3151, Hangar 3232, Building 3121 (the ARNG Hangar), Lewis Village Car Fire, Building 707 (LRC), Building 1436 (LRC), 1980s Plane Crash, Old South Post Fire Station, North Post Fire Station, and FBNA Fire Station (**Figures 7-3** through **7-9** and **7-11**). The 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]). Shallow (first encountered) groundwater was sampled at each of these sampling points via a Screen Point 22 Groundwater Sampler. The Screen Point 22 Groundwater Sampler is a 4-foot-long stainless-steel screen connected to a disposable point on the down-hole end and the 1.25-inch outer-diameter center rods of the DPT drilling rig. The 2.25-inch diameter outer casing rods were driven via DPT to the desired depth and then pulled back to expose the Screen Point 22 within the desired groundwater sample interval based on real-time observations. No temporary wells were installed. A peristaltic pump with PFAS-free disposable high-density polyethylene tubing (and, in a couple instances, a PFAS-free disposable bailer) was used for low-collect purging and to collect a groundwater sample from approximately the center of the of the saturated screen interval. Each boring was abandoned immediately after sample collection. Boreholes were backfilled with bentonite chips from the bottom of each up to approximately 3 inches bgs. The remaining void was filled to ground surface with native soil collected

from the area immediately around the borehole and the soil was compressed. In a few instances, the approximately top 3 inches of the borehole may have been backfilled with sand.

Groundwater samples were collected from existing monitoring wells at four of the AOPIs described in **Section 5.2**: FTBL-66, FTBL-68, Hangar 3232, and FBNA Fire Station (**Figures 7-2, 7-4,** and **7-11**). At each of the existing monitoring wells, a peristaltic pump with PFAS-free disposable high-density polyethylene tubing was used for low-flow purging and then collecting a groundwater sample. The groundwater samples were collected from approximately the center of the saturated screened interval via low-flow peristaltic pumps. None of the existing monitoring wells sampled contained dedicated equipment; therefore, no dedicated equipment background samples were collected.

Groundwater samples were analyzed for PFOS, PFOA, and PFBS. Field parameters (temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured during purging 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 was sooner) before groundwater sampling to ensure a representative sample was collected. Coordinates for each borehole's groundwater sampling location were recorded using a handheld global positioning system.

6.3.1.2 Soil Sampling

Shallow soil samples were collected to determine the presence or absence of PFOS, PFOA, and/or PFBS concentrations at or downslope of potential use, storage, and/or disposal areas, to evaluate the potential for those areas to be sources of PFOS, PFOA, and/or PFBS to surface water and groundwater as an influence to drinking water, and to update the individual AOPI CSMs. Soil samples were analyzed for PFOS, PFOA, and PFBS; TOC, pH, and grain size were analyzed in one soil sample per AOPI at which at least one soil sample was collected (i.e., these analytes were not analyzed for in every soil sample collected at an AOPI). Soil lithological descriptions were logged and documented on field forms. Soil samples were collected via hand auger and DPT methods in accordance with the TGI for PFAS-Specific Drilling and Monitoring Well Installation (P-12 in Appendix A to the PQAPP [Arcadis 2019]) from 25 discrete points for a total of 24 hand auger sampling points and one DPT sampling point at 12 of the AOPIs: DAAF Fire Station, FTBL-12, Hangar 3145, Hangar 3151, Building 3121 (ARNG Hangar), Lewis Village Car Fire, Building 1436, 1980s Plane Crash, Old South Post Fire Station, North Post Fire Station, FBNA Fire Station, and Building 1495 (**Figures 7-3** through **7-5** and **7-7** through **7-12**). At each hand auger sampling point at each AOPI, soil samples were collected from a 2-foot interval within the top 2 feet of native soil. Additionally, at one DPT sampling point, soil was collected at approximately 5 to 7 feet bgs at or near an oil-water separator location. Soil sampling locations were adjusted in the field, if necessary, to avoid augering through concrete or asphalt. Coordinates for each soil sampling location were recorded using a handheld global positioning system.

6.3.1.3 Surface Water Sampling

A surface water sample was collected from a wetland within one AOPI to determine the presence or absence of PFOS, PFOA, and/or PFBS concentrations originating from possible up-stream source areas within the AOPI. A grab surface water sample was collected from FTBL-66 AOPI (**Figure 7-2**). The surface water sample was collected using direct-fill methods just below the water surface and from downstream to upstream to reduce siltation in sequential samples. The surface water sample was

analyzed for PFOS, PFOA, and PFBS, and field parameters (temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured during surface water sampling to potentially inform the interpretation of analytical data. Coordinates for the surface water sampling location were recorded using a handheld global positioning system.

Surface water and/or sediment samples were not collected at AOPIs where the CSMs show potentially complete surface water and/or sediment pathways. This decision point was applied because surface water impacts primarily are attributed to groundwater discharge from the AOPIs and groundwater is regarded as the primary media in these scenarios. Groundwater samples were determined to establish sufficiently the absence or presence of PFOS, PFOA, and/or PFBS.

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 2020a), 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 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 2020a). The decontaminated reusable equipment from which EBs were collected include tubing, drill casing and cutting shoes, hand augers, and water-level meters as applicable to the sampled media. A source blank was collected from the water used to pressure-wash drill tooling. Analytical results for blank samples are discussed in **Section 7.19**.

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 FTBL 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. Seven 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 (FCRs) included as **Appendix L** and are summarized below:

- FCR-FTBL-01

  At the request of the USAEC, an additional AOPI, Building 3121 (ARNG Hangar) (an ARNG hangar located at DAAF), was added to the SI on 29 September 2020. Three borings to groundwater were added to the sampling scope with a shallow soil sample and a grab groundwater sample collected from each.

  - FTBL-B3121-01-SO / FTBL-B3121-01-GW

  - FTBL-B3121-02-SO / FTBL-B3121-02-GW
  - FTBL-B3121-03-SO / FTBL-B3121-03-GW

- FCR-FTBL-02

  During groundwater sampling of existing monitoring wells at FTBL-66 AOPI on 30 September 2020, monitoring well M26-LTM-01 could not be located during two separate attempts. There were no other monitoring wells appropriate to sample in the vicinity. Therefore, monitoring well M07-MW02 was sampled instead on 01 October 2020 (FTBL-M07-MW02-GW). Monitoring well M07-MW02 is located within AOPI FTBL-66 approximately 575 feet north of the originally scoped well. It was selected because it is located within a documented, historical fire training area that utilized AFFF and upgradient of five monitoring wells in which PFAS were detected in January 2017 (TriEco Tetra Tech, Joint Venture 2019).

- FCR-FTBL-03

  Building 1495 operates as a 90-day hazardous waste storage facility. It has an AFFF fire-suppression system that includes a 55-gallon AFFF storage tank. Building 1495 was initially excluded as an AOPI and from the SI scope because there were no known uses (including leaks) of the fire-suppression system. However, it was missed when areas not previously retained for further investigation were reevaluated when the required scope for the SI was expanded to include AFFF storage locations. Four shallow soil samples were collected during a second mobilization, a sample along the downgradient edge of the two concrete loading docks and a sample below the building's two stormwater line outfalls.

  - FTBL-B1495-01-SO
  - FTBL-B1495-02-SO
  - FTBL-B1495-03-SO
  - FTBL-B1495-04-SO

- FCR-FTBL-04

  The locations for the Hangar 3145 AOPI and the Hangar 3151 AOPI identified on Figure 10 of the QAPP Addendum are incorrect. The building identified as Hangar 3145 on Figure 10 is Hangar 3151, and the building identified as Hangar 3151 on Figure 10 is 3145. The location and hangar identifier for each of these two AOPIs were confirmed prior to commencing SI activities. On the figures in the PA/SI Report, the location identifiers for the Hangar 3145 and the Hangar 3151 AOPIs have been transposed and are now correct.

- FCR-FTBL-05

  The QAPP Addendum Worksheets # 17 and #18 identified that shallow soil samples would be collected at an interval of 0 to 2 feet bgs. During the SI field event, the shallow soil samples were collected from the upper-most 2 feet of native soil. At several of the AOPIs, the soil sampling locations had a variable thickness of fill material on top of the native soil. Therefore, the sample intervals ranged from 0 to 2 feet bgs to 3 to 5 feet bgs.

- FCR-FTBL-06

  During shallow soil sampling activities at Building 1495 (see FCR-FTBL-03) in March 2021, four shallow soil samples were collected (FTBL-B1495-01-SO through FTBL-B1495-04-SO). One of these samples was not identified on the laboratory chain-of-custody form as requiring additional analyses (TOC, pH, and grain size). Inadvertently, no field duplicate sample and no EB sample(s) were collected. Therefore, the TOC, pH, and grain size data collected for the Building 1436 (LRC) AOPI (FTBL-B1436-01-SO-092720) will be used to show fate and transport (if necessary) at the Building 1495 AOPI. The DQOs were not affected.

- FCR-FTBL-07

  There is a discrepancy in the soil sample collection interval for the single soil sample collected from Hangar 3151 on QAPP Addendum Worksheets #17 and #18 (identified as Hangar 3145 on Worksheets #17 and #18; see FCR-FTBL-04). It was determined that the soil sample depth provided for FTBL-H3151-01-SO on Worksheet #18 was an error and the correct interval was the top 2 feet of native soil. A soil sample (FTBL-H3151-01-SO) was collected in a grassy area to the northeast of Hangar 3151 from a soil interval of 1 to 3 feet bgs (the top 2 feet of native soil) on 01 October 2020.

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 were 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). Certified PFAS-free water, supplied either by the driller (Cascade Drilling) or the laboratory, was used for decontamination.

6.3.5 Investigation-Derived Waste

IDW, including soil cuttings, excess sediment, groundwater, surface water, and decontamination fluids were collected and placed in Department of Transportation-approved 55-gallon drums, labeled as non-hazardous, segregated by medium, and transported to an on-post staging area pending analysis and subsequent off-installation disposal.

Equipment IDW includes personal protective equipment and other disposable materials (e.g., gloves, plastic sheeting, Lexan™ tubes, and high-density polyethylene and silicon tubing) that may have come in contact with sampling media. These were disposed of as municipal waste. Analytical results for IDW samples collected during the SI are discussed in **Section 7.17**.

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 #12.5 in the PQAPP (Arcadis 2019). Eighteen PFAS-related compounds, including PFOS, PFOA, and PFBS, were analyzed for in groundwater, soil, and surface water samples using an analytical method that is ELAP-accredited and compliant with DoD 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 samples in accordance with Worksheet #18 of the QAPP Addendum (Arcadis 2020a) 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 M**).

6.4.2 Data Validation

All analytical data generated during the SI, except for 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). 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 M**. The Level IV analytical reports are included within **Appendix M** 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 FTBL. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix M**), 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 FTBL 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 M**), and as indicated in the full analytical tables (**Appendix N**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and FTBL QAPP Addendum (Arcadis 2020a). Data qualifiers applied to laboratory analytical results for samples collected during the SI at FTBL 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 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 at depths greater than 2 feet but less than 15 feet bgs will be compared to the Industrial/Commercial risk screening levels only.
mg/kg = milligram 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 used to compare all groundwater and/or 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 FTBL are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate

detected soil concentrations. 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 delineation in a remedial investigation is recommended in **Section 8**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

This section summarizes the analytical results obtained from samples collected during the SI at FTBL (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 2020a). 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 **7-3** provide a summary of the groundwater, soil, and surface water analytical results for PFOS, PFOA, and PFBS. **Table 7-4** summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. **Appendix N** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at FTBL 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, and surface water 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 parts per trillion, and soil data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during low-flow purging and sample collection, and for surface water during sample collection, are provided on the field forms in **Appendix K**. Soil descriptions are provided on the field forms in **Appendix K**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Groundwater was generally first encountered in the FBNA area at depths of approximately 3.5 (FTBL-66) to 21.5 feet bgs (FBNA Fire Station). Groundwater was generally first encountered in the DAAF (Main Post) area at depths of approximately 3.2 (Hangar 3232) to 38.7 feet bgs (1980s Plane Crash). Groundwater was generally first encountered in the Main Post area at depths of approximately 13.9 [Building 707 (LRC)] to 40.0 feet bgs (Building 1436).

Table 7-4 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
FTBL-66	No
FTBL-68	No
DAAF Fire Station	Yes
FTBL-12	Yes
Hangar 3132	Yes[1]
Hangar 3145	Yes[1]
Hangar 3151	Yes
Hangar 3232	Yes
Building 3121 (ARNG Hangar)	Yes

AOPI Name	OSD Exceedances (Yes/No)
Lewis Village Car Fire	No
Building 707 (LRC)	Yes
Building 1436 (LRC)	Yes
1980s Plane Crash	No
Old and New South Post Fire Stations	Yes
North Post Fire Station	Yes
FBNA Fire Station	Yes
Building 1495	No

Note:
1. AOPI is located upgradient of surrogate groundwater sample locations with detected concentrations of PFOS and PFOA that exceed the associated OSD tap water risks screening levels.

7.1 FTBL-66

The subsections below summarize the groundwater and surface water PFOS, PFOA, and PFBS analytical results associated with the FTBL-66 AOPI. The sampling locations and analytical results are presented on **Figure 7-2**. The groundwater and surface water analytical results are presented in **Tables 7-1** and **7-2**, respectively. A sediment sample(s) was not included in this investigation because sediment results are highly variable depending on the type of soil and the results would not provide defensible data to support an absence/presence determination for PFOS, PFOA, and PFBS.

7.1.1 Groundwater

Groundwater samples were collected from existing monitoring wells FTBL-M18-MW31, FTBL-M26-LTM-06, FTBL-M07-MW02, and FTBL-AOPC20-MW02 at FTBL-66 following low-flow purging with a peristaltic pump. The depth to groundwater ranged from 3.68 (FTBL-M26-LTM-06) to 11.05 feet bgs (FTBL-M07-MW-02).

- PFOS was detected in the four groundwater samples at concentrations ranging from 1.9 J (the analyte was positively identified but the associated numerical value is an estimated concentration only) ng/L (FTBL-M26-LTM-06-093020) to 7.0 ng/L (FTBL-M18-MW31-092920). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the four groundwater samples at concentrations ranging from 4.5 ng/L (FTBL-M26-LTM-06-093020) to 11 ng/L (FTBL-M07-MW02-100120). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in three of the four groundwater samples at concentrations ranging from 2.7 J ng/L (FTBL-M18-MW31-092920) to 5.1 ng/L (FTBL-AOPC20-MW02-092920). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.1.2 Surface Water

One grab surface water sample (FTBL-66-68-01-SW-092920) and one duplicate sample (DUP-2-093020 / FTBL-66-68-01-SW-092920) were collected from the wetland area downstream of historical firefighting training areas at FTBL-66. Surface water analytical results are being compared to the OSD tap water risk screening levels because surface water at this location may be an expression of groundwater.

- PFOS was detected in the two surface water samples at concentrations of 8.3 ng/L (FTBL-66-68-01-SW-092920) and 7.2 ng/L (DUP-2-093020 / FTBL-66-68-01-SW-092920). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the two surface water samples at concentrations of 11 ng/L (FTBL-66-68-01-SW-092920) and 9.2 ng/L (DUP-2-093020 / FTBL-66-68-01-SW-092920). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the two surface water samples at concentrations of 5.7 ng/L (FTBL-66-68-01-SW-092920) and 4.5 ng/L (DUP-2-093020 / FTBL-66-68-01-SW-092920). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.2 FTBL-68

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with the FTBL-68 AOPI. The sampling location and analytical results are presented on **Figure 7-2**. The groundwater analytical results are presented in **Table 7-1**.

7.2.1 Groundwater

Groundwater sample FTBL-FATTS-LTM-MW08-093020 was collected from existing monitoring well FATTS-LTM-MW08 at FTBL-68 following low-flow purging with a peristaltic pump. The depth to groundwater was 15.49 feet bgs.

- PFOS was not detected in the groundwater sample.
- PFOA was detected in the groundwater sample at a concentration of 2.9 J ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 5.3 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.3 DAAF Fire Station

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the DAAF Fire Station AOPI. The sampling locations and analytical results are presented on **Figure 7-3**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.3.1 Groundwater

Groundwater sample FTBL-DAAF-01-GW-092820 was collected from a DPT boring at the DAAF Fire Station following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 4.65 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 2,500 J (result reported from a secondary dilution) ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 330 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 230 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.3.2 Soil

Two soil samples and one duplicate sample were collected from the top 2 feet of native soil at an interval of 0.2 to 2.5 feet bgs (FTBL-DAAF-01-SO-092820, FTBL-DAAF-02-SO-092820, and DUP-1-092820 / FTBL-DAAF-01-SO-092820) via hand auger at the DAAF Fire Station.

- PFOS was detected in the three soil samples at concentrations ranging from 0.045 mg/kg (FTBL-DAAF-01-SO-092820) to 0.12 mg/kg (FTBL-DAAF-02-SO-092820). The detected concentrations do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFOA was detected in the three soil samples at concentrations ranging from 0.0036 mg/kg (FTBL-DAAF-01-SO-092820) to 0.0064 J- (the result is an estimated quantity; the result may be biased low) mg/kg (FTBL-DAAF-02-SO-092820). The detected concentrations do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFBS was not detected in any of the three soil samples.

7.4 FTBL-12

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the FTBL-12 AOPI. The sampling locations and analytical results are presented on **Figure 7-3**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.4.1 Groundwater

Three grab groundwater samples (FTBL-12-01-GW-09282020, FTBL-12-02-GW-09292020, and FTBL-12-03-GW-09282020) and one duplicate sample (DUP-1-GW-092820 / FTBL-12-01-GW-092820) were collected from three DPT borings at FTBL-12 following low-flow purging with a peristaltic pump. The depth to first encountered groundwater ranged from 9.52 (FTBL-12-03-GW-092820) to 13.44 feet bgs (FTBL-12-01-GW-09282020).

- PFOS was detected in the four groundwater samples at concentrations ranging from 4,300 J ng/L (FTBL-12-02-GW-092920) to 28,000 J ng/L (FTBL-12-03-GW-092820). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the four groundwater samples at concentrations ranging from 9,200 J ng/L (FTBL-12-02-GW-092920) to 52,000 ng/L (FTBL-12-03-GW-092820). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the four groundwater samples at concentrations ranging from 730 J ng/L (FTBL-12-01-GW-09282020) to 3,100 J ng/L (FTBL-12-03-GW-092820). The detected concentrations exceed the OSD tap water risk screening level (600 ng/L).

7.4.2 Soil

Two soil samples were collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-12-01-SO-092820 and FTBL-12-02-SO-092920) via hand auger at FTBL-12.

- PFOS was detected in the two soil samples at concentrations of 0.10 mg/kg (FTBL-12-01-SO-092820) and 1.2 J mg/kg (FTBL-12-02-SO-092820). One of the two detected concentrations (FTBL-12-02-SO-092820) exceeds the OSD residential risk screening level (0.13 mg/kg). The detected concentrations do not exceed the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFOA was detected in the two soil samples at concentrations of 0.044 mg/kg (FTBL-12-01-SO-092820) and 0.19 mg/kg (FTBL-12-02-SO-092820). One of the two detected concentrations (FTBL-12-02-SO-092820) exceeds the OSD residential risk screening level (0.13 mg/kg). The detected concentrations do not exceed the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFBS was detected in the two soil samples at concentrations of 0.0008 J mg/kg (FTBL-12-01-SO-092820) and 0.028 mg/kg (FTBL-12-02-SO-092820). The detected concentrations do not exceed the OSD residential risk screening level (1.9 mg/kg) or the OSD industrial/commercial risk screening level (25 mg/kg).

7.5 Hangar 3132

Hangar 3132 was reclassified as an AOPI after the two SI field events were completed. Two groundwater samples collected at the Hangar 3232 AOPI (see **Section 7.8**), located downgradient of and across the airfield from Hangar 3132, during the first SI field event had detected concentrations of PFOS and PFOA that exceed the associated OSD tap water risk screening levels. As Hangar 3132 is located upgradient of these two groundwater sample locations, these two downgradient groundwater samples are considered surrogate samples for Hangar 3132.

Remobilization to collect soil samples at Hangar 3132 was determined to be unnecessary because the analytical data for the two downgradient, surrogate groundwater samples indicate the AOPI will be recommended for further investigation in a remedial investigation.

The subsection below summarizes the groundwater PFOS, PFOA, and PFBS analytical results associated with the downgradient surrogate locations. The sampling locations and analytical results are presented on **Figure 7-4**. The groundwater analytical results are presented in **Table 7-1**.

7.5.1 Groundwater

- PFOS was detected in the two groundwater samples at concentrations of 130 ng/L (FTBL-H3232-01-GW-093020) and 1,400 J ng/L (FTBL-MW-1R-093020). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the two groundwater samples at concentrations of 59 ng/L (FTBL-H3232-01-GW-093020) and 110 ng/L (FTBL-MW-1R-093020). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the two groundwater samples at concentrations of 18 ng/L (FTBL-H3232-01-GW-093020) and 38 J- (the result is an estimated quantity; the result may be biased low) ng/L (FTBL-MW-1R-093020). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.6 Hangar 3145

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Hangar 3145 AOPI. The sampling locations and analytical results are presented on **Figure 7-4**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.6.1 Groundwater

Groundwater sample FTBL-H3145-01-GW-092920 was collected from a DPT boring at Hangar 3145 (located cross-gradient of the hangar) following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 5.71 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 28 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 8.6 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 3.8 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

A groundwater sample (FTBL-MW-1R-093020), collected from monitoring well MW-1R at the Hangar 3232 AOPI during the first SI field event, had detected concentrations of PFOS and PFOA that exceed the associated OSD tap water risk screening levels. Hangar 3145 is located across the airfield from, and upgradient of, monitoring well MW-1R; therefore, the groundwater sample collected from monitoring well MW-1R is considered a surrogate sample for Hangar 3145. The groundwater PFOS, PFOA, and PFBS analytical results associated with this downgradient surrogate location are presented below.

- PFOS was detected in the groundwater sample at a concentration of 1,400 J ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 110 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).

- PFBS was detected in the groundwater sample at a concentration of 38 J- ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.6.2 Soil

One soil sample was collected from native soil at an interval of 5 to 7 feet bgs (FTBL-H3145-01-SO-092920) from one DPT boring at Hangar 3145 via the DPT rig drill rod. This deeper sample was collected to capture soil from near Hangar 3145's oil-water separator.

- PFOS was not detected in the soil sample.
- PFOA was not detected in the soil sample.
- PFBS was not detected in the soil sample.

7.7 Hangar 3151

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Hangar 3151 AOPI. The sampling locations and analytical results are presented on **Figure 7-4**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.7.1 Groundwater

One grab groundwater sample (FTBL-H3151-01-GW-100120) was collected from one DPT boring at Hangar 3151. The depth to first encountered groundwater was 11.04 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 110 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 38 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 6.3 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.7.2 Soil

One soil sample was collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-H3151-01-SO-100120) via hand auger from a DPT boring at Hangar 3151.

- PFOS was not detected in the soil sample.
- PFOA was not detected in the soil sample.
- PFBS was not detected in the soil sample.

7.8 Hangar 3232

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with the Hangar 3232 AOPI. The sampling locations and analytical results are presented on **Figure 7-4**. The groundwater analytical results are presented in **Table 7-1**.

7.8.1 Groundwater

One grab groundwater sample (FTBL-MW-1R-093020) was collected from an existing monitoring well and one grab groundwater sample (FTBL-H3232-01-GW-093020) was collected from one DPT boring at Hangar 3232 following low-flow purging with a peristaltic pump. The depth to groundwater was 3.23 (FTBL-MW-1R-093020) and 9.73 feet bgs (FTBL-H3232-01-GW-093020, first encountered groundwater).

- PFOS was detected in the two groundwater samples at concentrations of 130 ng/L (FTBL-H3232-01-GW-093020) and 1,400 J ng/L (FTBL-MW-1R-093020). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the two groundwater samples at concentrations of 59 ng/L (FTBL-H3232-01-GW-093020) and 110 ng/L (FTBL-MW-1R-093020). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the two groundwater samples at concentrations of 18 ng/L (FTBL-H3232-01-GW-093020) and 38 J- ng/L (FTBL-MW-1R-093020). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.9 Building 3121 (ARNG Hangar)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Building 3121 (ARNG Hangar) AOPI. The sampling locations and analytical results are presented on **Figure 7-4**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.9.1 Groundwater

Three grab groundwater samples (FTBL-B3121-01-GW-100120, FTBL-B3121-02-GW-100120, and FTBL-B3121-03-GW-092920) were collected from three DPT borings at Building 3121 (ARNG Hangar) following low-flow purging with a peristaltic pump. The depth to first encountered groundwater ranged from 7.74 (FTBL-B3121-02-GW-100120) to 18.5 feet bgs (FTBL-B3121-03-GW-092920).

- PFOS was detected in the three groundwater samples at concentrations ranging from 10 ng/L (FTBL-B3121-03-GW-092920) to 26 ng/L (FTBL-B3121-01-GW-100120). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the three groundwater samples at concentrations of 3.0 J (the analyte was positively identified but the associated numerical value is an estimated concentration only) ng/L (FTBL-B3121-03-GW-092920) and 47 ng/L (FTBL-B3121-01-GW-100120). One of the three detected concentrations exceeds the OSD tap water risk screening level (40 ng/L).

