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

Fort Greely, Alaska

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

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Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

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Kimberley Schrupp, PMP
Site Inspection Project Manager, Arcadis U.S., Inc.

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

Joseph Quinnan, PE/PG
Technical Expert, Arcadis U.S., Inc.

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Prepared by:

Arcadis U.S., Inc.

7550 Teague Road

Suite 210

Hanover

Maryland 21076

Arcadis Ref.:

30001993

Date:

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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 Fort Greely, Alaska (FGA) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense (DoD) policy and guidance.

FGA is located approximately 100 miles southeast of Fairbanks and 5 miles south of Delta Junction. Other than Fairbanks, there are no major population centers for several hundred miles. The installation was originally comprised of 661,051 acres but has since been restructured into a much smaller, roughly triangular area of 7,200 acres. FGA supports a small population (approximately 1,000) of active-duty personnel, civilian workers, contractor/tenant personnel, and residents.

The FGA PA identified 21 AOPIs for investigation during the SI phase. SI sampling results from the 21 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 19 AOPIs; seven of the 21 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. The FGA 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 FGA, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Allen Army Airfield Runways	No	No	No action at this time
Allen Army Airfield Hangar Building 100	Yes	No	Further study in a remedial investigation
Building 111 Current Fire Station	Yes	No	Further study in a remedial investigation
Building 150 Fire Training Tower	Yes	No	Further study in a remedial investigation
Building T100 AFFF Storage	Yes	No	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	
FGLY-006 Fire Training Pits	No	No	No action at this time
Wetland-like Area	No	No	No action at this time
Old Post Forest Fire Area	No	ND	No action at this time
Building 347 AFFF Storage	No	No	No action at this time
AFFF Parade Route	No	Yes	Further study in a remedial investigation
Building 504 Former Fire Station	No	Yes	Further study in a remedial investigation
Old Lodge Area (Current Building 637)	No	Yes	Further study in a remedial investigation
Sludge Drying Beds	NS	No	No action at this time
Gate 18 Area	NS	No	No action at this time
900-Block Forest Fire Area	No	No	No action at this time
Nozzle Testing and Training Area	NS	No	No action at this time
Landfill #8	No	NS	No action at this time
Nursery Sludge Stockpile	No	No	No action at this time
Main Gate Fire	ND	ND	No action at this time
Chapel Nozzle Testing Area	NS	ND	No action at this time
Former Old Post Sewage Lagoons	ND	No	No action at this time

Notes:
Light gray shading – detection greater than the OSD risk screening level
GW – groundwater
ND – non-detect
NS – not sampled
SO – soil

Additionally, five monitoring wells installed by FGA in 2020 downgradient of the installation (i.e., north of Jarvis Creek) were sampled during the SI. PFOS was detected in one of the five wells (i.e., at MW-36, northeast of the FGLY-006 Fire Training Pits and potentially downgradient of multiple AOPIs), at a concentration less than the OSD risk screening level. PFOA and PFBS were not detected in any of the five new wells in the Donnelly Training Area.

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 Fort Greely, Alaska (FGA) based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the Office of the Secretary of Defense (OSD) PFOS, PFOA, and PFBS risk screening levels to determine whether further investigation is warranted. This report provides the PA/SI for FGA and was completed in accordance with CERCLA and The National Oil and Hazardous Substances Pollution Contingency Plan.

1.1 Project Background

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

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

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

1.2 PA/SI Objectives

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

1.2.1 PA Objectives

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

1.2.2 SI Objectives

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

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

1.3 PA/SI Process Description

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

1.3.1 Pre-Site Visit

First, an installation kickoff teleconference was held between applicable points of contact (POCs) from United States Army Environmental Command (USAEC), United States Army Corps of Engineers (USACE), FGA, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 12 July 2019, approximately 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 FGA.

A read-ahead package was prepared and submitted to the appropriate POCs 2 weeks before the site visit. The read-ahead package contains 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 31 July and 01 August 2018. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

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

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts, and the migration potential from each AOPI (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved, unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells, if present, 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 offered to installation personnel at the conclusion of the site visit to raise any items identified during the site visit, discuss any follow-up items, and review the schedule for submitting deliverables. The exit briefing was conducted on 01 August 2018 with the installation to discuss preliminary findings of the PA site visit.