- PFBS was detected in the three groundwater samples at concentrations of 4.3 ng/L (FTBL-B3121-03-GW-092920) and 8.0 ng/L (FTBL-B3121-02-GW-100120). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.9.2 Soil

Three soil samples were collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-B3121-01-SO-100120 and FTBL-B3121-02-SO-100120) or 2 to 4 feet bgs (FTBL-B3121-03-SO-100120) via hand auger from three DPT borings at Building 3121 (ARNG Hangar).

- PFOS was not detected in the three soil samples.
- PFOA was not detected in the three soil samples.
- PFBS was not detected in the three soil samples.

7.10 Lewis Village Car Fire

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Lewis Village Car Fire AOPI. The sampling locations and analytical results are presented on **Figure 7-5**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.10.1 Groundwater

One grab groundwater sample (FTBL-LVCF-01-GW-092720) was collected from a DPT boring at the site of the Lewis Village Car Fire following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 18.81 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 16 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 21 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 12 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.10.2 Soil

One soil sample was collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-LVCF-01-SO-092720) via hand auger from one DPT boring at the site of the Lewis Village Car Fire.

- PFOS was not detected in the soil sample.
- PFOA was not detected in the soil sample.
- PFBS was not detected in the soil sample.

7.11 Building 707 (LRC)

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with the Building 707 (LRC) AOPI. The sampling locations and analytical results are presented on **Figure 7-6**. The groundwater analytical results are presented in **Table 7-1**.

7.11.1 Groundwater

One grab groundwater sample (FTBL-B707-01-GW-092820) was collected from a DPT boring at Building 707 (LRC) following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 13.89 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 220 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 67 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 15 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.12 Building 1436 (LRC)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building the 1436 (LRC) AOPI. The sampling locations and analytical results are presented on **Figure 7-7**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.12.1 Groundwater

One grab groundwater sample (FTBL-B1436-01-GW-092720) was collected from a DPT boring at Building 1436 following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 39.98 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 1,400 J ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 270 J ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 460 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.12.2 Soil

Two soil samples were collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-B1436-01-092720 and FTBL-B1436-02-092720) via hand auger, one sample from a DPT boring, at Building 1436.

- PFOS was detected in the two soil samples at concentrations of 0.001 mg/kg (FTBL-B1436-02-092720) and 0.018 mg/kg (FTBL-B1436-01-092720). The detected concentrations do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFOA was detected in one of the two soil samples at a concentration of 0.0032 mg/kg (FTBL-B1436-01-092720). The detected concentration does not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFBS was not detected in the two soil samples.

7.13 1980s Plane Crash

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the 1980s Plane Crash AOPI. The sampling locations and analytical results are presented on **Figure 7-8**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.13.1 Groundwater

Two grab groundwater samples (FTBL-1980PC-01-GW-093020 and FTBL-1980PC-02-GW-093020) were collected from two DPT borings at the site of the 1980s Plane Crash following low-flow purging with a peristaltic pump. The depth to first encountered groundwater ranged from 33.81 (FTBL-1980PC-02-GW-093020) to 38.73 feet bgs (FTBL-1980PC-01-GW-093020).

- PFOS was detected in the two groundwater samples at concentrations of 11 J+ ng/L (FTBL-1980PC-01-GW-093020) and 13 J+ ng/L (FTBL-1980PC-02-GW-093020). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in one of the two groundwater samples at a concentration of 11 J- ng/L (FTBL-1980PC-02-GW-093020). The detected concentration does not exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in one of the two groundwater samples at a concentration of 2.2 J- ng/L (FTBL-1980PC-01-GW-093020). The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.13.2 Soil

Two soil samples were collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-1980PC-01-SO-093020 and FTBL-1980PC-02-SO-093020) via hand auger from two DPT borings at the site of the 1980s Plane Crash.

- PFOS was not detected in the two soil samples.
- PFOA was not detected in the two soil samples.
- PFBS was not detected in the two soil samples.

7.14 Old and New South Post Fire Stations

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Old and New South Post Fire Stations AOPI. The sampling locations and analytical results are presented on **Figure 7-9**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.14.1 Groundwater

One grab groundwater sample (FTBL-OSPFS-01-GW-092920) and a duplicate groundwater sample (DUP-3-092920 / FTBLOSPFS-01-GW-092920) were collected from a DPT boring cross-/downgradient of the Old South Post Fire Station and the New South Post Fire Station front apron following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 21.33 feet bgs.

- PFOS was detected in the two groundwater samples at concentrations of 840 J ng/L (DUP-3-092920 / FTBLOSPFS-01-GW-092920) and 1,100 J ng/L (FTBL-OSPFS-01-GW-092920). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the two groundwater samples at concentrations of 150 ng/L (DUP-3-092920 / FTBLOSPFS-01-GW-092920) and 160 ng/L (FTBL-OSPFS-01-GW-092920). The detected concentrations exceed the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the two groundwater samples at concentrations of 91 ng/L (FTBL-OSPFS-01-GW-092920) and 94 ng/L (DUP-3-092920 / FTBLOSPFS-01-GW-092920). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.14.2 Soil

Two soil samples were collected from the top 2 feet of native soil at an interval of 1 to 3 feet bgs (FTBL-OSPFS-02-SO-092920) or 2 to 4 feet bgs (FTBL-OSPFS-01-SO-092920) from two DPT borings via hand auger in the vicinity of the Old and New South Post Fire Stations.

- PFOS was detected in the two soil samples at concentrations of 0.0022 mg/kg (FTBL- OSPFS -01-SO-092920) and 0.010 mg/kg (FTBL- OSPFS -02-SO-092920). The detected concentrations do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFOA was not detected in the two soil samples.
- PFBS was not detected in the two soil samples.

7.15 North Post Fire Station

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the North Post Fire Station AOPI. The sampling locations and analytical results are presented on **Figure 7-10**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.15.1 Groundwater

One grab groundwater sample was collected from a DPT boring at the North Post Fire Station (FTBL-NPFS-01-GW-092720) following low-flow purging with a peristaltic pump. The depth to first encountered groundwater was 33.34 feet bgs.

- PFOS was detected in the groundwater sample at a concentration of 330 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the groundwater sample at a concentration of 44 ng/L. The detected concentration exceeds the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in the groundwater sample at a concentration of 21 ng/L. The detected concentration does not exceed the OSD tap water risk screening level (600 ng/L).

7.15.2 Soil

Two soil samples were collected from the top 2 feet of native soil at an interval of 0.2 to 2.5 feet bgs (FTBL-NPFS-02-SO-092720) or 1 to 3 feet bgs (FTBL-NPFS-01-SO-092720), one via hand auger and one via hand auger from a DPT boring, at the North Post Fire Station.

- PFOS was detected in the two soil samples at concentrations of 0.0021 mg/kg (FTBL-NPFS-02-SO-092720) and 0.19 mg/kg (FTBL-NPFS-01-SO-092720). One of the two detected concentrations (FTBL-NPFS-01-SO-092720) exceeds the OSD residential risk screening level (0.13 mg/kg). The detected concentration does not exceed the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFOA was not detected in the two soil samples.
- PFBS was not detected in the two soil samples.

7.16 FBNA Fire Station

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the FBNA Fire Station AOPI. The sampling locations and analytical results are presented on **Figure 7-11**. The groundwater and soil analytical results are presented in **Tables 7-1** and **7-3**, respectively.

7.16.1 Groundwater

One grab groundwater sample was collected from an existing monitoring well (FTBL-PSA2009-MW42-093020) and two grab groundwater samples (FTBL-FBNAFS-01-GW-100120 and FTBL-FBNAFS-02-GW-100120) were collected from DPT borings at the FBNA Fire Station following low-flow purging with a peristaltic pump. The depth to first encountered groundwater ranged from 17.5 (FTBL-FBNAFS-01-GW-100120) to 21.41 feet bgs (FBTL-PSA2009-MW42-093020).

- PFOS was detected in the three groundwater samples at concentrations ranging from 2.2 J (FBTL-PSA2009-MW42-093020) to 12 ng/L (FTBL-FBNAFS-01-GW-100120). The detected concentrations do not exceed the OSD tap water risk screening level (40 ng/L).
- PFOA was detected in the three groundwater samples at concentrations ranging from 2.1 J ng/L (FBTL-PSA2009-MW42-093020) to 280 ng/L (FTBL-FBNAFS-01-GW-100120). One of the three detected concentrations exceeds the OSD tap water risk screening level (40 ng/L).
- PFBS was detected in two of the three groundwater samples at concentrations of 2.7 J ng/L (FTBL-FBNAFS-01-GW-100120) and 3.4 J ng/L (FTBL-FBNAFS-02-GW-100120). The detected concentrations do not exceed the OSD tap water risk screening level (600 ng/L).

7.16.2 Soil

Three soil samples were collected from the top 2 feet of native soil at an interval of 0 to 2 feet bgs (FTBL-FBNAFS-03-SO-100120), 1 to 3 feet bgs (FTBL-FBNAFS-01-SO-100120), or 3 to 5 feet bgs (FTBL-FBNAFS-02-SO-100120), one via hand auger and the other two samples via hand auger from two DPT borings, at the FBNA Fire Station.

- PFOS was not detected in the three soil samples.
- PFOA was detected in two of the three soil samples at concentrations of 0.0011 J mg/kg (FTBL-FBNAFS-03-SO-100120) and 0.0041 mg/kg (FTBL-FBNAFS-01-SO-100120). The detected concentrations (FTBL-FBNAFS-03-SO-100120 and FTBL-FBNAFS-01-SO-100120) do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).
- PFBS was not detected in the three soil samples.

7.17 Building 1495

The subsection below summarizes the soil PFOS, PFOA, and PFBS analytical results associated with the Building 1495 AOPI. No groundwater samples were collected at this AOPI because, based on interviews during the PA site visit, there have been no known uses of the AFFF fire-suppression system (including leaks for the AFFF storage tank), and there are no known or documented leaks from PFAS-containing waste stored temporarily in Building 1495. The sampling locations and analytical results are presented on **Figure 7-12**. The soil analytical results are presented in **Table 7-3**.

7.17.1 Soil

Four soil samples were collected from the top 2 feet of native soil at an interval of 0 to 2 feet bgs (FTBL-B1495-01-SO-031021, FTBL-B1495-02-SO-031021, FTBL-B1495-03-SO-031021, and FTBL-B1495-04-SO-031021) via hand auger at Building 1495.

- PFOS was detected in three of the four soil samples at concentrations ranging from 0.0017 mg/kg (FTBL-B1495-04-SO-031021) to 0.0065 mg/kg (FTBL-B1495-02-SO-031021). The detected concentrations do not exceed the OSD residential risk screening level (0.13 mg/kg) or the OSD industrial/commercial risk screening level (1.6 mg/kg).

- PFOA was not detected in the four soil samples.
- PFBS was not detected in the four soil samples.

7.18 Investigation-Derived Waste

IDW, including soil cuttings, groundwater, surface water, and decontamination fluids were collected and placed in Department of Transportation-approved 55-gallon drums, labeled as non-hazardous, segregated by medium, and transported to an on-post staging area, the 90-day hazardous waste storage facility (Building 1495), pending characterization.

A composite sample of the purge and decontamination wastewater was collected from the two 55-gallon liquid-containing drums. The results indicated the following concentrations in the wastewater: 1,100 ng/L PFOS, 350 ng/L PFOA, and 42 ng/L PFBS (**Appendix N**). The PFOS, PFOA, and PFBS concentrations observed exceed the OSD risk screening levels. A composite sample of the soil cuttings was collected from the two 55-gallon soil-containing drums. The results indicated the following concentration in the soil: 0.0022 mg/kg PFOS; PFOA and PFBS were not detected (**Appendix N**). The PFOS concentration observed in the composite soil sample did not exceed the OSD risk screening level. The full analytical results (i.e., for all constituents analyzed) for IDW samples collected during the SI are included in **Appendix N**.

The four drums of IDW were removed from the installation on 03 November 2020, and transported to Cycle Chem, Inc. located in Lewisberry, Pennsylvania for disposal via incineration. The waste was transported as non-regulated waste on a hazardous waste manifest. The Waste Manifest is provided in **Appendix O**.

Equipment IDW includes personal protective equipment and other disposable materials (e.g., gloves, plastic sheeting, Lexan™ tubes, and high-density polyethylene and silicon tubing) that may have come in contact with sampling media. These were disposed of as municipal waste.

7.19 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. These data are included in **Appendix N**. The TOC in the soil samples ranged from 200 to 8,280 mg/kg. The TOC at this installation was lower than typical organic content in topsoil (topsoil: 5,000 to 30,000 mg/kg, desert: less than 5,000 mg/kg, organic: greater than 120,000 mg/kg). The combined percentage of fines in soils at Fort Belvoir ranged from 17.2 to 63.6% with an average of 36.0%. 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, on average 14.3%, was typical for clay. The pH of the soil was slightly acidic (average pH of 5.9). Based on these geochemical and physical soil characteristics (i.e., relatively low percentage of fines and lower TOC) observed underlying the installation during the SI, PFAS constituents are expected to be relatively more mobile at FTBL than in soils with greater percentages of fines and higher TOC.

7.20 Blanks Samples

PFOS, PFOA, and/or PFBS were not detected in any of the QA/QC samples (EBs, field blanks, source blank) collected during the SI work. The full analytical results for blank samples collected during the SI are included in **Appendix N**.

7.21 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020a) 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 and metal plating operations 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, 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, and surface water. 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. The following exposure pathway determinations apply to all CSMs:

- PFOS, PFOA, and/or PFBS were detected in groundwater at all AOPIs where groundwater was sampled (groundwater was not sampled at the Building 1495 AOPI). There are no on-post drinking water wells and FTBL has a land-use control in place that prohibits use of groundwater on the installation. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater if, for example, the existing land-use control is removed at some future date. Recreational users are not likely to contact groundwater. Therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.
- Groundwater associated with each AOPI may discharge to on-post surface water, and surface runoff at several AOPIs may flow to on-post surface water. Additionally, historical activities at FTBL-66 and FTBL-68 may have resulted in direct release of AFFF to surface water. On-post surface water bodies are not used for drinking water. On-installation site workers and residents are not likely to otherwise contact surface water and sediment in the on-post surface water bodies; therefore, these exposure pathways are incomplete for all AOPIs except FTBL-66 and FTBL-68, which are described separately below. Recreational users could contact constituents in various tributaries to the Potomac River (e.g., Accotink Creek or Accotink Creek's tributaries) through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete for all AOPIs except FTBL-66 and FTBL-68, which are described separately below.
- Groundwater associated with each AOPI may discharge to on-post surface water or directly to the Potomac River and surface runoff at several AOPIs may flow to on-post surface water. Additionally, historical activities at FTBL-66 and FTBL-68 may have resulted in direct release of AFFF to surface water. Surface water bodies at FBNA flow off post through Accotink Creek or its tributaries and Accotink Creek subsequently flows on post (Main Post) and then flows off post via discharge to the Potomac River. Surface water bodies at Main Post flow off post via discharge to the Potomac River. The Potomac River downstream of the Fall Line is tidal (i.e., brackish). Brackish water generally is not suitable for human or animal consumption. An assessment of the drinking water sources utilized by the municipal water providers in Prince William County, Virginia, and Charles County, Maryland, indicated that there are no known off-installation public drinking water system wells or surface water intakes for drinking water located downgradient of or downstream from (including the Potomac River) any of the identified AOPIs (Fairfax Water 2020; Prince William County Service Authority 2021; Charles County 2020; WSSC Water 2019). While not investigated, use of the Potomac River for drinking water by individuals living downstream of the Fall Line and within a 5-mile radius of the installation boundary (rather than utilize water provided by a public utility or a private well) is highly unlikely. Therefore, the surface water exposure pathway (via drinking water ingestion and dermal contact) for off-installation drinking water receptors is incomplete. Off-installation recreational users could contact constituents in the Potomac River or off-installation areas of Accotink Creek through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Additional exposure pathway descriptions for each CSM are listed below by figure.

Figure 7-13 shows the CSM for the FTBL-66 AOPI. Flame suppressants, including AFFF and possibly PFAS-containing animal protein foam, were used at several former designated FTAs within the FTBL-66 AOPI. AFFF was sprayed to soil and/or paved surfaces during fire training exercises.

- Soil at FTBL-66 was not analyzed for PFOS, PFOA, and PFBS. However, it is likely that PFOS, PFOA, and/or PFBS is present in soil at select locations within this AOPI, and there is the potential that site workers 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 potentially complete. This AOPI is not located in a residential or recreational area and is 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 PFBS were detected in groundwater, and groundwater originating at this AOPI flows off post (through the FBNA's southern boundary) and then back on post (through the Main Post's northern boundary). Due to the absence of land-use controls preventing potable use of groundwater in the off-post area between FBNA and Main Post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- PFOS, PFOA, and PFBS were detected in a surface water sample collected at FTBL-66 and sediment was not sampled at FTBL-66. There are no residents at FBNA; therefore, surface water and sediment exposure pathways for on-installation residents are incomplete. Surface water bodies on-post are not used for drinking water; therefore, the on-installation site worker surface water exposure via drinking water is incomplete. On-installation site workers could contact constituents in surface water or sediment at FTBL-66 in instances such as environmental monitoring or remediation in response to the PFOS, PFOA, and PFBS detections in surface water. Therefore, the surface water exposure pathways (via incidental ingestion and dermal contact) for on-installation site workers are complete and the sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation site workers are potentially complete at FTBL-66. FTBL-66 is within a restricted access area; therefore, surface water and sediment exposure pathways for on-installation recreational users are incomplete.

Figure 7-14 shows the CSM for the FTBL-68 AOPI. AFFF was used to extinguish a several-acre petroleum fire in 1968 located within the FTBL-68 AOPI (precise location is unknown).

- Soil at FTBL-68 was not analyzed for PFOS, PFOA, and PFBS. However, it is likely that PFOS, PFOA, and/or PFBS is present in soil somewhere within the AOPI, and there is the potential that site workers 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 potentially complete. Public roads bisect FTBL-68 and off-installation workers could potentially be exposed to soil at FTBL-68 during activities such as road maintenance. Therefore, the soil exposure pathway for off-installation site workers is potentially complete. This AOPI is not located in a residential or recreational area; therefore, the soil exposure pathways for on-installation and off-installation residents and recreational users are incomplete.
- PFOA and PFBS were detected in groundwater, and groundwater originating at this AOPI flows off post (through the FBNA's southern boundary) and then back on post (through the Main Post's

northern boundary). Due to the absence of land-use controls preventing potable use of groundwater in the off-post area between FBNA and Main Post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.

- Surface water and sediment were not sampled at FTBL-68. There are no residents at FBNA; therefore, surface water and sediment exposure pathways for on-installation residents are incomplete. Surface water bodies on-post are not used for drinking water; therefore, the on-installation site worker surface water exposure via drinking water is incomplete. On-installation site workers could contact constituents in surface water or sediment at FTBL-68 in instances such as environmental monitoring or remediation in response to the PFOS, PFOA, and PFBS detections in upstream surface water (at FTBL-66). Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation site workers are potentially complete at FTBL-68. FTBL-68 is within a restricted access area; therefore, surface water and sediment exposure pathways are incomplete for on-installation recreational users.

Figure 7-15 shows the CSM for the DAAF Fire Station and FTBL-12 AOPIs. Recent accidental uses (i.e., 2017 and 2019) of AFFF have been documented at both the DAAF Fire Station and the FTBL-12 FTA. AFFF has likely been stored occasionally in the fire station to allow for refilling engine AFFF reservoirs. Historically, AFFF was used during firefighter training activities conducted on the concrete training pad at the FTBL-12 AOPI, located adjacent to the DAAF Fire Station.

- PFOS and PFOA and/or PFBS were detected in soil at the DAAF Fire Station and FTBL-12 AOPIs, and site workers 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. These AOPIs are located at the airfield, are not in residential or recreational areas 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 PFBS were detected in groundwater and groundwater originating at this AOPI group does not flow off post. Groundwater flows to Accotink Creek and then discharges to the Potomac River. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.

Figure 7-16 shows the CSM for the Hangar 3145, Hangar 3151, and Building 3121 (ARNG Hangar) AOPIs. Each of these hangars has a fire-suppression system that currently utilizes, or historically utilized, AFFF. There are no known uses (via operation of the system or leaks) from the current or former AFFF-containing fire-suppression systems in these hangars. However, there are gaps in historical knowledge and historical uses cannot be ruled out.

- PFOS, PFOA, and PFBS were not detected in soil at Hangar 3145, Hangar 3151, and Building 3121. Therefore, the soil exposure pathways for all receptors are incomplete.
- PFOS, PFOA, and PFBS were detected in groundwater at or downgradient of these AOPIs and groundwater originating at these AOPIs does not flow off post. Groundwater flows to Accotink Creek and then discharges to the Potomac River. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is incomplete.

Figure 7-17 shows the CSM for the Building 707 (LRC), Hangar 3132, and Hangar 3232 AOPIs. Fire engine maintenance historically has been performed at Building 707 (LRC) (undergoing renovation since 2014 and not currently in operation; was still undergoing renovation during the 2019 site visit). Incidental uses and spills of AFFF to paved surfaces were likely during engine maintenance and AFFF tank reservoir refilling activities. Hangar 3132 and Hangar 3232 each has a fire-suppression system that currently utilizes, or historically utilized, AFFF. There are no known uses (via operation of the system or leaks) from the current or former AFFF-containing fire-suppression systems, and the hangars do not have an oil-water separator. However, there are gaps in historical knowledge and historical uses cannot be ruled out. Additionally, initial acceptance testing of the hangars (before they were occupied) likely would have involved use of the AFFF fire-suppression system, resulting in an AFFF use.

- Soil samples were not collected at the Building 707 (LRC), Hangar 3132, or Hangar 3232 AOPIs. In the absence of soil data, it is assumed site workers 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 potentially complete. These AOPIs are not in residential or recreational areas 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 PFBS were detected in groundwater at or downgradient of these AOPIs. Groundwater originating at the Hangar 3132 and Hangar 3232 AOPIs flows to Accotink Creek and then discharges to the Potomac River. Groundwater originating at the Building 707 (LRC) AOPI flows to an unnamed creek and then discharges to the Potomac River or flows to the Potomac River. Therefore, the groundwater exposure pathway for off-installation receptors for these AOPIs is incomplete.

Figure 7-18 shows the CSM for the Lewis Village Car Fire AOPI. AFFF was used in a car fire response in Lewis Village, an on-post residential community, in 2019. Approximately 5 to 10 gallons of AFFF and approximately 250 gallons of water were discharged during this firefighting activity. Cracked concrete/asphalt and adjoining grassy areas were impacted.

- PFOS, PFOA, and PFBS were not detected in soil at the Lewis Village Car Fire AOPI. Therefore, the soil exposure pathways for all receptors are incomplete.
- PFOS, PFOA, and PFBS were detected in groundwater and groundwater originating at this AOPI likely flows off post through the installation's eastern boundary to Dogue Creek. Due to the likely absence of land-use controls preventing potable use of groundwater beyond the eastern installation boundary, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.

Figure 7-19 shows the CSM for the 1980s Plane Crash AOPIs. AFFF was likely used in response to a plane crash on the southeast end of the DAAF runway sometime in the 1980s. At the time of the crash, the runway was shorter. The exact location of the crash is estimated. The use of AFFF, and the fire engine staging location(s) and spray directions are unknown. If AFFF was used, it was sprayed to the paved runway surface and soil (or flowed to soil) during the fire response.

- PFOS, PFOA, and PFBS were not detected in soil at the 1980s Plane Crash AOPI. Therefore, the soil exposure pathways for all receptors are incomplete.

- PFOS, PFOA, and PFBS were detected in groundwater and groundwater originating at this AOPI flows to Accotink Creek, or a tributary of Accotink Creek, and then discharges off installation into the Potomac River. Therefore, the groundwater exposure pathway for off-installation receptors for these AOPIs incomplete.

Figure 7-20 shows the CSM for the Building 1436 (LRC), Old and New South Post Fire Stations, North Post Fire Station, and Building 1495 AOPIs. AFFF may have been historically released to soil and paved surfaces at the Building 1436 (LRC) and Old and New South Post Fire Stations during AFFF storage, refilling, or spills at these AOPIs. AFFF may have been historically released to soil and paved surfaces at Building 1495, a storage facility with a fire-suppression system that includes a 55-gallon AFFF tank. No known uses of AFFF have occurred at Building 1495.

- PFOS and/or PFOA were detected in soil at the Building 1436 (LRC), Old and New South Post Fire Stations, North Post Fire Station, and Building 1495 AOPIs, and site workers 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. These AOPIs are not in residential or recreational areas 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 PFBS were detected in groundwater at the Building 1436 (LRC), Old and New South Post Fire Stations, and the North Post Fire Station AOPIs. Groundwater was not sampled at Building 1495. Groundwater originating at these AOPIs flows to a creek and then discharges off installation into the Potomac River or flows directly to and discharges into the Potomac River. Therefore, the groundwater exposure pathway for off-installation receptors for these AOPIs is incomplete.

Figure 7-21 shows the CSM for the FBNA Fire Station AOPI. AFFF historically may have been released to soil and paved surfaces during AFFF storage and/or AFFF refilling activities at this AOPI.

- PFOA was detected in soil at the FBNA Fire Station. Site workers 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. This AOPI is not in a residential or recreational area and is 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 PFBS were detected in groundwater at the FBNA Fire Station. Groundwater originating at the FBNA Fire Station flows south-southwest and south-southeast to tributaries of Accotink Creek, which then flows off post through the FBNA southern boundary before flowing back on installation at the Main Post northern installation boundary, and then discharges to the Potomac River. Groundwater originating at the FBNA Fire Station AOPI also flows off post through the installation's northern boundary. Due to the absence of land-use controls preventing potable use of groundwater beyond the installation boundary, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.

Following the SI sampling, all 17 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 CONCLUSIONS AND RECOMMENDATIONS

The PFAS PA/SI included two distinct efforts. The PA identified AOPIs at FTBL 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 2018b). 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 FTBL. Following the evaluation, 17 AOPIs were identified.

There are no on-post production wells used for drinking water and land-use controls are in place that prevent the current and future use of groundwater beneath FTBL for drinking water. Post-treatment drinking water purchased by FTBL from Fairfax Water has been analyzed annually from 2013 to 2015 for PFOS and PFOA constituents at the Fairfax Water distribution points. PFOS and PFOA were not detected at or above the minimum reportable level (40 ng/L and 20 ng/L, respectively) in any of the samples. It cannot be verified that historical sample collection or laboratory analysis for PFAS constituents was conducted in accordance with best practices for PFAS sampling to obtain technically defensible/usable data (i.e., not affected by sampling methods and procedures).

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

All 17 AOPIs had detections of PFOS, PFOA, and PFBS in groundwater, soil, and/or surface water (includes AOPIs for which downgradient, surrogate groundwater were utilized). Ten of the AOPIs have media detections that exceed OSD risk screening levels. Based on the PA/SI results, the majority of OSD risk screening level exceedances at FTBL can be attributed to historical and present fire station management and firefighter training activity, as well as fire truck maintenance activities. Groundwater samples collected from 15 of the 17 AOPIs had detected concentrations of PFOS, PFOA, and/or PFBS (no groundwater sample(s) was collected at one AOPI). Ten of these 15 AOPIs had a detected groundwater concentration of PFOS and/or PFOA that exceeded the OSD tap water risk screening level (40 ng/L). At one AOPI (FTBL-12), the groundwater samples had detected concentrations of PFBS exceeding the OSD tap water risk screening level (600 ng/L). The maximum groundwater concentrations of PFOS, PFOA, and PFBS were detected at FTBL-12 (former Fire Training Area) with concentrations of 28,000 J ng/L, 52,000 ng/L, and 3,100 J ng/L, respectively. The AOPI with the second highest groundwater concentrations of PFOS and PFOA was the DAAF Fire Station, which is located adjacent to FTBL-12 (PFOS, PFOA, and PFBS were detected at concentrations of 2,500 J ng/L, 330 ng/L, and 230 ng/L, respectively).Surface water samples (including duplicate) collected from AOPI FTBL-66 had detected concentrations of PFOS, PFOA, and PFBS that did not exceed the OSD risk screening levels of 40 ng/L and 600 ng/L, respectively. The maximum detected groundwater concentrations of PFOS, PFOA, and PFBS at FTBL-66 were 8.3 ng/L, 11 ng/L, and 5.7 ng/L, respectively.

Soil samples collected from seven of the 12 sampled AOPIs had detected concentrations of PFOS, PFOA, and/or PFBS (no soil samples were collected at five AOPIs). Soil concentrations of PFOS and/or PFOA at AOPIs FTBL-12 and the North Post Fire Station exceed the OSD residential risk screening level (0.13 mg/kg) but were below the industrial/commercial risk screening level (1.6 mg/kg). None of the detected concentrations of PFBS in the soil samples exceed the PFBS OSD residential risk screening level (1.9 mg/kg). The maximum soil concentrations of PFOS, PFOA, and PFBS were detected at FTBL-12 with concentrations of 1.2 J mg/kg, 0.19 mg/kg, and 0.028 mg/kg, respectively. The AOPI with the second highest soil concentration(s) of PFOS, PFOA, or PFBS is the North Post Fire Station (PFOS was detected at a concentration of 0.19 mg/kg; PFOA and PFBS were not detected). Following the SI sampling, all of the 17 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.

Following the SI sampling, all of the 17 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways. The following exposure pathways are considered complete or potentially complete:

- The soil exposure pathways for on-installation site workers are complete at seven AOPIs, potentially complete for on-installation site workers at five AOPIs, and potentially complete for off-installation site workers at one AOPI.
- The groundwater exposure pathways (via drinking water ingestion and dermal contact) are potentially complete for on-installation site workers and residents at all 17 AOPIs and potentially complete for off-installation receptors at four AOPIs.
- The surface water exposure pathways (via incidental ingestion and dermal contact) are complete for on-installation site workers at one AOPI and potentially complete at one AOPI, potentially complete for on-installation recreational users at 15 AOPIs, and potentially complete for off-installation recreational users at all 17 AOPIs.
- The sediment exposure pathways (via incidental ingestion and dermal contact) are potentially complete for on-installation site workers at two AOPIs and potentially complete for on-installation recreational users at 15 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 the SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the AOPIs identified at FTBL, PFOS, PFOA, and PFBS sampling and recommendations for each AOPI. Further investigation is warranted at FTBL. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1 Summary of AOPIs Identified During the PA, PFOS, PFOA, and PFBS Sampling at FTBL, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SW	
FTBL-66	No	NS	No	No action at this time
FTBL-68	No	NS	NS	No action at this time
DAAF Fire Station	Yes	No	NS	Further study in remedial investigation
FTBL-12	Yes	Yes	NS	Further study in remedial investigation
Building 3121 (ARNG Hangar)	Yes	ND	NS	Further study in a remedial investigation
Hangar 3132[1]	Yes[2]	NS	NS	Further study in a remedial investigation
Hangar 3145	Yes[2]	ND	NS	Further study in a remedial investigation
Hangar 3151	Yes	ND	NS	Further study in a remedial investigation
Hangar 3232	Yes	NS	NS	Further study in a remedial investigation
Lewis Village Car Fire	No	ND	NS	No action at this time
Building 707 (LRC)	Yes	NS	NS	Further study in a remedial investigation
Building 1436 (LRC)	Yes	No	NS	Further study in remedial investigation
1980s Plane Crash	No	ND	NS	No action at this time
Old and New South Post Fire Stations	Yes	No	NS	Further study in remedial investigation
North Post Fire Station	Yes	Yes	NS	Further study in remedial investigation
FBNA Fire Station	Yes	No	NS	Further study in remedial investigation

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SW	
Building 1495	NS[3]	No	NS	No action at this time

Notes:
1 Hangar 3132 was reclassified as an AOPI after the SI field events (November and December 2020 and March 2021) were completed.
2 Downgradient surrogate groundwater samples have PFOS and PFOA concentrations that exceed the associated OSD risks screening levels.
3 No groundwater sample was collected because there was no groundwater monitoring well located downgradient of this AOP. There is no indication from the PA site visit interviews and/or document review that there had been a use of AFFF-containing fire-suppression system or other PFOS, PFOA, and/or PFBS containing waste stored in Building 1495 to warrant drilling to groundwater and collecting a groundwater sample as part of the SI.
Light gray shading – detection greater than the OSD risk screening level
GW – groundwater
ND – non-detect
NS – not sampled
SO – soil
SW – surface water

Data collected during the PA (**Sections 3** through **5**) and SI (**Sections 6** through **7**) were sufficient to draw the conclusions and recommendations summarized above. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at FTBL 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.

Additionally, while the operations at facility types such as paint booths, photo processing labs, automotive service shops, or car washes can sometimes involve use, storage, and/or disposal of PFAS-containing material (e.g., in paints, lubricants/oils, or car wash products), information obtained during the PA (i.e., personnel interviews and/or records) regarding the associated materials did not indicate that PFAS-containing materials were used, stored, or disposed at those facilities. These facilities were therefore not retained for further investigation at this time. The potential secondary PFOS, PFOA, and PFBS source areas where it is unknown if PFAS-containing products were used, stored, or disposed (e.g., paint booths, automotive service or car wash shops, landfills) were not sampled as part of the SI at FTBL.

Shallow groundwater flow directions at the FTBL-66 and FTBL-68 AOPIs were sourced from a documented potentiometric study (TriEco Tetra Tech, Joint Venture 2019). For the remaining AOPIs

where shallow groundwater flow direction has not been determined through direct measurements, flow direction is inferred to be towards surface water bodies (Plexus 2021). In most instances, these surface water bodies are tributaries or drainage swales that discharge to Accotink Creek and ultimately to the Potomac River. There is uncertainty about shallow groundwater flow directions at most of the AOPIs, which may be of potential concern if the AOPI is located close to the installation boundary and there is an OSD tap water or residential or commercial/industrial soil risk screening level exceedance. Even though potential off-post sources for the use, storage, and/or disposal of PFAS-containing materials in the vicinity of FTBL are identified in **Section 4.3**, no exhaustive search was performed to identify off-post potential or suspected sources or locations for the use, storage, and/or disposal of PFAS-containing materials.

A comprehensive private 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 EDR report (**Appendix E**) and off-post well data were obtained from the State of Virginia.

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 review, installation personnel interviews, and site reconnaissance.

Finally, the available PFOS, PFOA, and PFBS analytical data are limited to the groundwater, surface water, and soil samples collected during the FTBL SI. The groundwater analytical data collected in 2017 from five monitoring wells during a groundwater investigation at FTBL-66 (TriEco Tetra Tech, Joint Venture 2019) were not included in the recommendations made in this SI. There are no on-post drinking water well sources. Available data, including PFOS, PFOA, and/or PFBS, are listed in **Appendix N**, which were analyzed per the selected analytical method.

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

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ACRONYMS

%	percent
AFFF	aqueous film-forming foam
AOPC	area of potential concern
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DAAF	Davison Army Airfield
DoD	Department of Defense
DPT	direct-push technology
DPW	Directorate of Public Works
DQO	data quality objective
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
EWG	Environmental Working Group
Fairfax Water	Fairfax County Water Authority
FBNA	Fort Belvoir North Area
FCR	Field Change Report
FTA	fire training area
FTBL	United States Army Garrison Fort Belvoir
GIS	geographic information system
GW	groundwater
HDPE	high-density polyethylene
HQAES	Headquarters Army Environmental System

ID	identification
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
LRC	Logistics Readiness Center
mg/kg	milligrams per kilogram (parts per million)
ND	non-detect
ng/L	nanograms per liter (parts per trillion)
NS	not sampled
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
Plexus	Plexus Scientific Corporation
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RSL	Regional Screening Level
SDS	Safety Data Sheet
SI	site inspection
SO	soil

SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SW	surface water
TGI	technical guidance instruction
TOC	total organic carbon
UCMR3	third Unregulated Contaminant Monitoring Rule
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

TABLES

Table 2-1 - Historical PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Location		EP001 Drinking Water Sampling Port near intersection of Telegraph Road and Beulah Road				James J. Corbalis Water Treatment Plant				Fred P. Griffith Water Treatment Plant
Sample ID		TelegraphIntertEP AM	TelegraphIntertEP AM	TelegraphIntertEP AM	TelegraphIntertEP AM	FW13070212-01	FW13070212-02	FW13070212-03	FW13070212-04	FW13070212-05
Sample Date		Quarterly sample, no date	Quarterly sample, no date	Quarterly sample, no date	Quarterly sample, no date	NA	NA	NA	NA	NA
Chemical name	OSD Risk Screening Level* in ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorooctanoic acid (PFOA)	40	<20	<20	<20	<20	<20	<20	<20	<20	<20
Perfluorobutanesulfonic acid (PFBS)[1]	600	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane sulfonate (PFOS)	40	<40	<40	<40	<40	<40	<40	<40	<40	<40

Table 2-1 - Historical PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Location		James J. Corbalis Water Treatment Plant				Fred P. Griffith Water Treatment Plant	James J. Corbalis Water Treatment Plant				Fred P. Griffith Water Treatment Plant
Sample ID		FW13121937-01	FW13121937-02	FW13121937-03	FW13121937-04	FW13121938-01	FW14032661-01	FW14032661-02	FW14032661-03	FW14032661-04	FW14032662-01
Sample Date		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical name	OSD Risk Screening Level* in ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorooctanoic acid (PFOA)	40	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Perfluorobutanesulfonic acid (PFBS)[1]	600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane sulfonate (PFOS)	40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40

Table 2-1 - Historical PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Location		James J. Corbalis Water Treatment Plant				Fred P. Griffith Water Treatment Plant	EP001 Drinking Water Sampling Port near intersection of Telegraph Road and Beulah Road			
Sample ID		FW13092592-01	FW13092592-02	FW13092592-03	FW13092592-04	FW13092593-01	TelegraphIntertEPAM	TelegraphIntertEPAM	TelegraphIntertEPAM	TelegraphIntertEPAM
Sample Date		10/15/2013	10/15/2013	10/15/2013	10/15/2013	10/15/2013	4/9/2014	7/7/2014	10/1/2014	1/7/2015
Chemical name	OSD Risk Screening Level* in ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorooctanoic acid (PFOA)	40	<20	<20	<20	<20	<20	<20	<20	<20	<20
Perfluorobutanesulfonic acid (PFBS)[1]	600	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctane sulfonate (PFOS)	40	<40	<40	<40	<40	<40	<40	<40	<40	<40

Table 2-1 - Historical PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Location		FTBL-66[2]					
Sample ID		M18-MW34-011117 Grab Groundwater	M18-MW32-011117 Grab Groundwater	ROPC20-MW02-011117 Grab Groundwater	M18-MW38-011117 Grab Groundwater	M18-MW38P-011117 Grab Groundwater	M18-MW31-011117 Grab Groundwater
Sample Date		1/11/2017	1/11/2017	1/12/2017	1/12/2017	1/12/2017	1/12/2017
Chemical name	OSD Risk Screening Level* in ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Perfluorooctanoic acid (PFOA)	40	2	5	12	1 J	1 J	9
Perfluorobutanesulfonic acid (PFBS)[1]	600	1 J	2 J	3	1 J	2 J	5
Perfluorooctane sulfonate (PFOS)	40	6 U	2 J	3 J	6 U	6 U	8

Table 2-1 - Historical PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Notes and Acronyms:
* OSD risk screening level for tap water. To be conservative, the OSD tap water risk screening levels will be used to compare all groundwater and potable-use surface water for this Army PFAS PA/SI program.
[1] Chemical reported as Perfluorobutanesulfonate in FTBL-66 laboratory analytical report.
[2] These samples were analyzed using USEPA Method 537, Revision 1.1.
Units are provided in nanograms per liter (ng/L)
ID = identification
LOQ = The lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias
MDL/DL = The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results
NA = not available
ng/L = nanograms per liter
OSD = Office of the Secretary of Defense
RL = The smallest concentration of a chemical that can be reported by a laboratory

Qualifier Descriptions:
J = estimated value is greater or equal to the method detection limit ([MDL]/detection limit [DL]) and less than the limit of quantitation ([LOQ]/reporting limit [RL])
U = Analyte was not detected at the value indicated
< = indicates the sample concentration was less than the minimum reportable level

Sources:
American Water Works. 2016. American Water Fort Belvoir UCMR 3 Results, 2014-2015 (internal document).
Army. 2018. IMCOM UCMR3 2013 PFOA PFOS Testing Report. 20 August.
TriEco Tetra Tech, Joint Venture. 2019. Final Data Gap Investigation Report FTBL-66 (Fire Training Area), North Area, Fort Belvoir, Virginia. February.

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Area of Potential Interest	Sampling Location ID[1]	September/ October 2020 Total Well Depth	Measuring Point Elevation	Measuring Point[2]	September/ October 2020 Depth to Groundwater	September/ October 2020 Groundwater Elevation	Screened Interval	Casing Diameter	Well Completion	Dedicated Bladder Pump
		(ft bgs)	(ft amsl)	(TOC/GS)	(ft)	(ft amsl)	(ft bgs)	(in)		(Y/N)
FTBL-66	FTBL-M07-MW02	27.8	NM	GS	11.05	NC	NA	2	Stick Up	N
	FTBL-M18-MW31	15.2	177.91	TOC	3.91	174.0	NA	2	Stick Up	N
	FTBL-M26-LTM-06	22.75	175.48	TOC	3.68	171.8	10 - 20	2	Stick Up	N
	FTBL-AOPC20-MW02	23.6	176.48	TOC	5.13	171.4	NA	2	Stick Up	N
FTBL-68	FTBL-FATTS-LTM-MW08	19.25	175.89	TOC	15.49	160.4	NA	2	Flush Mount	N
DAAF Fire Station	FTBL-DAAF-01-GW	20	NM	GS	4.65	NC	14 - 18	1	NA	N
FTBL-12	FTBL-12-01-GW	18	NM	GS	13.44	NC	14 - 18	1	NA	N
	FTBL-12-02-GW	18	NM	GS	13.04	NC	14 - 18	1	NA	N
	FTBL-12-03-GW	16	NM	GS	9.52	NC	12 - 16	1	NA	N
Building 3121 (ARNG Hangar)	FTBL-B3121-01-GW	14	NM	GS	8.74	NC	10 - 14	1	NA	N
	FTBL-B3121-02-GW	14	NM	GS	7.74	NC	10 - 14	1	NA	N
	FTBL-B3121-03-GW	21.5	NM	GS	18.5	NC	17.5 - 21.5	1	NA	N
Hangar 3145	FTBL-H3145-01-GW	10	NM	GS	5.71	NC	5 - 9	1	NA	N
Hangar 3151	FTBL-H3151-01-GW	14	NM	GS	11.04	NC	10 - 14	1	NA	N

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Area of Potential Interest	Sampling Location ID[1]	September/ October 2020 Total Well Depth	Measuring Point Elevation	Measuring Point[2]	September/ October 2020 Depth to Groundwater	September/ October 2020 Groundwater Elevation	Screened Interval	Casing Diameter	Well Completion	Dedicated Bladder Pump
		(ft bgs)	(ft amsl)	(TOC/GS)	(ft)	(ft amsl)	(ft bgs)	(in)		(Y/N)
Hangar 3232	FTBL-H3232-01-GW	14	NM	GS	9.73	NC	10 - 14	1	NA	N
	FTBL-MW-1R	20	NM	TOC	3.23	NC	4.5 - 19.5	2	NA	N
Lewis Village Car Fire	FTBL-LVCF-01-GW	23	NM	GS	18.81	NC	19-23	1	NA	N
Building 707 (LRC)	FTBL-B707-01-GW	18	NM	TOC	13.89	NC	14 - 18	1	NA	N
Building 1436 (LRC)	FTBL-B1436-01-GW	51	NM	GS	39.98	NC	45 - 49	1	NA	N
1980s Plane Crash	FTBL-1980PC-01-GW	45	NM	GS	38.7	NC	40.5 - 44.5	1	NA	N
	FTBL-1980PC-02-GW	38	NM	GS	33.81	NC	34 - 38	1	NA	N
Old and New South Post Fire Stations	FTBL-OSPFS-01-GW	23	NM	GS	21.33	NC	19-23	1	NA	N
North Post Fire Station	FTBL-NPFS-01-GW	42	NM	GS	33.34	NC	38 - 42	1	NA	N
FBNA Fire Station	FTBL-FBNAFS-01-GW	19	NM	GS	17.5	NC	15 - 19	1	NA	N
	FTBL-FBNAFS-02-GW	24	NM	GS	20.11	NC	20 - 24	1	NA	N
	FTBL-PSA2009-MW42	29.9	NM	TOC	21.41	NC	23 - 33	2	Stick Up	N

Notes:

1. Permanent wells were not installed at the direct push technology (DPT) sampling locations (location IDs end in "-GW"). The total depth listed indicates the total depth of the temporary borehole; the screened interval listed for DPT sampling points indicates the interval at which the drill casing was retracted for collection of a grab groundwater sample through a decontaminated screen-point sampler.

2. Unless otherwise documented on the purge log, the measuring point (MP) for existing monitoring wells is assumed to be top of casing (TOC) and the MP for DPT borings is assumed to be ground surface (GS).

Acronyms/Abreviations:

amsl = above mean sea level
ARNG = Army National Guard
bgs = below ground surface
DAAF = Davison Army Airfield
DPT = direct-push techology
FBNA = Fort Belvoir North Area
ft = feet
FTBL= Fort Belvoir
GS = ground surface
GW = Groundwater
in = inches
ID = identification
LRC = Logistics Readiness Center
MP = measuring point
MW = Monitoring well
NA = not available/not applicable
NC = not calculated
NM = not measured (not surveyed)
TOC = top of casing
Y/N = yes/no

Sources:

AECOM. 2020. Final FTBL-68: Semi-Annual Event #3 Groundwater Monitoring Report. January.
Arcadis. 2020a. Final UFP QAPP Addendum, Revision 0, USAEC PFAS PA/SI, Fort Belvoir, Virginia. September.
FTBL Groundwater Sample Logs (See Appendix K - Site Inspection Field Forms).
TriEco Tetra Tech, Joint Venture. 2019. Final Data Gap Investigation Report, FTBL-66 (Fire Training Area), North Area, Fort Belvoir, Virginia. February.

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tap Water Risk Screening Level	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
FTBL-66	FTBL-M18-MW31-092920	9/29/2020	N	**7.0**		**8.4**		**2.7**	J
	FTBL-M26-LTM-06-093020	9/30/2020	N	**1.9**	J	**4.5**		3.6	U
	FTBL-M07-MW02-100120	10/1/2020	N	**2.5**	J	**11**		**2.8**	J
	FTBL-AOPC20-MW02-092920	9/29/2020	N	**3.8**		**10**		**5.1**	
FTBL-68	FTBL-FATTS-LTM-MW08-093020	9/30/2020	N	3.6	U	**2.9**	J	**5.3**	
DAAF Fire Station	FTBL-DAAF-01-GW-092820	9/28/2020	N	**2,500**	J	**330**		**230**	
FTBL-12	FTBL-12-01-GW-09282020	9/28/2020	N	**6,200**	J	**12,000**	J	**730**	J
	DUP-1-GW-092820 / FTBL-12-01-GW-092820	9/28/2020	FD	**5,900**	J	**12,000**	J	**740**	J
	FTBL-12-02-GW-092920	9/29/2020	N	**4,300**	J	**9,200**	J	**1,600**	
	FTBL-12-03-GW-092820	9/28/2020	N	**28,000**	J	**52,000**		**3,100**	J
Hangar 3145	FTBL-H3145-01-GW-092920	9/29/2020	N	**28**		**8.6**		**3.8**	
Hangar 3151	FTBL-H3151-01-GW-100120	10/1/2020	N	**110**		**38**		**6.3**	
Hangar 3232	FTBL-H3232-01-GW-093020	9/30/2020	N	**130**		**59**		**18**	
	FTBL-MW-1R-093020	9/30/2020	N	**1,400**	J	**110**		**38**	J-

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tap Water Risk Screening Level	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Building 3121 (ARNG Hangar)	FTBL-B3121-01-GW-100120	10/1/2020	N	**26**		**47**		**7.5**	
	FTBL-B3121-02-GW-100120	10/1/2020	N	**19**	J+	**14**		**8.0**	
	FTBL-B3121-03-GW-092920	9/29/2020	N	**10**		**3.0**	J	**4.3**	
Lewis Village Car Fire	FTBL-LVCF-01-GW-092720	9/27/2020	N	**16**		**21**		**12**	
Building 707 (LRC)	FTBL-B707-01-GW-092820	9/28/2020	N	**220**		**67**		**15**	
Building 1436 (LRC)	FTBL-B1436-01-GW-092720	9/27/2020	N	**1,400**	J	**270**	J	**460**	
1980s Plane Crash	FTBL-1980PC-01-GW-093020	9/30/2020	N	**11**	J+	4.2	UJ-	**2.2**	J-
	FTBL-1980PC-02-GW-093020	9/30/2020	N	**13**	J+	**11**	J-	6.7	UJ-
Old and New South Post Fire Stations	FTBL-OSPFS-01-GW-092920	9/29/2020	N	**1,100**	J	**160**		**91**	
	DUP-3-092920 / FTBLOSPFS-01-GW-092920	9/29/2020	FD	**840**	J	**150**		**94**	
North Post Fire Station	FTBL-NPFS-01-GW-092720	9/27/2020	N	**330**		**44**		**21**	
FBNA Fire Station	FTBL-FBNAFS-01-GW-100120	10/1/2020	N	**12**		**280**		**2.7**	J
	FTBL-FBNAFS-02-GW-100120	10/1/2020	N	**7.5**		**16**		**3.4**	J
	FBTL-PSA2009-MW42-093020	9/30/2020	N	**2.2**	J	**2.1**	J	3.5	U

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 Office of the Secretary of Defense (OSD) risk screening levels for tap water (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).