1.3.3 Post-Site Visit

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

1.3.4 Site Inspection Planning and Field Work

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

The objectives of the SI kickoff teleconference were to:

- discuss the AOPIs selected for sampling
- discuss general SI deliverable and field work schedule information and logistics

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

- regulatory involvement (i.e., USEPA and Alaska Department of Environmental Conservation [ADEC]) requirements or preferences
- identify overlapping unexploded ordnance or cultural resource areas
- confirm the plan for investigation derived waste (IDW) handling and disposal
- identify specific installation access requirements and potential schedule conflicts
- provide an updated SI deliverable and field work schedule.

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP) was developed and finalized in October 2019 for the USAEC PFAS PA/SI (Arcadis 2019). The PQAPP details general planning processes for collecting data and describes the implementation of quality assurance (QA) and quality control (QC) activities for the SI portion for Army installations nationwide. Additionally, an installation-specific QAPP Addendum was developed to define the DQOs, present the sampling design and rationale, and provide qualifications for project personnel. The SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation-specific QAPP Addendum. A Site Safety and Health Plan (SSHP) was also developed as an attachment to the QAPP Addendum to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for Army installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

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

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

1.3.5 Data Analysis, Validation, and Reporting

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

2 INSTALLATION OVERVIEW

The following subsections provide general information about FGA, 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

FGA is approximately 100 miles southeast of Fairbanks and 5 miles south of Delta Junction, Alaska (**Figure 2-1**). The entrance is on Richardson Highway, a paved, two-lane roadway. Other than Fairbanks, which is home to about 50,000 people, there are no major population centers for several hundred miles. The installation was originally comprised of 661,051 acres and was under the control of the United States Army Alaska (USARAK). In 2002, FGA was restructured into a much smaller, roughly triangular area of 7,200 acres. Responsibility for the remainder of the former FGA was transferred to Fort Wainwright, Alaska, and is now called the Donnelly Training Area (DTA); the DTA remains under the control of the USARAK. United States Army Space and Missile Defense Command (USASMDC) briefly controlled FGA (i.e., from 2002 to 2005) before the installation transferred to IMCOM. FGA supports a small population (approximately 1,000) of active-duty personnel, civilian workers, contractor/tenant personnel, and residents. USASMDC remains a major tenant on the southwestern portion of the post at the Missile Defense Agency (MDA) area (FGA 2017). The installation houses the Allen Army Airfield (AAAF) at the north end of the installation. The installation layout is shown on **Figure 2-2**.

2.2 Mission and Brief Site History

The mission of FGA is to support the Ground-based Midcourse Defense interceptor deployment and the Cold Regions Test Center. The installation also maintains the AAAF, which is used by Ground-based Midcourse Defense and other agencies for miscellaneous activities in the area (e.g., United States Air Force training, forest firefighting training). The installation has undergone several environmental studies and restoration activities dating back to 1978. In 1989, the first stage of the Installation Restoration Program (IRP) initiated a number of investigations. The first significant study was a PA conducted in 1992 for various contaminants. Between 1992 and 1995, most of the sites were studied and several remediation projects were completed (FGA 2017).

In 1995, FGA was selected for realignment under the Base Realignment and Closure (BRAC) program. The Army subsequently declared as surplus 1,700 acres, including most of the cantonment area. A cleanup plan was developed to remediate the sites so the surplus property would not pose environmental liabilities to future occupants. Under the BRAC program, the installation was abbreviated as “FGLY” (Fort Greely), and many environmental sites retain this nomenclature. The BRAC-driven remediation continued through 2002, the scheduled implementation date for realignment. Just prior to this date, the Department of the Army decided to retain previously identified surplus property at FGA and directed transition of the current footprint from USARAK to USASMDC (FGA 2017).

In June 2003, a list was developed of 132 environmental sites where there was suspected or confirmed contamination; the list originated from examination of all BRAC parcels, the USEPA solid waste

management units list, the ADEC contaminated sites database, and the Army Environmental Database - Restoration. In 2005 a decision document was produced to close out 73 of these sites. A record of decision finalized in 2009 closed or determined the final remedial actions at nine additional sites. Since 2003, four additional sites have been identified. The remaining 54 sites require additional documentation, investigations, and/or remedial action prior to closeout, either under the Military Munitions Response Program or the IRP (FGA 2017). These 54 sites were regrouped into 29 sites by the Army and are tracked in the Headquarters Army Environmental System.