Acronyms/Abbreviations:
-- = not applicable
% = percent
AOPI = area of potential interest
ARNG = Army National Guard
DAAF = Davison Army Airfield
FBNA = Fort Belvoir North Area
FD = field duplicate sample
FTBL = U.S. Army Garrison Fort Belvoir
GW = Groundwater
ID = identification
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutane sulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
Qual = qualifier

Qualifier Description:
J = The analyte was positively identified but 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).
UJ- = The analyte was analyzed for but was not detected. The reported LOQ is approximate and may be inaccurate or imprecise.

Table 7-2 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Tap Water Risk Screening Level	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
FTBL-66	FTBL-66-68-01-SW-092920	9/29/2020	N	**8.3**		**11**		**5.7**	
	DUP-2-093020 / FTBL-66-68-01-SW-092920	9/29/2020	FD	**7.2**		**9.2**		**4.5**	

Notes:

1. **Bolded** values indicate the result was detected greater than the limit of detection.
2. Data compared to the Office of the Secretary of Defense (OSD) risk screening levels for tap water (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
FTBL = U.S. Army Garrison Fort Belvoir
ID = identification
LRC = Logistics Readiness Center
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutane sulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
SW = surface water
Qual = qualifier

Table 7-3 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/Parent 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
DAAF Fire Station	FTBL-DAAF-01-SO-092820	9/28/2020	N	**0.045**		**0.0036**		0.0012	U
	DUP-1-092820 / FTBL-DAAF-01-SO-092820	9/28/2020	FD	**0.066**		**0.0051**		0.0013	U
	FTBL-DAAF-02-SO-092820	9/28/2020	N	**0.12**		**0.0064**	J-	0.0012	U
FTBL-12	FTBL-12-01-SO-092820	9/28/2020	N	**0.10**		**0.044**		**0.0008**	J
	FTBL-12-02-SO-092920	9/29/2020	N	**1.2**	J	**0.19**		**0.028**	
Hangar 3145	FTBL-H3145-01-SO-092920	9/29/2020	N	0.0010	U	0.0010	U	0.0010	U
Hangar 3151	FTBL-H3151-01-SO-100120	10/1/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 3121 (ARNG Hangar)	FTBL-B3121-01-SO-100120	10/1/2020	N	0.0012	U	0.0012	U	0.0012	U
	FTBL-B3121-02-SO-100120	10/1/2020	N	0.00098	U	0.00098	U	0.00098	U
	FTBL-B3121-03-SO-092920	9/29/2020	N	0.0011	U	0.0011	U	0.0011	U

Table 7-3 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/Parent 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
Lewis Village Car Fire	FTBL-LVCF-01-SO-092720	9/27/2020	N	0.0011	U	0.0011	U	0.0011	U
Building 1436	FTBL-B1436-01-SO-092720	9/27/2002	N	**0.018**		**0.0032**		0.00095	U
	FTBL-B1436-02-SO-092720	9/27/2020	N	**0.0010**	J	0.0011	U	0.0011	U
1980s Plane Crash	FTBL-1980PC-01-SO-093020	9/30/2020	N	0.0014	U	0.0014	U	0.0014	U
	FTBL-1980PC-02-SO-093020	9/30/2020	N	0.0012	U	0.0012	U	0.0012	U
Old and New South Post Fire Stations	FTBL-OSPFS-01-SO-092920	9/29/2020	N	**0.0022**		0.0012	U	0.0012	U
	FTBL-OSPFS-02-SO-092920	9/29/2020	N	**0.010**		0.0010	U	0.0010	U
North Post Fire Station	FTBL-NPFS-01-SO-092720	9/27/2020	N	**0.19**		0.0012	U	0.0012	U
	FTBL-NPFS-02-SO-092720	9/27/2020	N	**0.0021**		0.0012	U	0.0012	U

Table 7-3 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

AOPI	Sample/Parent 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
FBNA Fire Station	FTBL-FBNAFS-01-SO-100120	10/1/2020	N	0.0012	U	**0.0041**		0.0012	U
	FTBL-FBNAFS-02-SO-100120	10/1/2020	N	0.0010	U	0.0010	U	0.0010	U
	FTBL-FBNAFS-03-SO-100120	10/1/2020	N	0.0012	U	**0.0011**	J	0.0012	U
Building 1495	FTBL-B1495-01-SO-031021	3/10/2021	N	0.0012	U	0.0012	U	0.0012	U
	FTBL-B1495-02-SO-031021	3/10/2021	N	**0.0065**		0.0011	U	0.0011	U
	FTBL-B1495-03-SO-031021	3/10/2021	N	**0.0020**		0.00096	U	0.00096	U
	FTBL-B1495-04-SO-031021	3/10/2021	N	**0.0017**		0.0011	U	0.0011	U

Table 7-3 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection.
2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for both the residential as well as the industrial/commercial scenarios (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.)
3. Gray-shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2021). There were no soil detections above the industrial/commercial scenario risk screening level.

Acronyms/Abbreviations:
-- = not applicable/not analyzed
AOPI = area of potential interest
ARNG = Army National Guard
DAAF = Davison Army Airfield
FBNA = Fort Belvoir North Area
FD = field duplicate sample
FTBL = United States Army Garrison Fort Belvoir
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
SO = soil

Qualifier Descriptions:
J = The analyte was positively identified but 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).

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

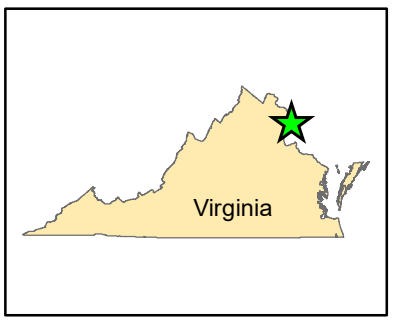
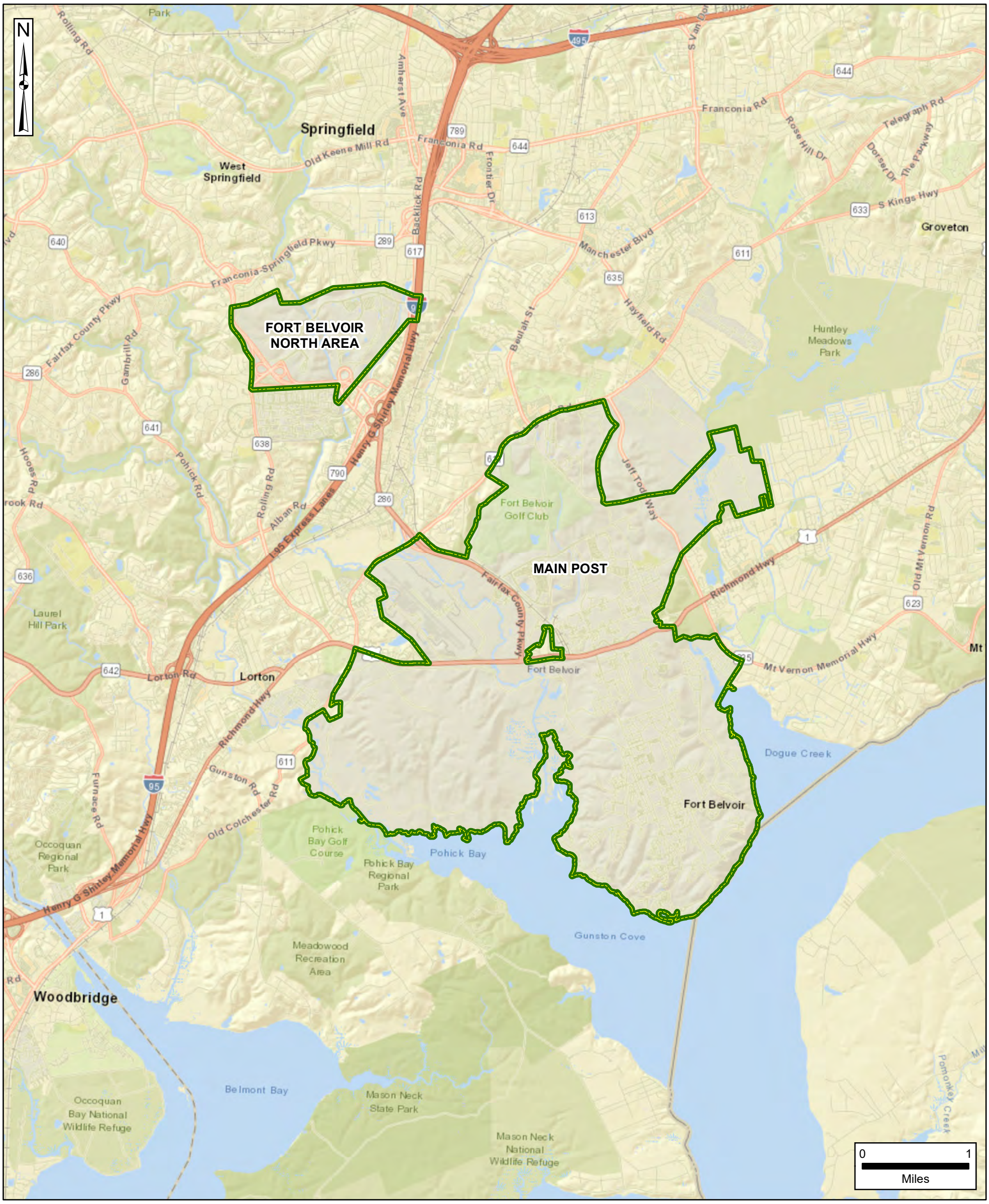


Figure 2-1
Site Location



Installation Boundary

Data Sources:
ESRI, ArcGIS Online, StreetMap

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 2-2
Site Layout

Installation Boundary
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Wetland
Regional Groundwater Flow Direction
Surface Water Flow Direction

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
USFWS, Wetlands, 2020
ESRI, ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 2-3
Topographic Map

Installation Boundary

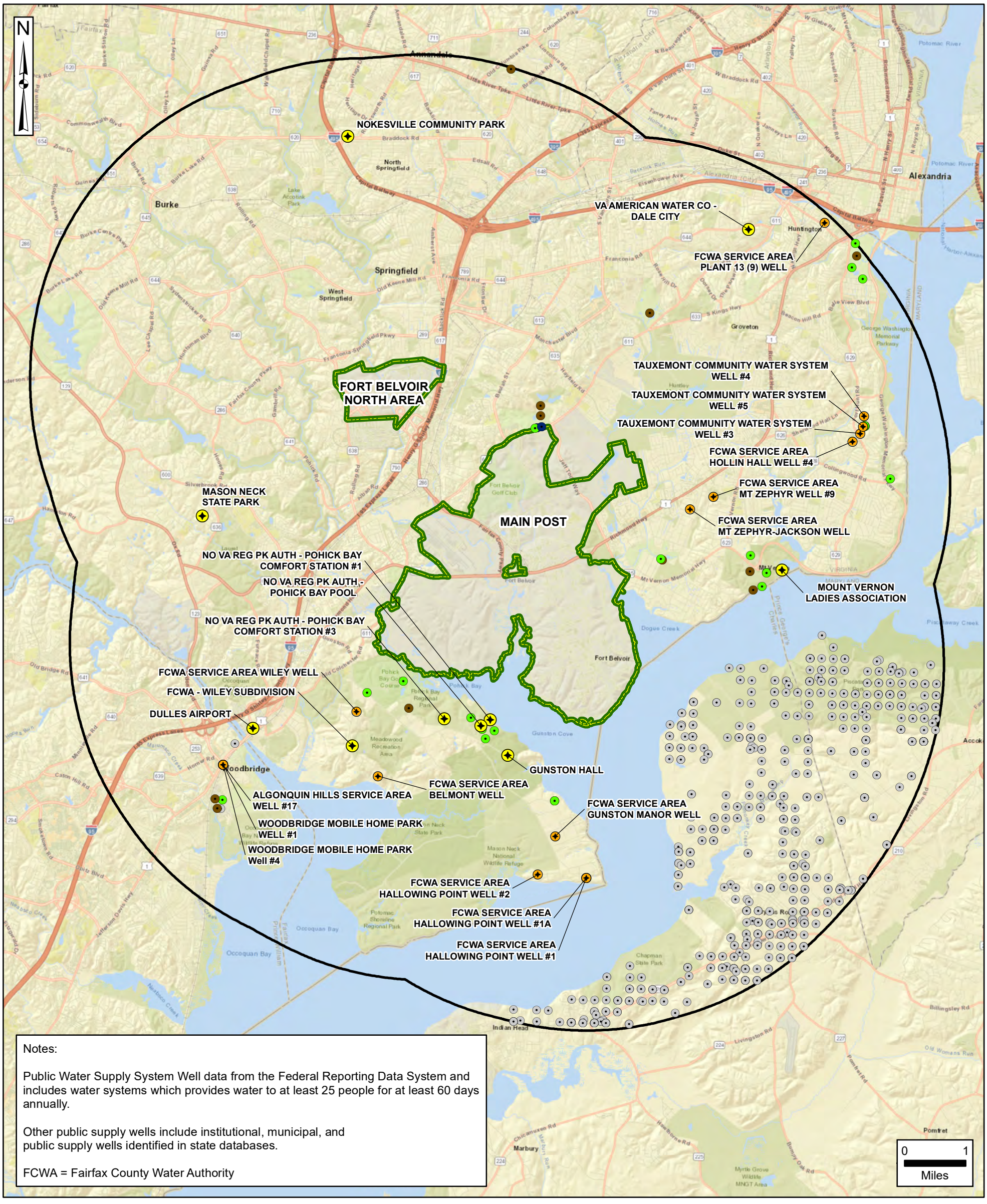
Elevation Contour (feet)

Data Sources:
ESRI, ArcGIS Online, USGS Topo Map

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 2-4
Off-Post Potable Wells



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, municipal, and public supply wells identified in state databases.

FCWA = Fairfax County Water Authority

Installation Boundary

5-Mile Radius

Public Water Supply System Well

Other Public Supply Well

Domestic Use Well

Agricultural/Irrigation Use Well

Industrial, Remedial, and Other

Well - Unspecified Use Type

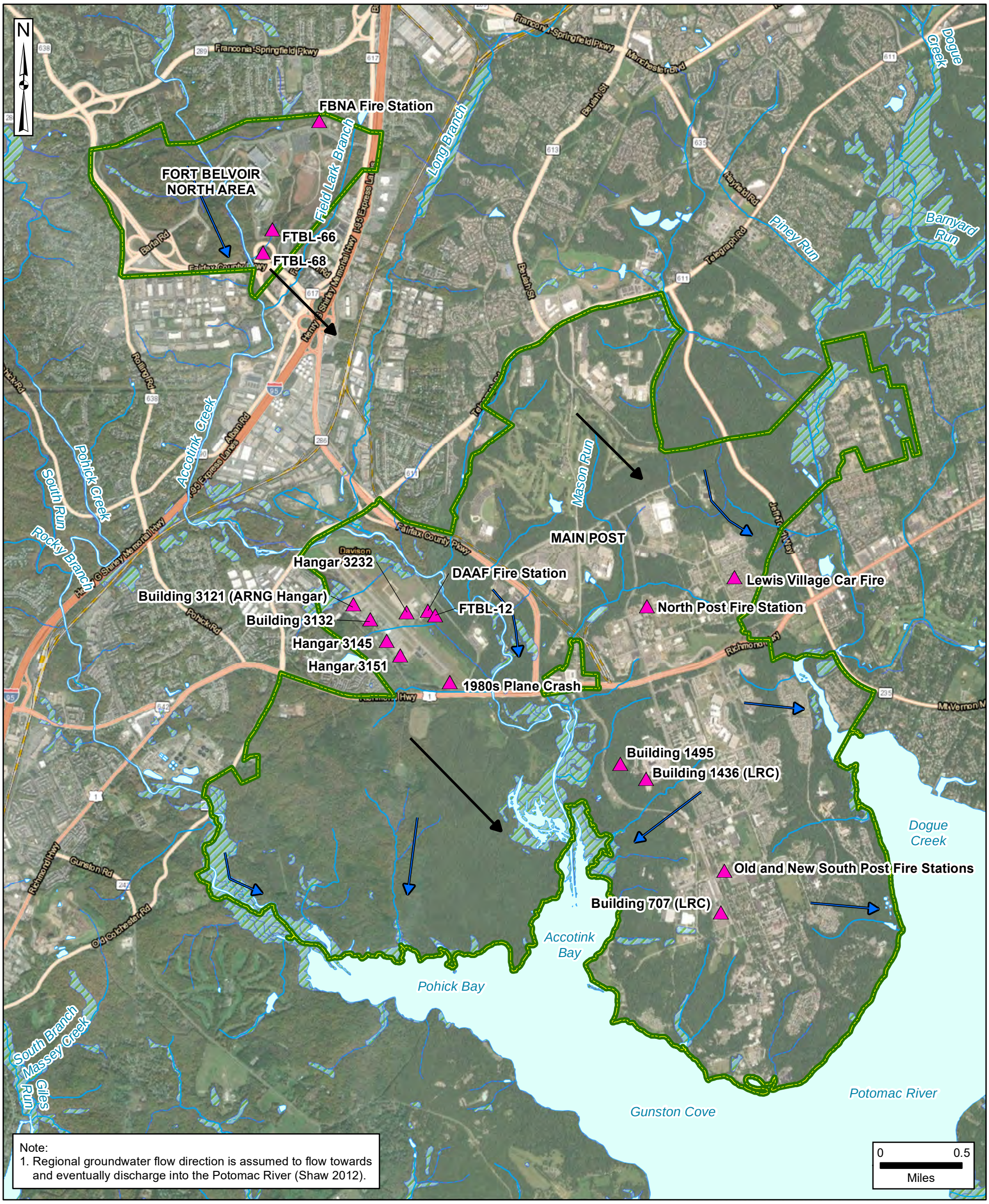
Note: Public water supply system well labels are as provided in the Environmental Data Resources (EDR) Report. See Appendix E for further information. Other public supply well labels are as provided in Virginia Department of Environmental Quality (VA DEQ) GIS data.

Data Sources:
EDR, VA PWSS Wells and MD Wells, 2018
VA DEQ, Well Data, 2020
ESRI, ArcGIS Online, StreetMap

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-2
AOPI Locations



Note:
1. Regional groundwater flow direction is assumed to flow towards and eventually discharge into the Potomac River (Shaw 2012).

Installation Boundary
AOPI Location
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Wetland
Regional Groundwater Flow Direction
Surface Water Flow Direction

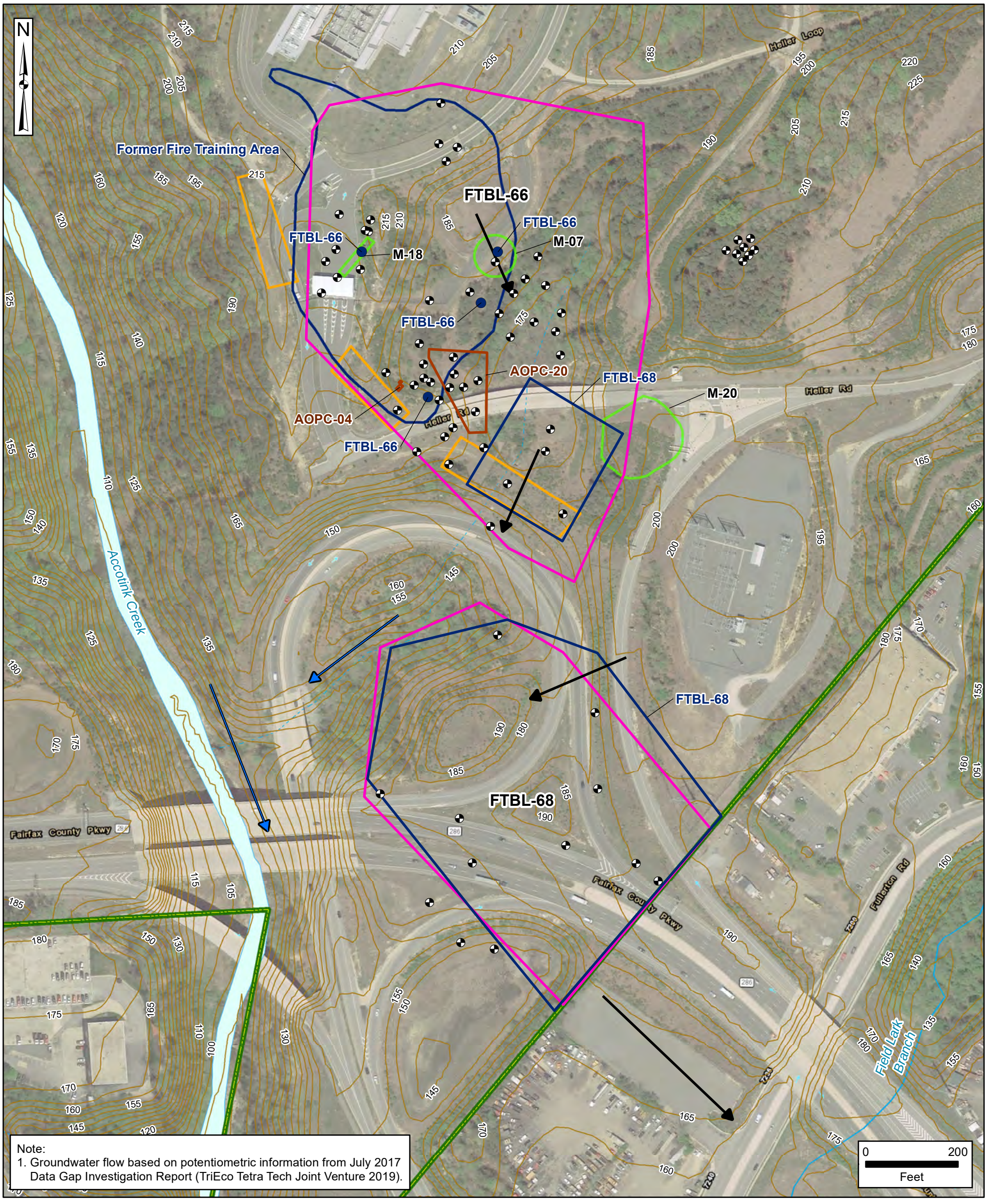
AOPI = area of potential interest
ARNG = Army National Guard
DAAF = Davison Army Airfield
FBNA = Fort Belvoir North Area
FTBL = Fort Belvoir
LRC = Logistical Readiness Center

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
USFWS, Wetlands, 2020
ESRI, ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-3
Aerial Photo of
FTBL-66 and FTBL-68 AOPIs



Note:
1. Groundwater flow based on potentiometric information from July 2017 Data Gap Investigation Report (TriEco Tetra Tech Joint Venture 2019).

- Installation Boundary
- Area of Potential Interest (AOPI)
- SWMU Area
- AOPC Boundary
- IRP Site
- IRP Site Location
- Potential Location of Overpass Fire
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Elevation Contour (feet)
- Shallow Groundwater Flow Direction
- Surface Water Flow Direction
- Monitoring Well

AOPC = Area of Potential Concern
FBNA = Fort Belvoir North Area
FTBL = Fort Belvoir
IRP = Installation Restoration Program
SWMU = Solid Waste Management Unit

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-4
Aerial Photo of
DAAF Fire Station and FTBL-12 AOPIs

Note:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.

Installation Boundary
Area of Potential Interest (AOPI)
AFFF Spill Area
Historical Fire Training Pit
River/Stream (Perennial)
Elevation Contour (feet)
Shallow Groundwater Flow Direction

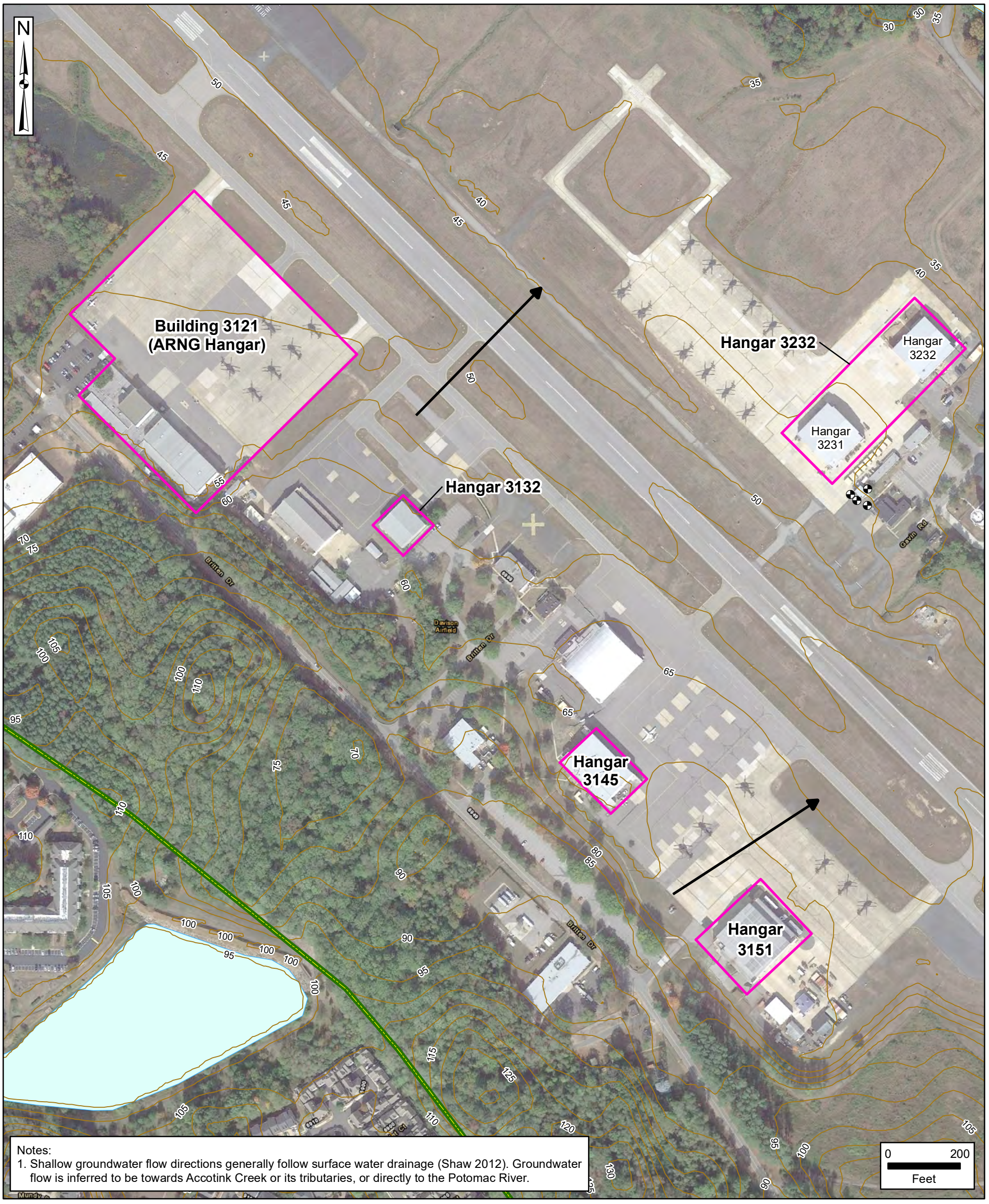
AFFF = aqueous film-forming foam
DAAF = Davison Army Airfield
FTBL = Fort Belvoir

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-5
Aerial Photo of Hangar 3132, Hangar 3145, Hangar 3151, Hangar 3232, and Building 3121 (ARNG Hangar) AOPIs



Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.

Installation Boundary
Area of Potential Interest (AOPI)
River/Stream (Perennial)
Water Body
Shallow Groundwater Flow Direction
Elevation Contour (feet)
Monitoring Well

ARNG = Army National Guard

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-6
Aerial Photo of
Lewis Village Car Fire AOPI

Note:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Dogue Creek.

Installation Boundary
Area of Potential Interest (AOPI)
Stream (Intermittent)
Stormwater Line
Outfall
Elevation Contour (feet)
Shallow Groundwater Flow Direction

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-7
Aerial Photo of
Building 707 (LRC) AOPI

Installation Boundary

Area of Potential Interest (AOPI)

Shallow Groundwater Flow Direction

Elevation Contour (feet)

LRC = Logistical Readiness Center

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-8
Aerial Photo of
Building 1436 (LRC) AOPI

Note:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.

Installation Boundary
Area of Potential Interest (AOPI)
AFFF Spill Area
Elevation Contour (feet)
Shallow Groundwater Flow Direction

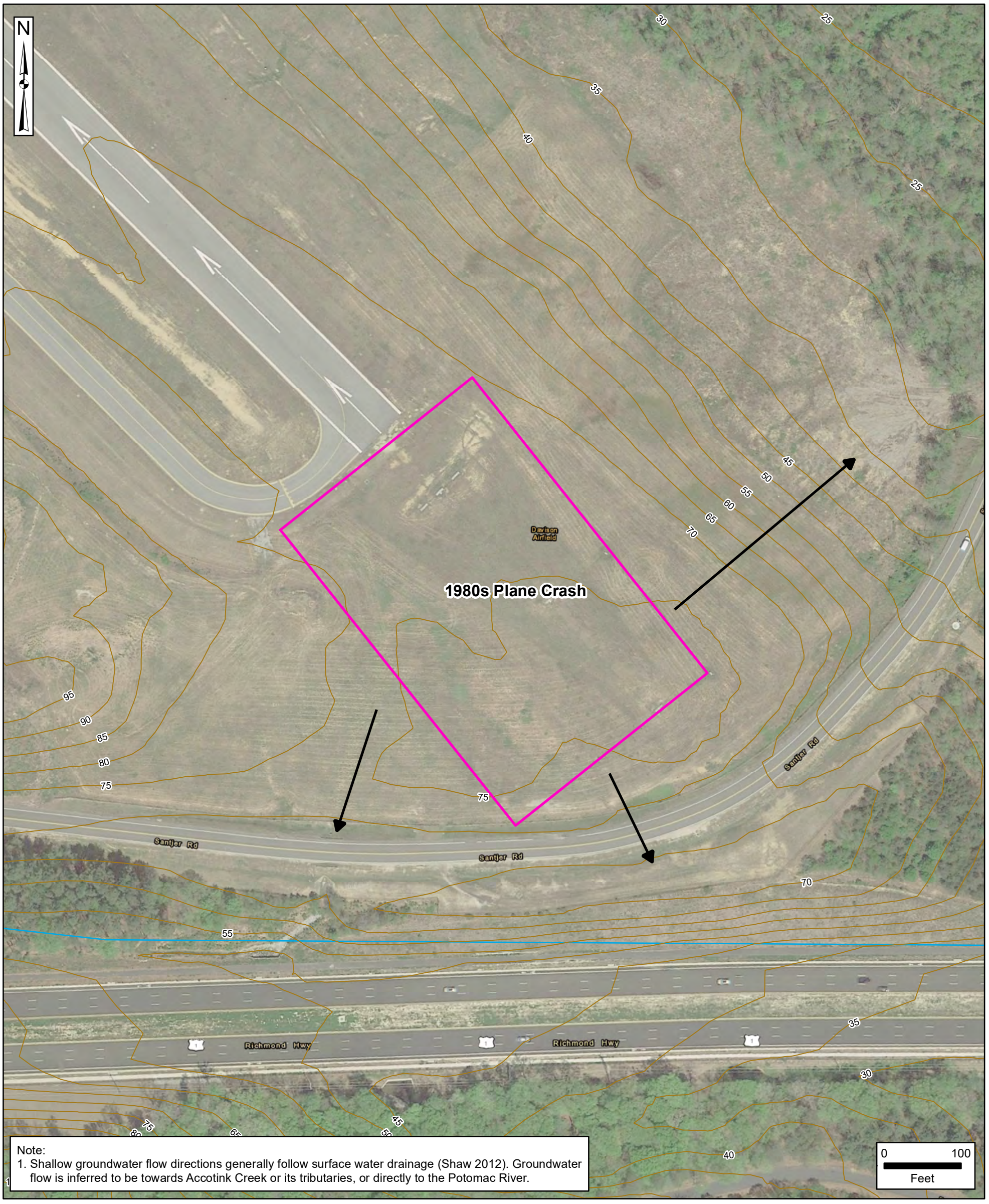
AFFF = aqueous film-forming foam
LRC = Logistical Readiness Center

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-9
Aerial Photo of
1980s Plane Crash AOPI



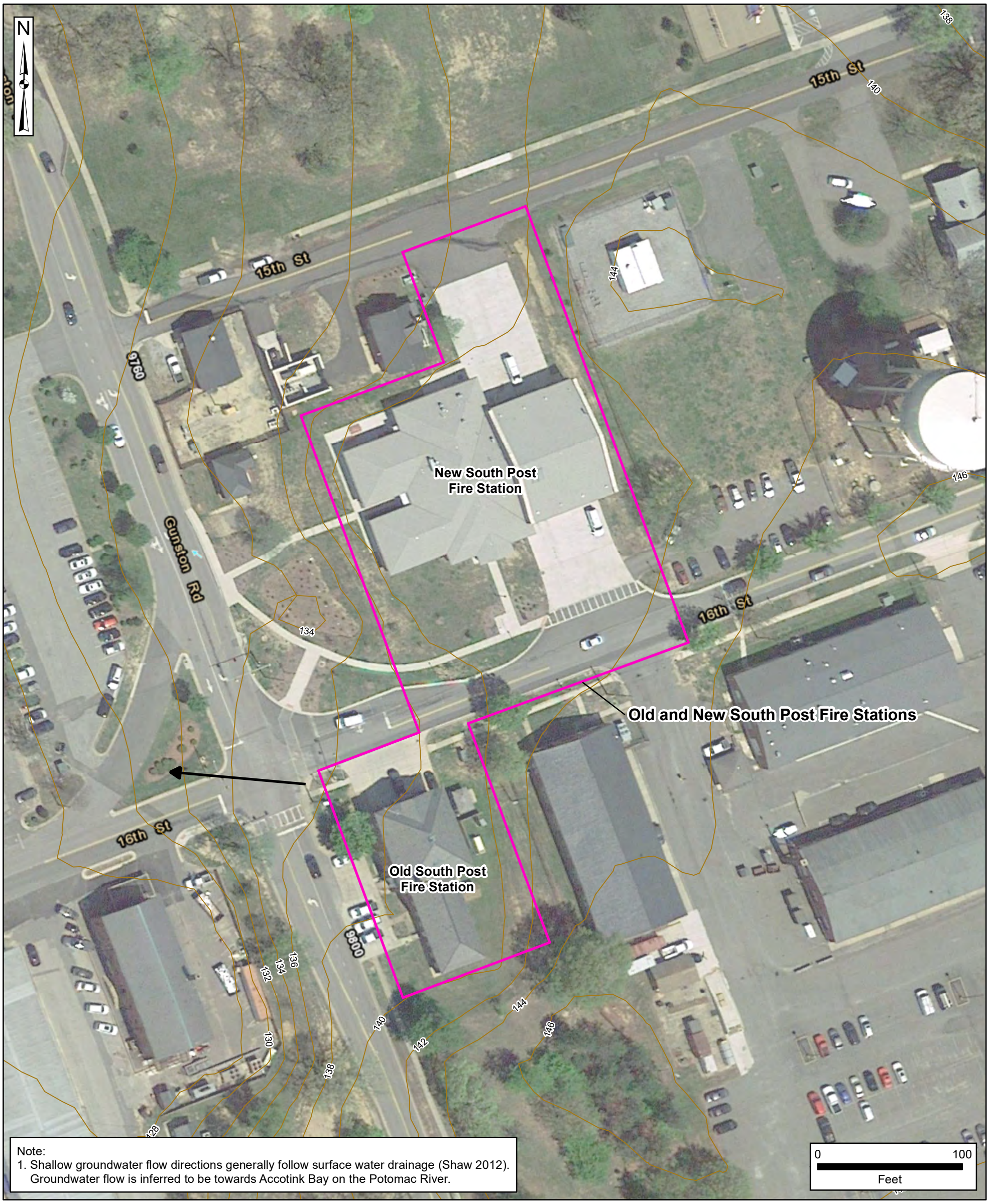
Installation Boundary
Area of Potential Interest (AOPI)
River/Stream (Perennial)
Elevation Contour (feet)
Shallow Groundwater Flow Direction

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-10
Aerial Photo of
Old and New South Post Fire Stations AOPI



Note:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Bay on the Potomac River.

Installation Boundary

Area of Potential Interest (AOPI)

Elevation Contour (feet)

Shallow Groundwater Flow Direction

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-11
Aerial Photo of
North Post Fire Station AOPI

Note:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.

Installation Boundary

Area of Potential Interest (AOPI)

Shallow Groundwater Flow Direction

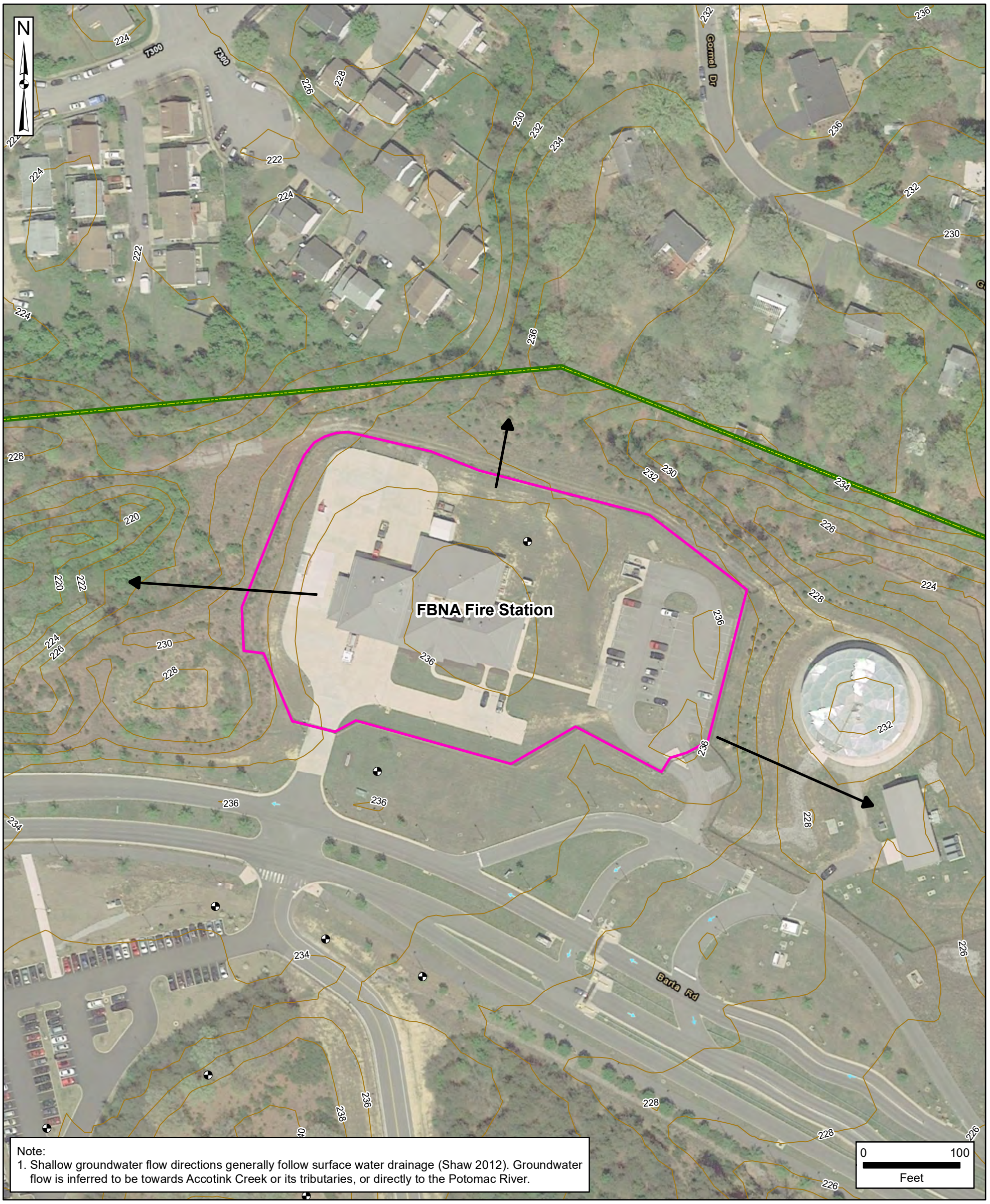
Elevation Contour (feet)

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-12
Aerial Photo of
FBNA Fire Station AOPI



FBNA = Fort Belvoir North Area

- Installation Boundary
- Area of Potential Interest (AOPI)
- Shallow Groundwater Flow Direction
- Elevation Contour (feet)
- Monitoring Well

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 5-13
Aerial Photo of
Building 1495 AOPI

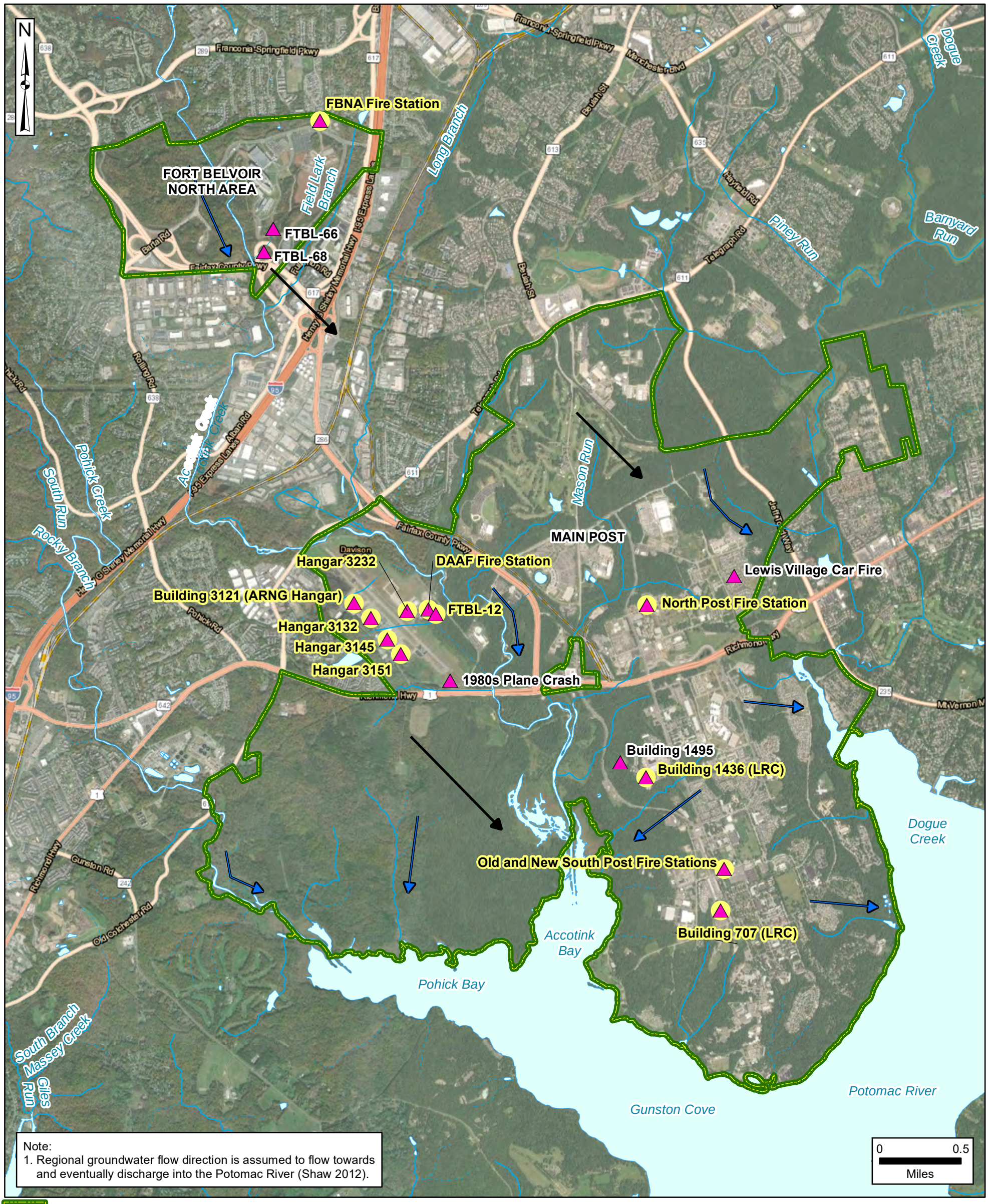
Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Stormwater Line

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

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



Installation Boundary
AOPI Location
AOPI with OSD Risk Screening Level Exceedance
River/Stream (Perennial)
Stream (Intermittent)
Water Body
Regional Groundwater Flow Direction
Surface Water Flow Direction

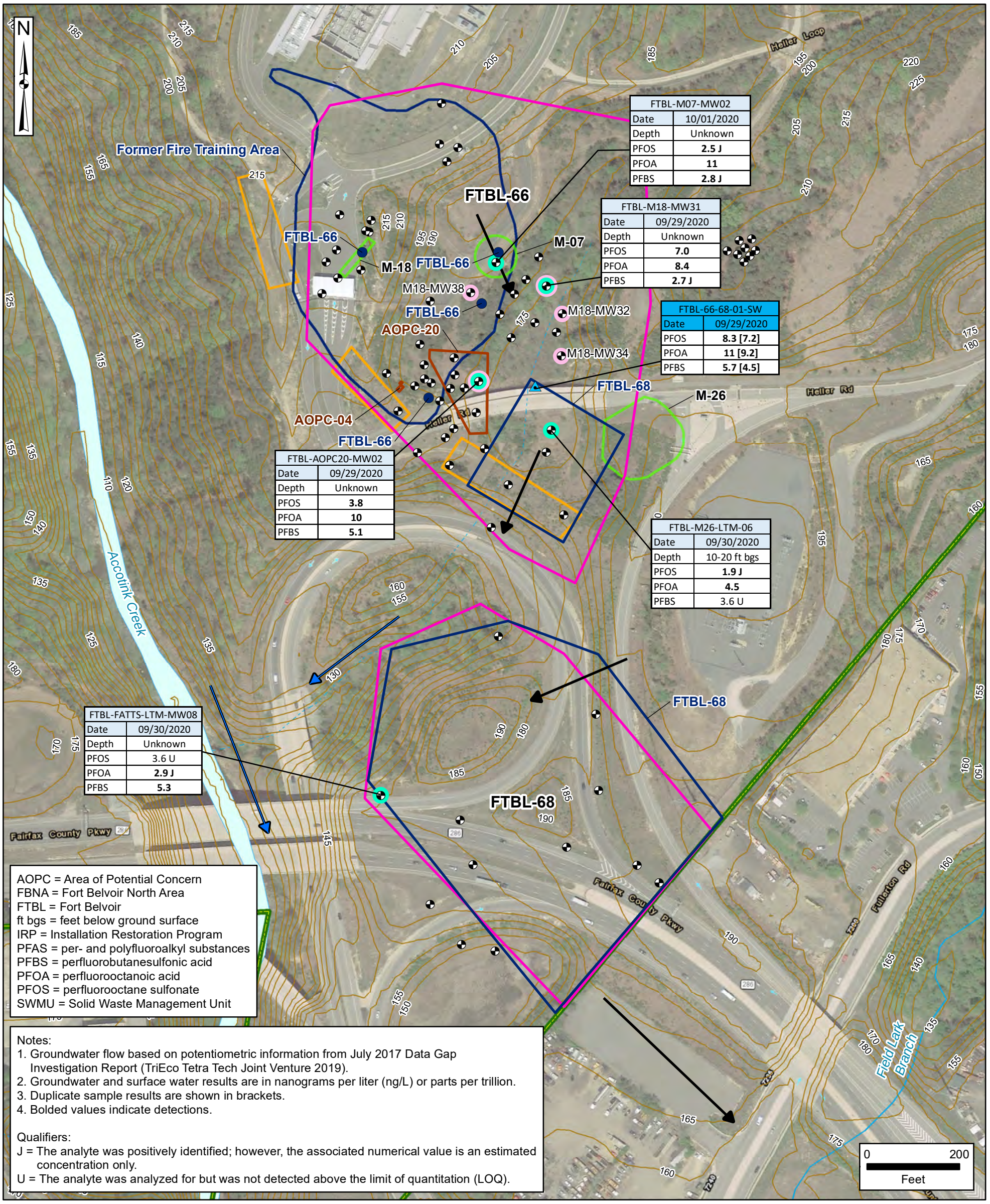
AOPI = area of potential interest
ARNG = Army National Guard
DAAF - Davison Army Airfield
FBNA = Fort Belvoir North Area
FTBL = Fort Belvoir
LRC = Logistical Readiness Center
OSD = Office of the Secretary of Defense

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
ESRI, ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Investigation
Fort Belvoir, VA

Figure 7-2
FTBL-66 and FTBL-68 AOPIs
PFOS, PFOA, and PFBS Analytical Results



AOPC = Area of Potential Concern
FBNA = Fort Belvoir North Area
FTBL = Fort Belvoir
ft bgs = feet below ground surface
IRP = Installation Restoration Program
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SWMU = Solid Waste Management Unit

Notes:
1. Groundwater flow based on potentiometric information from July 2017 Data Gap Investigation Report (TriEco Tetra Tech Joint Venture 2019).
2. Groundwater and surface water results are in nanograms per liter (ng/L) or parts per trillion.
3. Duplicate sample results are shown in brackets.
4. 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).