Installation cleanup activities from 2008 to 2012 focused on achieving remedy-in-place, a remedy complete, or site closure for all sites. Extensive investigations, removal actions, remedial actions, and/or treatability studies for remediation were utilized to characterize sites, perform cleanup, and prepare most of the sites for closeout. Other decision documents are currently under development to close out the remaining sites (some with no restrictions, some with land use controls, and some with final closeout actions; FGA 2017).

2.3 Current and Projected Land Use

FGA is primarily used for industrial purposes and is largely covered by asphalt and administrative buildings (i.e., a cantonment area), the AAAF, and the MDA. These areas are surrounded by forested and grassy areas. A residential area is established in the southern part of the cantonment area. Land use at FGA as industrial and residential is expected to remain constant for the foreseeable future. Land use controls are in place at FGA to control unauthorized land uses and to prohibit unauthorized excavation or well installation without proper controls including a dig permit at previously-investigated environmental sites to prevent exposure to impacted soil and groundwater.

Due to the nature of the USASMDC's mission, FGA is not open to the public for recreation. However, a limited number of permits are issued yearly to Purple Heart veterans for guided moose hunting expeditions.

2.4 Climate

FGA is located within the continental climate zone, which is characterized by extreme diurnal and annual temperature variations, low precipitation, low cloudiness, and low humidity (WHPacific, Inc. 2014). Mean annual temperature in the area is 28 degrees Fahrenheit (°F), but temperatures range from a July mean maximum of 69 °F to a January mean minimum of -11 °F (Nelson 1995). Annual precipitation is around 11 inches in rainfall during summer months (predominantly July and August) and about 39 inches of snowfall during the prolonged winters. Rainfall intensity (as measured by a 2-year frequency and 24-hour precipitation duration) at FGA indicates a relatively low potential for runoff to erode soil directly into local streams and rivers (WHPacific, Inc. 2014). The mean wind speed and direction is about 8 miles per hour to the east-southeast (CH2M Hill 1992). Wildfires can be common in the area during dry years. Prescribed burns are periodically conducted around FGA, the DTA, and Delta Junction to reduce the risk that wildfires could pose on the surrounding communities.

2.5 Topography

FGA is located at the base of the Alaska Range, near the head of the Tanana Valley, in an area formerly dominated by wetlands and sub-boreal forests. Landforms in the vicinity of FGA include coalescing alluvial fans, moraines, and river flood plains. The cantonment area is located on a low, gently undulating alluvial terrace between the Delta River and Jarvis Creek (**Figure 2-3**; WHPacific, Inc. 2015b). Glacial-fluvial and glacial-moraine deposits are present on FGA immediately east and south of the cantonment (WHPacific, Inc. 2014). The ground surface at FGA slopes to the northeast in the southern half of the installation with a maximum elevation of approximately 1,480 feet above mean sea level, and slopes more to the north in the northern half of the installation with the elevation decreasing to approximately 1,200 feet above mean sea level near Jarvis Creek at the installation boundary (**Figure 2-3**).

2.6 Geology

FGA is underlain by altered sedimentary and volcanic rocks of Paleozoic age that were later intruded by granite plutons. These rocks were subsequently overlain by Tertiary-age sediments of continental origin. The alluvial terrace underlying the cantonment area is composed of glacial outwash deposits, which are underlain by glacial till and older stratified gravels of alluvial fan complexes (WHPacific, Inc. 2015b). The morainal features east and south of the cantonment area are characterized by kame and kettle topography, and are composed of generally coarse, unstratified, unsorted till ranging from silty gravel with sand to sandy silt with gravel (WHPacific, Inc. 2014).

The thickness of unconsolidated materials is estimated to be as much as approximately 2,500 feet. It is likely that deep sediments in the area are poorly sorted lacustrine, glacial, or marine sediments of low permeability. The area was glaciated in at least three episodes, as evidenced by the presence of terminal moraines in the Delta and Gerstle River valleys and in the valleys of several small creeks draining the north face of the Alaska Range (WHPacific, Inc. 2014). As glaciers withdrew from the area during the most recent regression, silt left behind from the flooding of the Delta River and Jarvis Creek was picked up by the wind and deposited to form a mantle of loess and organic silt across the Tanana Valley, including FGA. The loess ranges from several inches thick to more than 5 feet thick (Péwé and Holmes 1964).