- Installation Boundary
- Area of Potential Interest (AOPI)
- SWMU Area
- IRP Site
- IRP Site Location
- AOPC Boundary
- Potential Location of Overpass Fire
- River/Stream (Perennial)
- Stream (Intermittent)
- Water Body
- Elevation Contour (feet)
- Shallow Groundwater Flow Direction
- Surface Water Flow Direction
- Monitoring Well
- Well with Previous PFAS Detection
- Surface Water Sampling Location
- Groundwater Sampling Location - Existing Well

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
USFWS, Wetlands, 2020
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-3
DAAF Fire Station and FTBL-12 AOPIs
PFOS, PFOA, and PFBS Analytical Results

FTBL-DAAF-01-SO	
Date	09/28/2020
Depth	0.2-2.5 ft bgs
PFOS	**0.045 [0.066]**
PFOA	**0.0036 [0.0051]**
PFBS	0.0012 U [0.0013 U]

FTBL-DAAF-01-GW	
Date	09/28/2020
Depth	14-18 ft bgs
PFOS	**2,500 J**
PFOA	**330**
PFBS	**230**

FTBL-DAAF-02-SO	
Date	09/28/2020
Depth	0.2-2.5 ft bgs
PFOS	**0.12**
PFOA	**0.0064 J-**
PFBS	0.0012 U

FTBL-12-01-SO	
Date	09/28/2020
Depth	1-3 ft bgs
PFOS	**0.10**
PFOA	**0.044**
PFBS	**0.00080 J**

FTBL-12-01-GW	
Date	09/28/2020
Depth	14-18 ft bgs
PFOS	**6,200 J [5,900 J]**
PFOA	**12,000 J [12,000 J]**
PFBS	**730 J [740 J]**

FTBL-12-02-SO	
Date	09/29/2020
Depth	1-3 ft bgs
PFOS	**1.2 J**
PFOA	**0.19**
PFBS	**0.028**

FTBL-12-02-GW	
Date	09/29/2020
Depth	14-18 ft bgs
PFOS	**4,300 J**
PFOA	**9,200 J**
PFBS	**1,600**

FTBL-12-03-GW	
Date	09/28/2020
Depth	12-16 ft bgs
PFOS	**28,000 J**
PFOA	**52,000**
PFBS	**3,100 J**

DAAF Fire Station

FTBL-12

Hangar 3232
Approximately 0.75 miles West

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
4. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. 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.
7. Concentrations of PFOS and PFOA that exceed the OSD residential soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray.
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).

0 100
Feet

Installation Boundary
Area of Potential Interest (AOPI)
AFFF Spill Area
Historical Fire Training Pit
River/Stream (Perennial)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Soil Sampling Location
Groundwater Sampling Location
Soil Boring to Groundwater Sampling Location

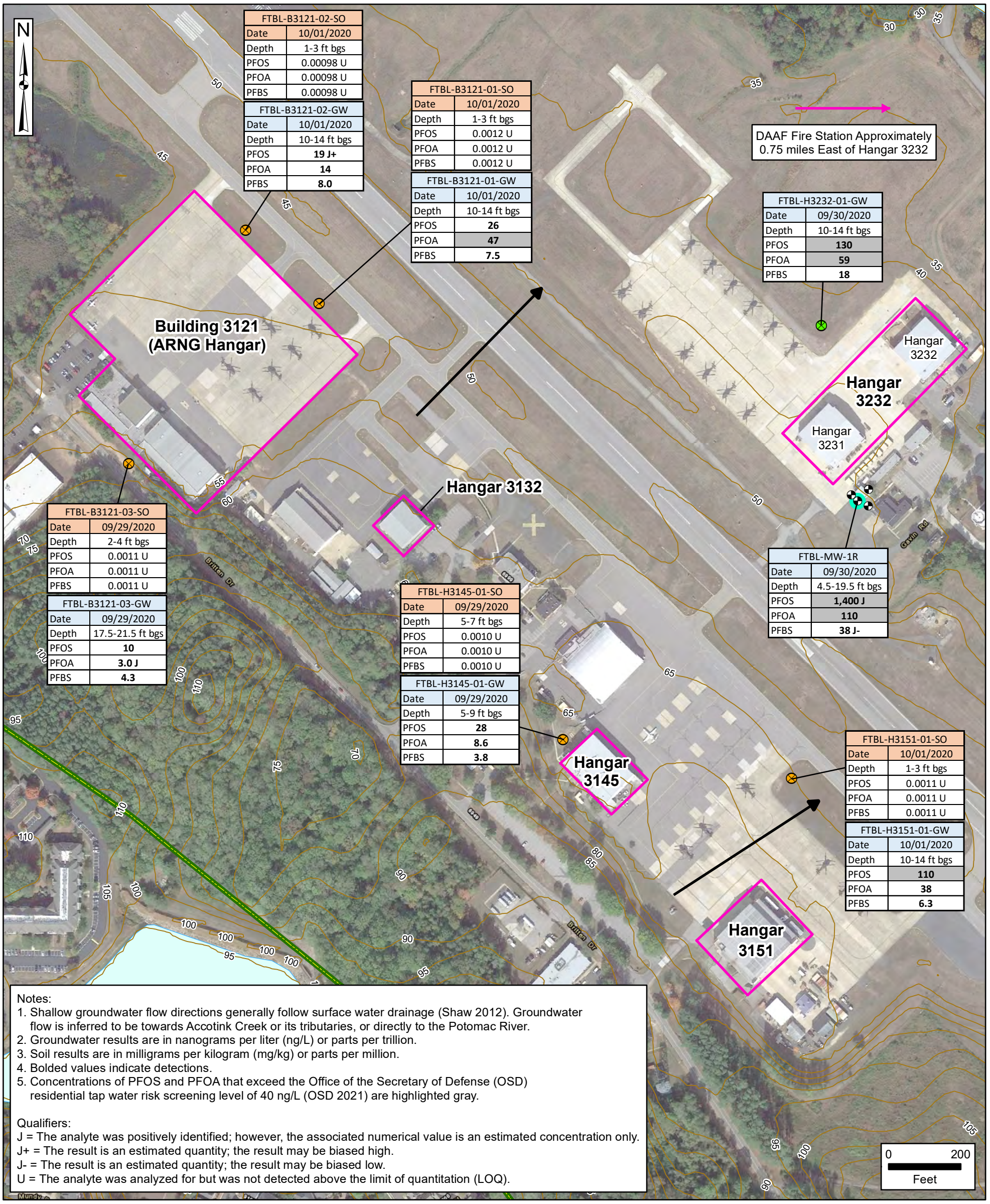
AFFF = aqueous film-forming foam
DAAF = Davison Army Airfield
FTBL = Fort Belvoir
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-4
Hangar 3132, Hangar 3145, Hangar 3151, Hangar 3232, and Building 3121 (ARNG Hangar) AOPIs
PFOS, PFOA, and PFBS Analytical Results



Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
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) 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 high.
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).

- Installation Boundary
- Area of Potential Interest (AOPI)
- River/Stream (Perennial)
- Water Body
- Elevation Contour (feet)
- Shallow Groundwater Flow Direction
- Monitoring Well
- Groundwater Sampling Location
- Soil Boring to Groundwater Sampling Location
- Groundwater Sampling Location - Existing Well

ARNG = Army National Guard
DAAF = Davison Army Airfield
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SI = Site Inspection
RI = Remedial Investigation

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-5
Lewis Village Car Fire AOPI
PFOS, PFOA, and PFBS Analytical Results

Lewis Village Car Fire

Outfall 4215

FTBL-LVCF-01-SO	
Date	09/27/2020
Depth	1-3 ft bgs
PFOS	0.0011 U
PFOA	0.0011 U
PFBS	0.0011 U

FTBL-LVCF-01-GW	
Date	09/27/2020
Depth	19-23 ft bgs
PFOS	**16**
PFOA	**21**
PFBS	**12**

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Dogue Creek.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
4. Bolded values indicate detections.

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

Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Stream (Intermittent)
Outfall
Shallow Groundwater Flow Direction
Stormwater Line
Soil Boring to Groundwater Sampling Location

ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
USFWS, Wetlands, 2020
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-6
Building 707 (LRC) AOPI
PFOS, PFOA, and PFBS Analytical Results

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Bay on the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
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.

Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Groundwater Sampling Location

ft bgs = feet below ground surface
LRC = Logistical Readiness Center
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-7
Building 1436 (LRC) AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-B1436-01-SO	
Date	09/27/2020
Depth	1-3 ft bgs
PFOS	**0.018**
PFOA	**0.0032**
PFBS	0.00095 U

FTBL-B1436-01-GW	
Date	09/27/2020
Depth	45-49 ft bgs
PFOS	**1,400 J**
PFOA	**270 J**
PFBS	**460**

FTBL-B1436-02-SO	
Date	09/27/2020
Depth	1-3 ft bgs
PFOS	**0.0010 J**
PFOA	0.0011 U
PFBS	0.0011 U

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
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) 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).

Installation Boundary
Area of Potential Interest (AOPI)
AFFF Spill Area
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Soil Sampling Location
Soil Boring to Groundwater Sampling Location

AFFF = aqueous film-forming foam
ft bgs = feet below ground surface
LRC = Logistical Readiness Center
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-8
1980s Plane Crash AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-1980PC-01-SO	
Date	09/30/2020
Depth	1-3 ft bgs
PFOS	0.0014 U
PFOA	0.0014 U
PFBS	0.0014 U

FTBL-1980PC-01-GW	
Date	09/30/2020
Depth	40.5-44.5 ft bgs
PFOS	**11 J+**
PFOA	4.2 UJ-
PFBS	**2.2 J-**

FTBL-1980PC-02-SO	
Date	09/30/2020
Depth	1-3 ft bgs
PFOS	0.0012 U
PFOA	0.0012 U
PFBS	0.0012 U

FTBL-1980PC-02-GW	
Date	09/30/2020
Depth	34-38 ft bgs
PFOS	**13 J+**
PFOA	**11 J-**
PFBS	6.7 UJ-

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
4. Bolded values indicate detections.

Qualifiers:
J+ = The result is an estimated quanity; the result may be biased high.
J- = The result is an estimated quanity; the result may be biased low.
U = The analyte was analyzed for but was not detected above the limit of quantitation (LOQ).
UJ- = The analyte was analyzed for but was not detected. The reported LOQ is approximate and may be inaccurate or imprecise.

Installation Boundary
Area of Potential Interest (AOPI)
River/Stream (Perennial)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Soil Boring to Groundwater Sampling Location

ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
USGS, NHD, Water Bodies, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-9
Old and New South Post Fire Stations AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-OSPFS-01-SO	
Date	09/29/2020
Depth	2-4 ft bgs
PFOS	**0.0022**
PFOA	0.0012 U
PFBS	0.0012 U

FTBL-OSPFS-01-GW	
Date	09/29/2020
Depth	19-23 ft bgs
PFOS	**1,100 J [840 J]**
PFOA	**160 [150]**
PFBS	**91 [94]**

FTBL-OSPFS-02-SO	
Date	09/29/2020
Depth	1-3 ft bgs
PFOS	**0.010**
PFOA	0.0010 U
PFBS	0.0010 U

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Bay on the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
4. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. 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).

Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Soil Sampling Location
Soil Boring to Groundwater Sampling Location

ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-10
North Post Fire Station AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-NPFS-02-SO	
Date	09/27/2020
Depth	0.2-2.5 ft bgs
PFOS	**0.0021**
PFOA	0.0012 U
PFBS	0.0012 U

FTBL-NPFS-01-GW	
Date	09/27/2020
Depth	38-42 ft bgs
PFOS	**330**
PFOA	**44**
PFBS	**21**

FTBL-NPFS-01-SO	
Date	09/27/2020
Depth	1-3 ft bgs
PFOS	**0.19**
PFOA	0.0012 U
PFBS	0.0012 U

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
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) are highlighted gray.
6. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray.

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

Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Soil Sampling Location
Soil Boring to Groundwater Sampling Location

ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-11
FBNA Fire Station AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-FBNAFS-01-SO	
Date	10/01/2020
Depth	1-3 ft bgs
PFOS	0.0012 U
PFOA	**0.0041**
PFBS	0.0012 U

FTBL-FBNAFS-01-GW	
Date	10/01/2020
Depth	15-19 ft bgs
PFOS	**12**
PFOA	**280**
PFBS	**2.7 J**

FTBL-FBNAFS-02-SO	
Date	10/01/2020
Depth	3-5 ft bgs
PFOS	0.0010 U
PFOA	0.0010 U
PFBS	0.0010 U

FTBL-FBNAFS-02-GW	
Date	10/01/2020
Depth	20-24 ft bgs
PFOS	**7.5**
PFOA	**16**
PFBS	**3.4 J**

FTBL-FBNAFS-03-SO	
Date	10/01/2020
Depth	0-2 ft bgs
PFOS	0.0012 U
PFOA	**0.0011 J**
PFBS	0.0012 U

FTBL-PSA2009-MW42	
Date	09/30/2020
Depth	23-33 ft bgs
PFOS	**2.2 J**
PFOA	**2.1 J**
PFBS	3.5 U

FBNA Fire Station

Gormel Dr

Barta Rd

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Groundwater results are in nanograms per liter (ng/L) or parts per trillion.
3. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
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) 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).

0 100 Feet

Installation Boundary
Area of Potential Interest (AOPI)
Elevation Contour (feet)
Shallow Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Soil Boring to Groundwater Sampling Location
Groundwater Sampling Location - Existing Well

FBNA = Fort Belvoir North Area
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, VA

Figure 7-12
Building 1495 AOPI
PFOS, PFOA, and PFBS Analytical Results

FTBL-B1495-03-SO	
Date	3/10/2021
Depth	0-2 ft bgs
PFOS	**0.0020**
PFOA	0.00096 U
PFBS	0.00096 U

FTBL-B1495-04-SO	
Date	3/10/2021
Depth	0-2 ft bgs
PFOS	**0.0017**
PFOA	0.0011 U
PFBS	0.0011 U

FTBL-B1495-02-SO	
Date	3/10/2021
Depth	0-2 ft bgs
PFOS	**0.0065**
PFOA	0.0011 U
PFBS	0.0011 U

FTBL-B1495-01-SO	
Date	3/10/2021
Depth	0-2 ft bgs
PFOS	0.0012 U
PFOA	0.0012 U
PFBS	0.0012 U

Building 1495

Sharon Lane Rd

Notes:
1. Shallow groundwater flow directions generally follow surface water drainage (Shaw 2012). Groundwater flow is inferred to be towards Accotink Creek or its tributaries, or directly to the Potomac River.
2. Soil results are in milligrams per kilogram (mg/kg) or parts per million.
3. Bolded values indicate detections.

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

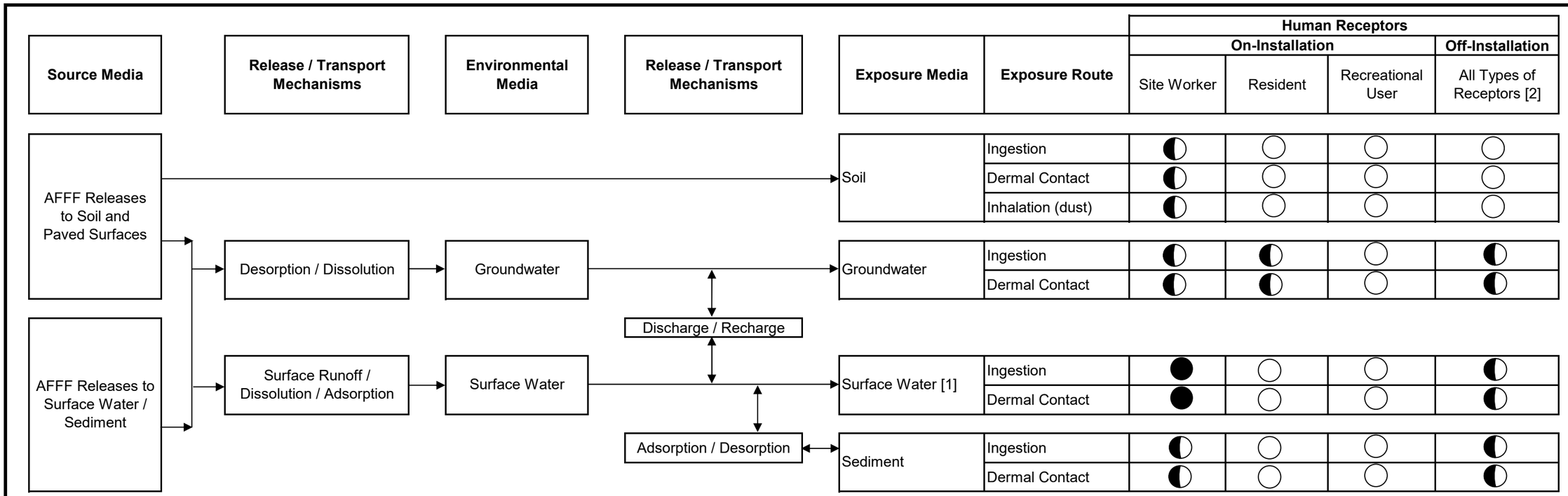
0 50
Feet

Installation Boundary
Area of Potential Interest (AOPI)
Shallow Groundwater Flow Direction
Elevation Contour (feet)
Stormwater Line
Soil Sampling Location

ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Belvoir, GIS Data, 2019
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 18 North



Legend:

- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

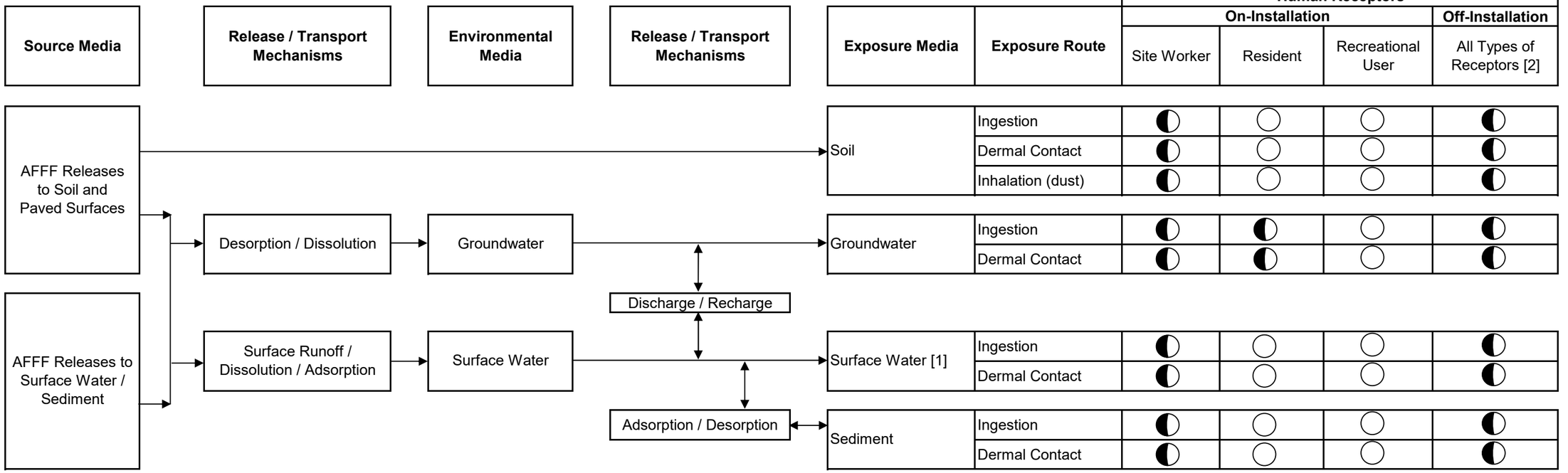
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - FTBL-66 AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-13



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:

[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.

[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest

AFFF = aqueous film-forming foam

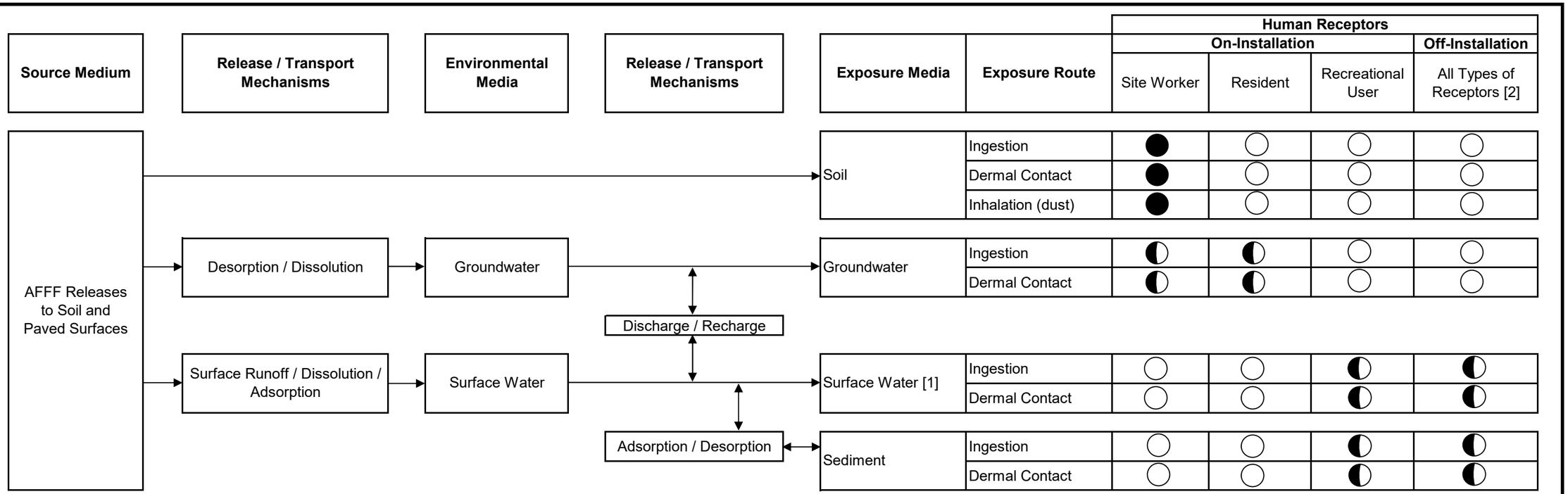
ARCADIS

Conceptual Site Model - FTBL-68 AOPI

USAEC PFAS Preliminary Assessment / Site Inspection

Fort Belvoir, Virginia

Figure 7-14



Legend:

- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

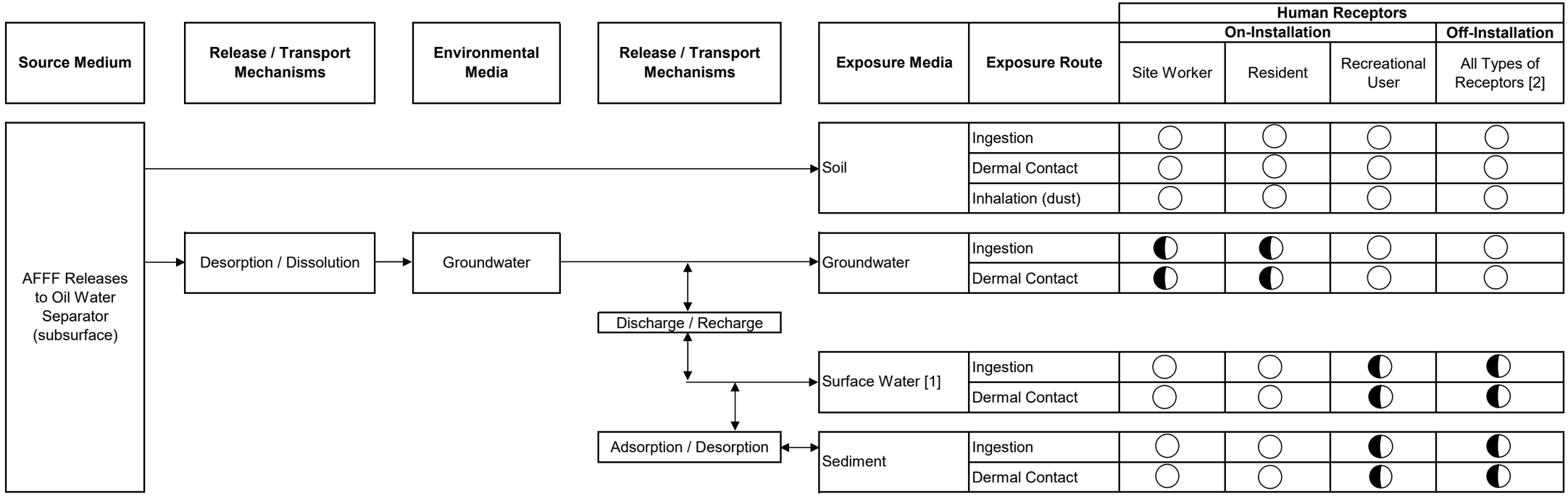
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
DAAF = Davison Army Airfield
FTBL = Fort Belvoir
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - DAAF Fire Station and FTBL-12 AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-15



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

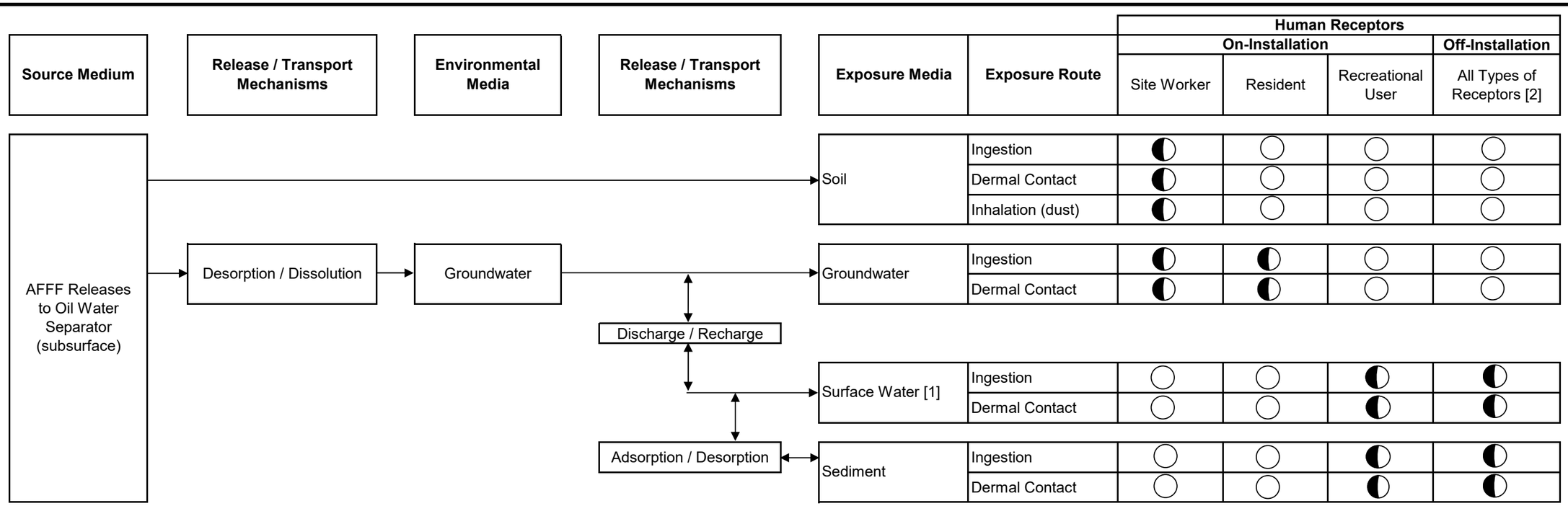
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
ARNG = Army National Guard
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - Building 3121 (ARNG Hangar), Hangar 3145, and Hangar 3151 AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-16



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

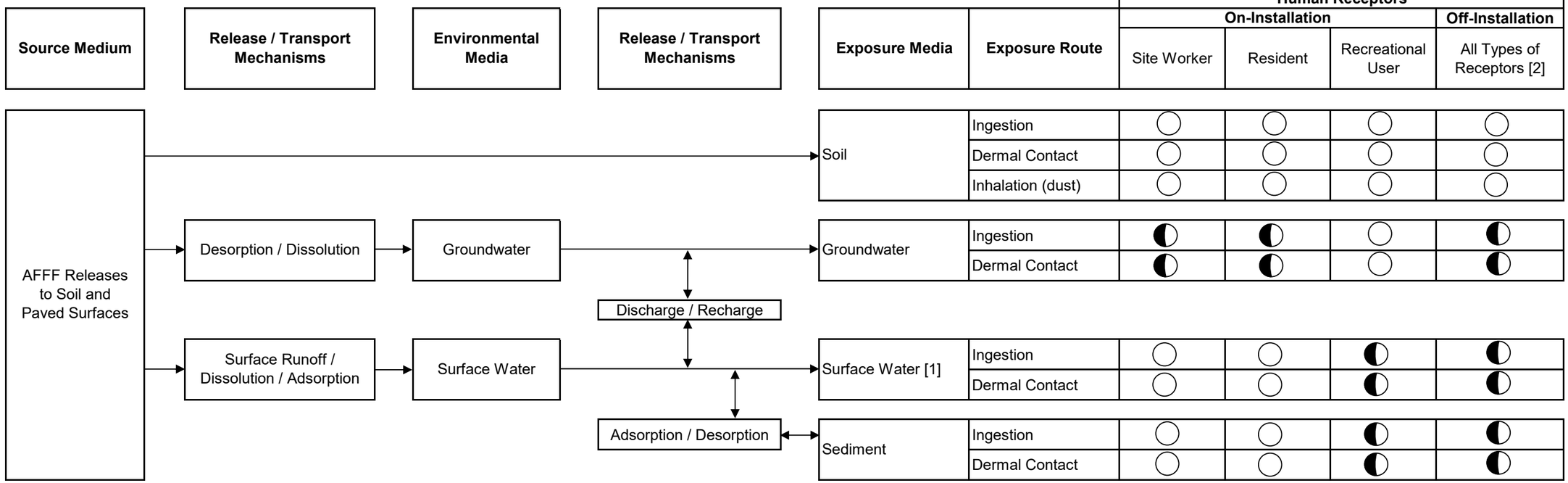
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
LRC = Logistics Readiness Center
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - Building 707 (LRC), Hangar 3132, and Hangar 3232 AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-17



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

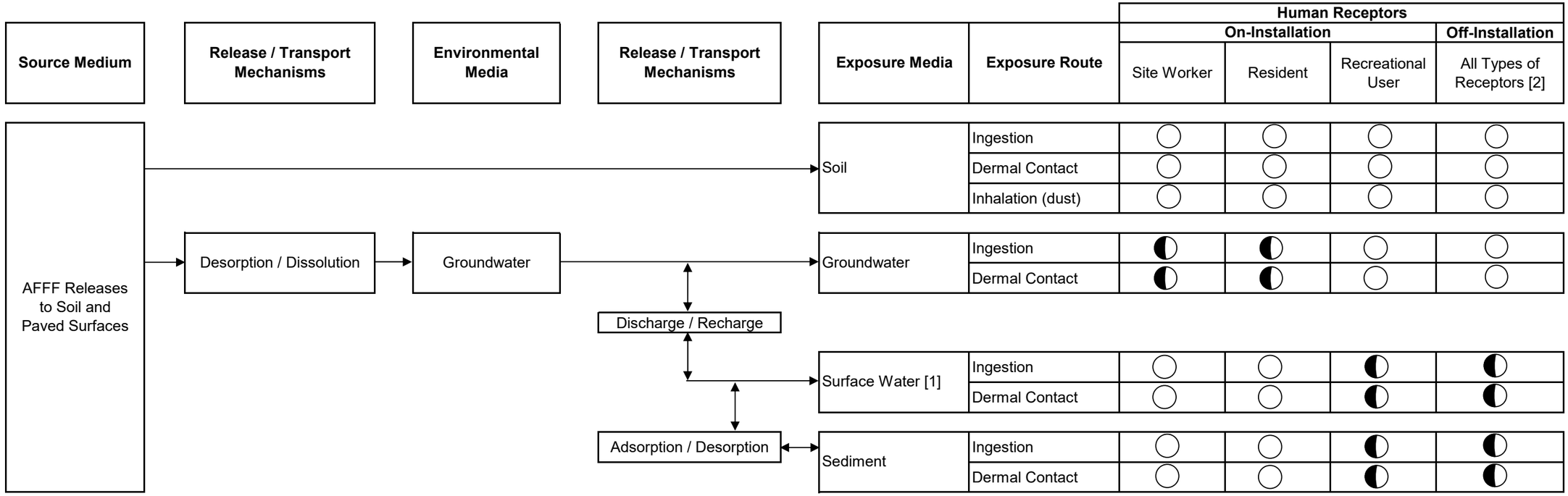
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - Lewis Village Car Fire AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-18



Legend:

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

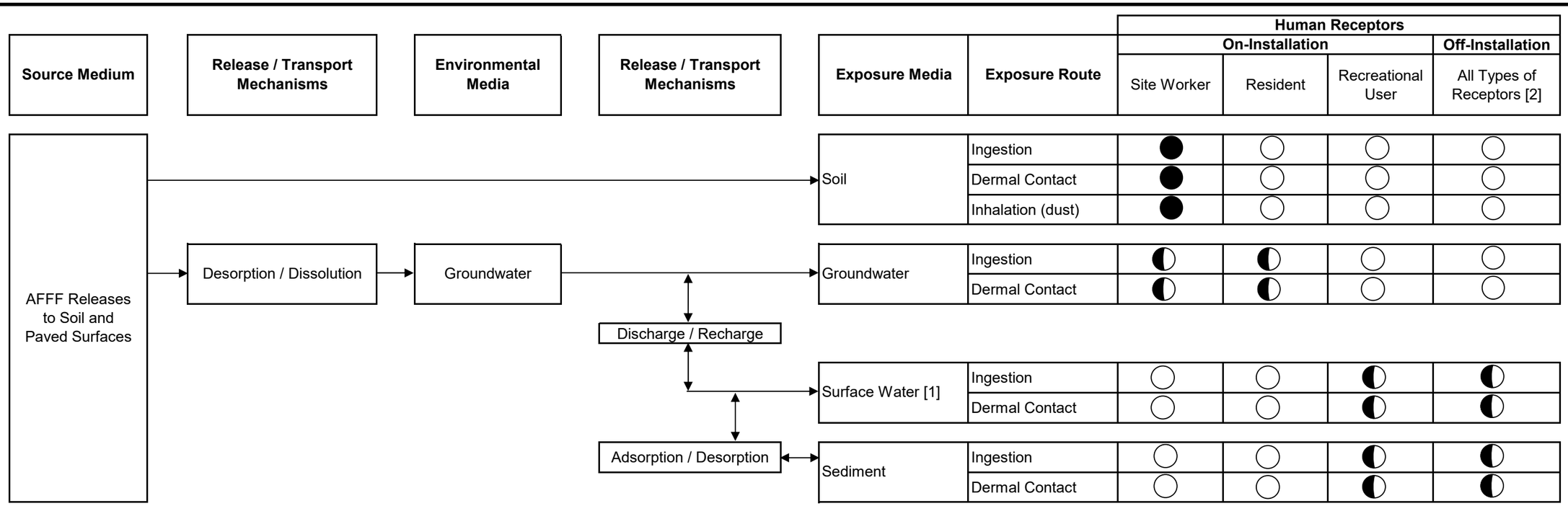
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - 1980s Plane Crash AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-19



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

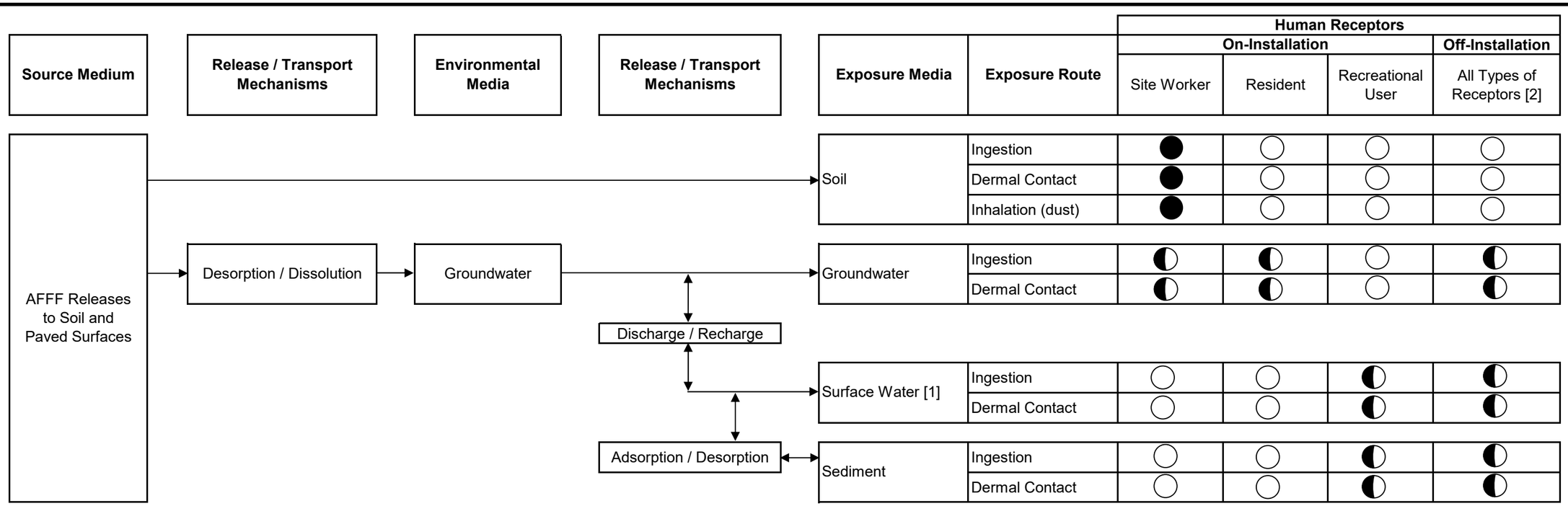
Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
LRC = Logistics Readiness Center
AFFF = aqueous film-forming foam

ARCADIS

Conceptual Site Model - Building 1436 (LRC), Old and New South Post Fire Stations, North Post Fire Station, and Building 1495 AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-20



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.

AOPI = area of potential interest
FBNA = Fort Belvoir North Area
AFFF = aqueous film-forming foam

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Conceptual Site Model - FBNA Fire Station AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Belvoir, Virginia

Figure 7-21

Arcadis U.S., Inc.

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Suite 210

Hanover, Maryland 21076

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Fax 410 987 4392

www.arcadis.com

APPENDIX A

Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

SUSTAINMENT

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS, ENERGY AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY (ENERGY, INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS, ENVIRONMENT AND ENERGY)
DIRECTOR, NATIONAL GUARD BUREAU (JOINT STAFF, J8)
DIRECTOR, DEFENSE LOGISTICS AGENCY (INSTALLATION MANAGEMENT)

SUBJECT: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program

The Department of Defense (DoD) conducts cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Defense Environmental Restoration Program (DERP). Our goal is protection of human health and the environment in a risk-based, fiscally-sound manner. This memorandum provides clarifying technical guidance on the investigation of perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS). This guidance is applicable to investigating PFOS, PFOA, and PFBS at Environmental Restoration Account-funded, Base Realignment and Closure Account-funded, and Operation and Maintenance accounts for the National Guard-funded sites.

This revised memorandum accounts for the updated PFBS screening levels and updates the Assistant Secretary of Defense for Sustainment (ASD(S)) memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program," October 15, 2019. The U.S. Environmental Protection Agency (EPA) reassessed the toxicity of PFBS in 2021.[1] One purpose of the assessment was to update and replace the existing 2014 Provisional Peer-Reviewed Toxicity Value (PPRTV) assessment for PFBS used by the EPA's Superfund Program. Based on studies published since 2014, the PFBS chronic reference dose (RfD) was reduced and use of the new value results in lower human health screening levels for this chemical.

PFOS, PFOA, and PFBS are part of a larger class of chemicals known as per- and polyfluoroalkyl substances (PFAS). PFAS shall be addressed in the same manner as other contaminants of concern within the DERP.

[1] U.S. EPA. Human Health Toxicity Values for Perfluorobutane Sulfonic Acid and Related Compound Potassium Perfluorobutane Sulfonate. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-20/345F, April 2021.

Under CERCLA, site-specific regional screening levels[2] (RSLs) for PFOS and PFOA are calculated using the EPA online calculator using the oral RfD of 2E-05 mg/kg-day. The RSL for PFBS is calculated using the EPA PPRTV RfD of 3E-04 mg/kg-day (old value was 2E-02 mg/kg-day), or it may be read off the tables available on the EPA RSL website. The values are provided in the attachment. These RSLs should be used for screening to determine if further investigation in the remedial investigation (RI) phase is warranted or if the site can proceed to site closeout. When multiple PFAS are encountered at a site, a 0.1 factor is applied to the screening level when it is based on noncarcinogenic endpoints. For example, in cases where there are multiple PFAS, the screening level for PFOS and PFOA individually in tap water is 40 parts per trillion (ppt) (0.1 x 400 ppt = 40 ppt) and for PFBS it is 600 ppt (old value was 40,000 ppt).

During the RI phase, the RfDs for PFOS, PFOA, and PFBS and the oral cancer slope factor (CSF) for PFOA of 0.07 $(mg/kg\text{-}day)^{-1}$ will be used to conduct site specific risk assessments in accordance with Risk Assessment Guidance for Superfund Volume I, Part A (EPA/540/1-89/002, December 1989).[3] Site-specific risk assessment results will be used to determine if any necessary remedial actions are required in accordance with CERCLA, DERP, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This guidance is effective immediately and supersedes and cancels the ASD(S) memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program," October 15, 2019. The point of contact for this matter is Ms. Alexandria Long, Office of the Deputy Assistant Secretary of Defense for Environment and Energy Resilence, at 703-571-9061 or alexandria.d.long.civ@mail.mil.

Steven J. Morani
Principal Deputy Assistant Secretary of Defense
for Sustainment (Logistics)
Acting Assistant Secretary of Defense for
Sustainment

Attachment:
As stated

[2] For sites on the National Priorities List, the DoD Components will use the EPA site specific screening levels, if provided.
[3] Currently there are only three PFAS – PFOS, PFOA, and PFBS – with established toxicity values that DoD can use to perform a baseline risk assessment to determine whether remedial action is needed under CERCLA.

Attachment: Risk Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil Using EPA's RSL Calculator

Chemical	Carcinogenic Slope Factor - Oral (SF) $(mg/kg\text{-}day)^{-1}$	Non-Carcinogenic Reference Dose (RfD) (mg/kg-day)	Residential Scenario Screening Levels Calculated Using EPA RSL Calculator								Industrial/Commercial Composite Worker Screening Levels Calculated Using EPA RSL Calculator			
			Tap Water (µg/L or ppb)				Soil (mg/kg or ppm)				Soil (mg/kg or ppm)			
			HQ = 0.1	HQ = 1.0	ILCR = 1E-06	ILCR = 1E-04	HQ = 0.1	HQ = 1.0	ILCR = 1E-06	ILCR = 1E-04	HQ = 0.1	HQ = 1.0	ILCR = 1E-06	ILCR = 1E-04
PFOS	NA	2.00E-05	0.040	0.40	NA	NA	0.13	1.3	NA	NA	1.6	16	NA	NA
PFOA	7.00E-02	2.00E-05	0.040	0.40	1.1	111	0.13	1.3	7.8	775	1.6	16	33	3,280
PFBS	NA	3.00E-04	0.6	6.0	NA	NA	1.9	19	NA	NA	25	250	NA	NA

HQ=Hazard Quotient
ILCR=Incremental Lifetime Cancer Risk
NA=Not available/applicable

NOTES:

- The table represents screening levels based on residential and industrial/commercial worker receptor scenarios for either direct ingestion of groundwater (residential scenario only) or incidental ingestion of contaminated soil (both residential and composite worker scenarios).
- All values were calculated using slope factors or reference doses for PFOS and PFOA published by EPA Office of Water in support of the LHA, and default exposure assumptions for each potential receptor scenario, contained in EPA's RSL Calculator on April 6, 2018.
- Peer reviewed toxicity values considered valid for risk assessment exist for PFBS, and the screening levels may be found in EPA's RSL table or EPA's RSL calculator used to develop them.
- Other potential receptor scenarios (e.g., recreational user, site trespasser, construction worker) are not included in the above table, but could be relevant receptors at a site potentially contaminated with PFOS, PFOA and/or PFBS. These receptors, and their associated exposure scenarios, should be further considered in the scoping phase and completion of the Baseline Human Health Risk Assessment typically completed during an RI.
- The shaded values represent conservative screening levels for PFOS and PFOA in groundwater or soil that when exceeded should be considered a contaminant of potential concern in the risk assessment process and calculations of site-specific risk posed.

APPENDIX B

Preliminary Assessment/Site Inspection Quality Control Checklist

Appendix B
Installation Preliminary Assessment / Site Inspection Quality Control Checklist
Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Action Item *(Target Date)*	Comments	Completed Date	Completed By
Preliminary Assessment			
Pre-Site Visit			
Kickoff teleconference *(6 weeks prior to site visit)*	Arcadis U.S., Inc. (Arcadis) hosted a teleconference to introduce the U.S. Army Environmental Command (USAEC) per- and polyfluoroalkyl substances program with Fort Belvoir, the U.S. Army Corps of Engineers (USACE), and the USAEC.	22 April 2019	C. Ingersoll
Kickoff teleconference meeting minutes *(1 week after teleconference)*	Arcadis regional lead discussed site visit logistics and requested contact information for interviewees. Deliverable was reviewed by Arcadis Regional Lead and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	03 May 2019	C. Ingersoll
Read-ahead package *(2 weeks prior to site visit)*	Pre-site visit records search was started in April 2019. Deliverable was reviewed by Arcadis Regional Lead and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	23 May 2019	C. Ingersoll
Site Visit			
In-briefing	Arcadis hosted an in-briefing for several personnel, including Fort Belvoir Directorate of Public Works, airfield, and fire department staff, and USAEC representatives.	04 June 2019	C. Ingersoll
Site visit records search	Arcadis collected various documents and records prior to, during and following the site visit.	08 April 2019 through 01 October 2019	L. Henderson
Site visit personnel interviews	Arcadis interviewed several personnel (Directorate of Public Works, Davison Army Airfield, fire department, hazardous waste) during the site visit, completing interview logs for each interviewee (or group of interviewees).	04 to 06 June 2019	L. Henderson
Site reconnaissance trips	Arcadis conducted site reconnaissance at several areas during the site visit, completing site reconnaissance logs for each area (or group of areas) visited.	04 to 06 June 2019	L. Henderson
Exit briefing	Arcadis hosted an informal exit briefing with Fort Belvoir Directorate of Public Works. During the site visit, Arcadis scheduled or obtained possible dates for the AOPI teleconference from necessary U.S. Army installation points of contact.	06 June 2019	L. Henderson

Appendix B
Installation Preliminary Assessment / Site Inspection Quality Control Checklist
Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Action Item *(Target Date)*	Comments	Completed Date	Completed By
Post-Site Visit			
Site Visit Trip Report *(submittal and closing of pending action items within 2 weeks of site visit)*	Arcadis evaluated additional information and data collected during the site visit to determine AOPI designations. Deliverable was reviewed by Arcadis Regional Lead and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	25 June 2019	C. Ingersoll
Post-site visit teleconference *(within 4 weeks of site visit)*	Arcadis hosted a discussion of proposed AOPIs with Fort Belvoir staff, and the list of AOPIs was finalized except for one AOPI (1958 Helicopter Crash). The 1958 Helicopter Crash was excluded as an AOPI sometime between the Post-site visit teleconference and the Site inspection kickoff teleconference on 30 Jan 2020. The Post-site visit teleconference took place approximately five months after the site visit because (1) it took a few months to obtain the information necessary to make determinations on whether investigated locations should be classified as AOPIs or Non-AOPIs, and (2) there was a pause on preparations for this teleconference pending the award of funds for the SI after the originally approved funds were redirected to another installation in response to an urgent USAEC request.	15 November 2019	C. Ingersoll
Site Inspection			
Site inspection (SI) kickoff teleconference	Arcadis hosted a kickoff meeting with Fort Belvoir, USAEC, and the USACE to discuss sampling options for the site inspection.	30 January 2020	A. Hess
SI kickoff teleconference meeting minutes	Deliverable was reviewed by Arcadis SI Project Manager and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	05 February 2020	A. Hess
SI scoping teleconference	Arcadis hosted a meeting with Fort Belvoir and USAEC to discuss the sampling scope and schedule for the site inspection.	04 May 2020	A. Hess
SI scoping teleconference meeting minutes	Deliverable was reviewed by Arcadis SI Project Manager and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	18 March 2020	A. Hess
Draft Quality Assurance Project Plan (QAPP) Addendum and Site Safety and Health Plan (SSHP)	Arcadis provided a draft proposed scope of work based on the determination of AOPIs discussed during the post-site-visit teleconference and the SI kickoff meeting. Deliverable was reviewed by the Arcadis SI Project Manager, Technical Lead, Quality Control Reviewer, and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	6 May 2020	A. Hess
Response to comments discussion teleconference *(within 15 days of receipt of comments)*	Arcadis did not host a discussion of the comments received to date with Fort Belvoir, the USACE, and the USAEC prior to submittal of responses to comments.	Not Applicable	Not Applicable
Submittal of responses to comments *(within 7 days of RTC discussion teleconference)*	The comments were addressed as agreed upon during the response to comment discussion teleconference, and the response to comment matrix detailing the completed revisions was submitted to Fort Belvoir, the USACE, and the USAEC. Concurrence on responses to comments was received on 05 Aug 2020.	13 July 2020	A. Hess

Appendix B
Installation Preliminary Assessment / Site Inspection Quality Control Checklist
Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

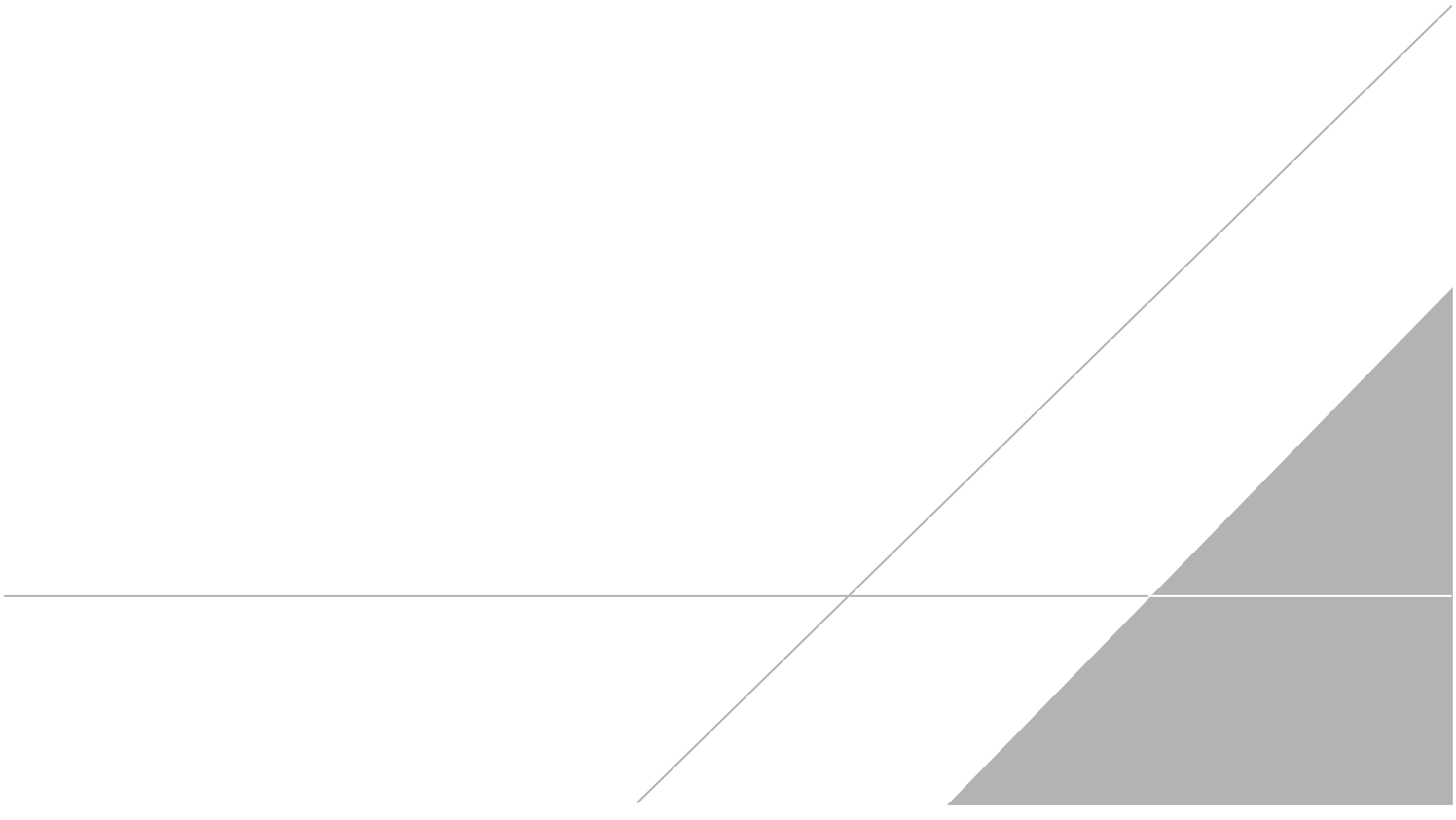
Action Item *(Target Date)*	Comments	Completed Date	Completed By
Draft Final QAPP Addendum *(within 2 weeks of concurrence on responses to comments on the Draft QAPP Addendum and SSHP)*	Arcadis provided the draft final proposed scope of work agreed upon by the installation, USACE, and USAEC for the installation to provide to regulators.	11 August 2020	A. Hess
Submittal of responses to comments *(within 2 weeks of concurrence from installation, USACE, and USAEC)*	Arcadis addressed the comments received from regulatory agencies, and the response to comment matrix detailing the completed revisions was submitted to Fort Belvoir, the USACE, and the USAEC. Concurrence on responses to comments was received on 21 September 2020.	15 September 2020	A. Hess
Final QAPP Addendum and SSHP *(submittal within 2 weeks of receipt of client comments)*	Arcadis revised the draft final document as agreed upon by Fort Belvoir, the USACE, the USAEC, and regulatory agencies prior to finalizing the document.	22 September 2020	A. Hess
Site inspection planning	Arcadis SI Project Manager finalized site inspection logistics and completed all access requirements, scheduling, and/or permits necessary.	24 September 2020	A. Hess
Site inspection field work *(timing dependent on availability of subcontractors)*	Arcadis completed the scope of work outlined in the QAPP Addendum with drilling subcontractor Drilling.	27 September 2020 through 01 October 2020, 10 March 2021	J. Coffey
Preliminary Assessment/Site Inspection Report			
Draft Preliminary Assessment/Site Inspection (PA/SI) Report *(submittal within 90 days of site inspection data validation or 30 days after the site inspection results discussion, whichever is later)*	An Arcadis chemist, independent of the project team, validated and verified all analytical data collected during the SI and summarized the data usability in a report for inclusion as an appendix to the PA/SI Report. Deliverable was reviewed by Arcadis Project Manager, Quality Control Reviewer, and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	06 August 2021	A. Hess
Submittal of responses to comments (within 7 days of responses to comment discussion teleconference)	The comments were addressed as agreed upon during the response to comment discussion teleconference, and the response to comment matrix detailing the completed revisions was submitted to Fort Belvoir, the USACE, and the USAEC.	25 October 2021	A. Hess
Draft Final (V1) PA/SI Report (USAEC Legal Review)	Arcadis provided the draft final PA/SI Report agreed upon by the installation, USACE, and USAEC for USAEC Legal review	5 November 2021	A. Hess
Submittal of responses to comments *(within 2 weeks of concurrence from installation, USACE, and USAEC)*	Arcadis addressed USAEC Legal comments received and the response to comment matrix detailing the completed revisions was submitted to USAEC during HQDA submittal. Concurrence on responses to comments not required as comments were "suggestions".	21 January 2022	A. Hess
Draft Final (V2) PA/SI Report (HQDA/Cliff Opdyke Review)	Arcadis provided the draft final PA/SI Report agreed upon by the installation, USACE, and USAEC to USAEC for HQDA review on 21 January 2022. However, on 14 February 2022, USAEC decided that Cliff Opdyke (USACE) will review the Draft Final (V2) PA/SI report in lieu of HQDA. Cliff Opdyke received the report for review on 7 March 2022 and completed his review on 21 March 2022 and provided one editorial comment.	21 January 2022	A. Hess

Appendix B
Installation Preliminary Assessment / Site Inspection Quality Control Checklist
Per- and Polyfluoroalkyl Substances Preliminary Assessment/Site Inspection
Fort Belvoir, Virginia

Action Item *(Target Date)*	Comments	Completed Date	Completed By
Draft Final (V3) PA/SI Report (VADEQ review)	The deliverable was updated with programmatic template changes and submitted to USAEC for distribution to FTBL, and subsequent distribution to VADEQ for review. VADEQ received the report for review on 12 April 2022.	31 March 2022	A. Hess
Submittal of responses to comments	Arcadis received VADEQ's comments on 19 May 2022. Arcadis addressed the comments received from VADEQ and the response to comment matrix detailing the completed revisions was submitted to the USAEC for review on 14 June 2022. USAEC concurrence on responses to comments was received on 04 October 2022.	14 June 2022	A. Hess
Final PA/SI Report *(submittal within 45 days of receipt of comments)*	Revised deliverable was reviewed by Arcadis Project Manager, Quality Control Reviewer, and Technical Editor prior to distribution to Fort Belvoir, the USACE, and the USAEC.	13 October 2022	A. Hess
Preliminary assessment/site inspection complete at Fort Belvoir - Quality Control Reviewer		Jessica Travis, Seres E&S	

APPENDIX C

Antiterrorism/Operations Security Review Cover Sheet



U.S. Army Corps of Engineers

CONTRACT REQUIREMENTS PACKAGE

ANTITERRORISM/OPERATIONS SECURITY REVIEW COVER SHEET

For use of this form, see AR 525-13, ALARACT 015/2012; and USACE OPORD 2013-74; the proponent agency is CECO-P.

SECTION I - CONTRACT INFORMATION

1. CONTRACT TITLE	2. LOCATION
US Army Environmental Command Preliminary Assessments (PAs) of Perfluorooctane Sulfonate (PFOS)	Nationwide
3. SOLICITATION/CONTRACT NO.	4. CLASS APPROVAL REQUEST NUMBER
W912DR-13-D-0019	

5. CONTRACT TYPE

☐ Construction ☐ IDIQ ☒ MATOC ☐ SATOC ☐ Service ☐ Supply ☐ Task Order

☐ Other (*specify*)

SECTION II - PURPOSE

Part A. Purpose of cover sheet is to document the review of the requirements package performance work statement (PWS)/statement of work (SOW)/ statement of requirements (SOR) for antiterrorism (AT) and other related protection matters to include, but not limited to: operation security (OPSEC), information assurance (IA), physical security, law enforcement, intelligence and foreign disclosure. **Army policy requirement:** A Signed AT/OPSEC cover sheet is required to be included in all requirements packages except for supply contracts under the simplified acquisition level threshold ($150K), field ordering officer actions and Government purchase card purchases. Local policy may require this form for supply contracts under the simplified acquisition level threshold based on risk and threat. **Mandatory review and signatures**: The organizational Antiterrorism Officer (ATO) and OPSEC Officer must review each requirements package, unless a signed class approval request form is completed, prior to submission to the supporting contracting activity to include coordination with other staff review as appropriate. If the requiring activity (RA) does not have an ATO or OPSEC Officer, the first ATO and OPSEC Officer in the chain of command will review the contract for AT/OPSEC considerations.

SECTION III - STANDARD CONTRACT LANGUAGE

Part B. Standard Contract Language and/or Additional PWS/SOW/SOR Language. The applicability of each requirement must be considered and each block must be checked "Yes" or "N/A". If the standard PWS/SOW/SOR language text found in Section VIII. of this form is sufficient to meet specific contract request requirements, check "Yes" in block below and include this language in the PWS/SOW/SOR. If the standard PWS/SOW/SOR language applies, but is not in of itself sufficient, check "Yes" and include both the standard language and additional contract specific language in the PWS/SOW/SOR. If standard PWS/SOW/SOR language text does not apply, check "N/A".

SECTION IV - REQUIRED CLAUSES

Required Clause(s) (*see Section VIII for sample language*)	YES	N/A
1. AT Level I training *(general).*	☒	☐
2. Access and General Protection/Security Policy and Procedures.	☒	☐
2a. Contractors requiring Common Access Card (CAC).	☒	☐
2b. Contractors who do not require CAC, but require access to a Department of Defense (DoD) facility or installation.	☒	☐
3. AT Awareness training for contractor personnel traveling overseas.	☒	☐
4. iWATCH and/or CorpsWatch training.	☒	☐
5. Access to government information systems.	☐	☒
6. OPSEC SOP/Plan requirements.	☒	☐
7. Requirement for OPSEC training.	☒	☐
8. Information assurance/information technology training.	☐	☒
9. Information assurance/information technology training certification.	☐	☒
10. Contractors Authorized to Accompany the Force (OCONUS).	☐	☒
11. Contract requires performance or delivery in a foreign country (OCONUS).	☐	☒
12. Handling/Access to Classified Information.	☐	☒
13. Will be escorted in areas where they may be exposed to classified and/or sensitive materials.	☐	☒
14. Contractor Company to obtain a Facility Clearance and individual clearances at the appropriate level.	☐	☒

15. Pre-screen candidates using E-Verify Program.	☐	☒
16. For contracts requiring armed security guards.	☐	☒
17. Threat Awareness Reporting Program (TARP) training.	☐	☒

SECTION V - REMARKS

1. CONTRACT TITLE	2. LOCATION
US Army Environmental Command Preliminary Assessments (PAs) of Perfluorooctane Sulfonate (PFOS)	Nationwide
3. SOLICITATION/CONTRACT NO.	4. CLASS APPROVAL REQUEST NUMBER
W912DR-13-D-0019	

5. CONTRACT TYPE

☐ Construction ☐ IDIQ ☒ MATOC ☐ SATOC ☐ Service ☐ Supply ☐ Task Order

☐ Other (*specify*) _____

SECTION VI - ANTITERRORISM REVIEWER'S SIGNATURE

I am ATO Level II certified and I have reviewed the requirements package and understand my responsibilities IAW Army Regulation 525-13, Antiterrorism.

1. TYPED OR PRINTED NAME	2. RANK/CIVILIAN GRADE	3. PHONE NUMBER
Pratya Siriwat	GS14	210-466-1656
4. SIGNATURE	5. DATE	
SIRIWAT.PRATYA.1159129710 Digitally signed by SIRIWAT.PRATYA.1159129710 Date: 2018.07.27 16:19:09 -05'00'	2018-07-27	

SECTION VII - OPERATIONS SECURITY REVIEWER'S SIGNATURE

I am OPSEC Level II certified and have reviewed the requirements package to ensure that there are no OPSEC concerns regarding the release and/or publication of attached documentation to public forums as well as to determine OPSEC requirements for the Contractor, and understand my responsibilities IAW Army Regulation 530-1, Operations Security.

1. TYPED OR PRINTED NAME	2. RANK/CIVILIAN GRADE	3. PHONE NUMBER
Pratya Siriwat	GS14	210-466-1656
4. SIGNATURE	5. DATE	
SIRIWAT.PRATYA.1159129710 Digitally signed by SIRIWAT.PRATYA.1159129710 Date: 2018.07.27 16:19:45 -05'00'	2018-07-27	

SECTION VIII - STANDARD CONTRACT PROVISION AND CLAUSE TEXT APPLICABILITY AND/OR ADDITIONAL PWS/SOW/SOR LANGUAGE

(*To access a Word version of page 3 and 4 for this form please click on the attachment icon on the left of the form*)

1. **AT Level I Training.** This provision/contract text is for contractor employees with an area of performance within an Army controlled installation, facility or area. **Proposed language:** "All contractor employees, to include subcontractor employees, requiring access to Army installations, facilities, controlled access areas, or require network access, shall complete AT Level I awareness training within 30 calendar days after contract start date or effective date of incorporation of this requirement into the contract, whichever is applicable. Upon request, the contractor shall submit certificates of completion for each affected contractor employee and subcontractor employee, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training by all employees and subcontractor personnel. AT Level I awareness training is available at the following website: http://jko.jten.mil/courses/atl1/launch.html; or it can be provided by the RA ATO in presentation form which will be documented via memorandum."

2. **Access and General Protection/Security Policy and Procedures**. This standard language text is for contractor employees with an area of performance within an Army controlled installation, facility or area. **Proposed language**: "All contractor and all associated sub-contractors employees shall comply with applicable installation, facility and area commander installation/facility access and local security policies and procedures (provided by government representative). The contractor shall also provide all information required for background checks to meet installation/facility access requirements to be accomplished by installation Provost Marshal Office, Director of Emergency Services or Security Office. Contractor workforce must comply with all personal identity verification requirements (FAR clause 52.204-9, Personal Identity Verification of Contractor Personnel) as directed by DOD, HQDA and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any installation or facility change, the Government may require changes in contractor security matters or processes."

2a. **For contractors requiring Common Access Card (CAC).** Before CAC issuance, the contractor employee requires, at a minimum, a favorably adjudicated National Agency Check with Inquiries (NACI) or an equivalent or higher investigation in accordance with Army Directive 2014-05 and Homeland Security Presidential Directive-12 (HSPD-12). **Proposed language:** "The contractor and all sub-contractors employees will be issued a CAC only if duties involve one of the following: (1) Both physical access to a DoD facility and access, via logon, to DoD networks on-site or remotely; (2) Remote access, via logon, to a DoD network using DoD-approved remote access procedures; or (3) Physical access to multiple DoD facilities or multiple non-DoD federally controlled facilities on behalf of the DoD on a recurring basis for a period of 6 months or more. At the discretion of the sponsoring activity, an interim CAC may be issued based on a favorable review of the FBI fingerprint check and a successfully scheduled NACI at the Office of Personnel Management."

2b. **For contractors who do not require CAC, but require access to a DoD facility or installation**. **Proposed language**: Contractor and all associated sub-contractors employees shall comply with adjudication standards and procedures using the National Crime Information Center Interstate Identification Index (NCIC-III) and Terrorist Screening Database (TSDB) (Army Directive 2014-05 / AR 190-13), applicable installation, facility and area commander installation/facility access and local security policies and procedures (provided by government representative, as NCIC and TSDB are available), or, at OCONUS locations, in accordance with status of forces agreements and other theater regulations.

3. **AT Awareness Training for Contractor Personnel Traveling Overseas**. This standard language text required US based contractor employees and associated sub-contractor employees to make available and to receive government provided area of responsibility (AOR) specific AT awareness training as directed by AR 525-13 (Antiterrorism). Specific AOR training content is directed by the combatant commander with the unit ATO being the local point of contact. **Proposed language**: "All US based contractor employees and associated sub-contractor employees traveling overseas will receive the government provided AOR specific AT awareness training. The documentation of training completion must be provided to the COR prior to departure."

4. **Suspicious Activity Reporting Training (e.g.** iWATCH, CorpsWatch, or See Something, Say Something**).** This standard language is for contractor employees with an area of performance within an Army controlled installation, facility or area. **Proposed language:** "The contractor and all associated sub-contractors shall receive a brief/training (provided by the RA) on the local suspicious activity reporting program. This locally developed training will be used to inform employees of the types of behavior to watch for and instruct employees to report suspicious activity to the project manager, security representative or law enforcement entity. This training shall be completed within 30 calendar days of contract award and within 30 calendar days of new employees commencing performance with the results reported to the COR NLT 5 calendar days after the completion of the training."

5. **Contractor Employees Who Require Access to Government Information Systems.** This standard language text is for contractor employees with access to government info system. **Proposed language:** "All contractor employees with access to a government info system must be registered in the Army Training Certification Tracking System (ATCTS) at commencement of services, and must successfully complete the DOD Information Assurance Awareness prior to access to the information systems and then annually thereafter in accordance with personnel security standards listed in AR 25-2 (Information Assurance), an appropriate background investigation will be conducted prior to accessing the government information systems."

6. **For Contracts that Require an OPSEC Standing Operating Procedure/Plan.** This standard language text is for contractor employees with an area of performance for classified contracts or if the contract employee has access or responsibility to protect critical information. The Contractor, in collaboration with RA OPSEC Officer, shall develop an OPSEC Standard Operating Procedure (SOP)/Plan within 90 calendar days of contract award per AR 530-1 (Operations Security). **Proposed language:** "The Contractor shall develop an OPSEC SOP/Plan within 90 days of contract award. The OPSEC SOP/Plan must be reviewed and approved by the RA OPSEC Officer. The SOP/Plan will include the government's critical information, why it needs to be protected, where it is located, who is responsible for it and how to protect it. In addition, the contractor shall identify an individual who will be an OPSEC Coordinator."

7. **For Contracts that Require OPSEC Training.** Per AR 530-1, (Operations Security) contractor employees must complete Level I OPSEC Training within 30 calendar days of contract award. **Proposed language**: "All new contractor employees will complete Level I OPSEC Training within 30 calendar days of their reporting for duty. Additionally, all contractor employees must complete annual OPSEC awareness training. The contractor shall submit certificates of completion for each affected contractor and subcontractor employee, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. OPSEC awareness training is available at the following websites: https://www.iad.gov/ioss/ or http://www.cdse.edu/catalog/operations-security.html; or it can be provided by the RA OPSEC Officer in presentation form which will be documented via memorandum."

8. **For Information assurance (IA)/information technology (IT) training.** This standard language text is for contract employees who need network access and/or working IA/IT functions. **Proposed language**: "All contractor employees and associated sub-contractor employees must complete the DoD IA awareness training before issuance of network access and annually thereafter. All contractor employees working IA/IT functions must comply with DoD and Army training requirements in DoDD 8570.01, DoD 8570.01-M and AR 25-2 within six months of employment."

9. **For information assurance (IA)/information technology (IT) certification.** Per DoD 8570.01-M , DFARS 252.239.7001 and AR 25-2, the contractor employees supporting IA/IT functions shall be appropriately certified upon contract award. The baseline certification as stipulated in DoD 8570.01-M must be completed upon contract award. **Proposed language:** "All contractor employees supporting IA/IT functions shall be appropriately certified upon contract IAW DoD 8570.01-M, DFARS 252.239-7001 and AR 25-2. The baseline certification as stipulated in DoD 8570.01-M must be completed upon contract award."

10. **For Contractors Authorized to Accompany the Force.** DFARS Clause 252.225-7040, Contractor Personnel Authorized to Accompany U.S. Armed Forces Deployed Outside the United States. The clause shall be used in solicitations and contracts that authorize contractor personnel to accompany US Armed Forces deployed outside the US in contingency operations; humanitarian or peacekeeping operations; or other military operations or exercises, when designated by the combatant commander. **Proposed language**: "All contractor employees shall ensure the following AT/OPSEC requirements are met prior to deploying personnel authorized to accompany U.S. Armed Forces outside the United States; to include compliance with laws, regulations, pre-deployment requirements, and required training in accordance with combatant command guidance."

11. **For Contracts Requiring Performance or Delivery in a Foreign Country.** DFARS Clause 252.225-7043, Antiterrorism/Force Protection for Defense Contractors Outside the US. The clause shall be used in solicitations and contracts that require performance or delivery in a foreign country. This clause applies to both contingencies and non-contingency support. **Proposed language:** "All non-local contracting personnel will comply with theater clearance requirements and allows the combatant commander to exercise oversight to ensure the contractor's compliance with combatant commander and subordinate task force commander policies and directives."

12. **For Contracts That Require Handling or Access to Classified Information.** This clause involves access to classified information, i.e. “Confidential,” “Secret,” or “Top Secret”. **Proposed language**: "Contractor shall comply with AR 380-67 (Personnel Security Program) and Homeland Security Presidential Directive 12 (Policy for a Common Identification Standard for Federal Employees and Contractors) as well as FAR 52.204-2, Security Requirements. Additionally, Contractors must comply with - (1) The Security Agreement (DD Form 441), including the National Industrial Security Program Operating Manual (DoD 5220.22-M); any revisions to DOD 5220.22-M, notice of which has been furnished to the contractor. For classified contracts, the DD Form 254 will be attached with the contract."

13. **Will be escorted in areas where they may be exposed to classified and/or sensitive materials and/or sensitive or restricted areas.** The contractor will coordinate with the COR and/or the facility security office for access when required. (Use when security clearances are not required, i.e. facility repair or construction). **Proposed language**: "All contract employees, including subcontractor employees who are not in possession of the appropriate security clearance or access privileges, will be escorted in areas where they may be exposed to classified and/or sensitive materials and/or sensitive or restricted areas."

14. (FOR CLASSIFIED CONTRACTS ONLY) **Contractor Company to obtain a Facility Clearance and individual clearances at the appropriate level. Proposed language:** "The Prime Contractor Company must have a Facility Clearance (FCL) at the appropriate level (IAW the NISPOM DOD 5220.22-M and AR 380-49) prior to the start of the contract awarded period of performance. Contractor personnel performing work under this contract must have the required security clearance, per AR 380-67, at the appropriate level at the start of the period of performance. Security Clearances and FCL requirements are required to be maintained for the life of the contract IAW the DD Form 254 attached to the contract. If no FCL, the supporting Government Contracting Activity will sponsor the prime contract company in obtaining the FCL."

15. **Pre-screen candidates using E-Verify Program. Proposed language:** "The Contractor must pre-screen Candidates using the E-verify Program (http://www.uscis.gov/e-verify) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to enrollment to ensure the correct information is entered into the E-verify system. An initial list of verified/eligible Candidates must be provided to the COR no later than 3 business days after the initial contract award." *When contracts are with individuals, the individuals will be required to complete a Form I-9, Employment Eligibility Verification, with the designated Government representative. This Form will be provided to the Contracting Officer and shall become part of the official contract file.

16. **For contract requiring armed security guards.** This standard language text is for contractor employees with an area of performance within an Army controlled installation, facility or area. The Physical Security Officer must or will review the PWS/SOW with the Contracting Officer (KO) for accuracy and completeness of AR 190-11 requirements. **Proposed language:** "All contractor and all associated sub-contractors employees shall comply with applicable installation, facility and area commander installation/facility policies and procedures on storing weapons and ammunition IAW AR 190-11 (provided by government representative)."

17. **Threat Awareness Reporting Program**. For all contractors with security clearances. Per AR 381-12 Threat Awareness and Reporting Program (TARP), contractor employees must receive annual TARP training by a CI agent or other trainer as specified in 2-4b. **Proposed language**: "All new contractor employees will complete annual Threat Awareness and Reporting Program (TARP) Training provided by a Counterintelligence Agent, IAW AR 381-12 . The contractor shall submit certificates of completion for each affected contractor and subcontractor employee(s) or a memorandum for the record, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. Authorized web-based TARP training for CAC card holders is available at the following website: https://www.us.army.mil/suite/page/655474