FGA lies within an active seismic zone that extends from Fairbanks, Alaska, southward through the Kenai Peninsula. The Denali Fault extends through the Alaska Range just south of the installation; slip on this fault is on the order of 1 centimeter per year. The seismic behavior of the Denali Fault is characterized by infrequent large earthquakes. FGA is considered to be in a seismic zone characterized by a 10 percent (%) probability of major earthquake damage occurring at least once in 50 years (Tetra Tech, Inc. 2008).

2.7 Hydrogeology

Hydrological and soil investigations conducted at and around FGA since the 1950s have produced a substantial amount of information on the hydrogeology of the area. Soil borings from environmental contamination investigations, conducted between 1997 and 2009, indicate that the upper 250 feet of soil within FGA is dominated by sandy gravels that are interlaced with discontinuous, less permeable, silt-rich zones. Discontinuous permafrost has been recorded up to approximately 120 feet below ground surface (bgs) in the region, which is above the saturation zone and thought to not interact or be associated with

the local aquifer. However, soil investigations at FGA have not revealed any evidence of permafrost within the base boundaries (WHPacific, Inc. 2015a). It is possible permafrost once existed beneath areas of FGA but has since degraded after the areas were cleared and developed.

Groundwater in and around FGA is found in an unconfined aquifer. Groundwater generally flows in a northeasterly to east-northeasterly direction towards Jarvis Creek year-round. Groundwater is estimated to have a hydraulic gradient between 0.001 to 0.004 feet per linear foot, indicating a consistent soil composition and water table elevation underlying the base. The aquifer beneath FGA is thought to be recharged primarily from the Alaska Range with contributions from the Delta River and Jarvis Creek (WHPacific, Inc. 2015a). Stream flow data for Jarvis Creek and the Delta River which indicate that both are losing streams near FGA suggests that the aquifer is also locally recharged from surface water (WHPacific, Inc. 2015a). Local groundwater recharge from snowmelt and precipitation has been estimated at 1 inch per year.

The depth to the aquifer decreases with distance to the north from the mountains. The water table is estimated to be roughly 400 feet bgs near the mountains, between 150 and 250 feet bgs around FGA (WHPacific, Inc. 2014), 50 to 100 feet bgs near Delta Junction, and less than 10 feet bgs near the Clearwater Creek and Clearwater Lake (WHPacific, Inc. 2015a). Groundwater levels fluctuate seasonally, with the lowest groundwater elevations normally recorded between April and May, when the soil and rivers are still frozen over, and no water can infiltrate. The highest groundwater elevations are recorded between September and October when thawing is complete and allows for maximum aquifer recharge to occur (Midwest Environmental Consultants 2004). Groundwater elevation ranges recorded during the different seasons have shown water levels to fluctuate by 20 feet or more in a year at FGA, and fluctuations of up to 50 feet have been recorded in wells in nearby Delta Junction (WHPacific, Inc. 2014; 2015a). While historical documents indicate that discontinuous areas of perched water and permafrost have been reported in the FGA area, no perched water or permafrost has been encountered in soil borings at FGA during historical environmental investigation activities.

Information obtained from lithologic logs of borings completed in the FGA area indicates that the aquifer appears to be hydraulically continuous; bedrock or a laterally continuous confining layer was not encountered during installation of the potable water supply wells (WHPacific, Inc. 2014).

2.8 Surface Water Hydrology

The principal freshwater bodies near the installation are Jarvis Creek (bordering the installation to the north and east) and the Delta River (west of the installation). Jarvis Creek flows into Delta River; both are glacially fed, broad, braided channels with flow over permeable alluvial fan deposits, which allow much of the streamflow to infiltrate, thus decreasing flow downstream (Nelson 1995). Depth to groundwater and losing stream conditions at FGA indicates groundwater is not likely to discharge to surface water in the area. Most of the stormwater runoff at FGA infiltrates before it reaches a surface water body due to the relatively flat terrain and permeable soils in the area (Tetra Tech, Inc. 2008).

Regionally, groundwater discharges into the lower Delta River, Tanana River, Clearwater Creek, and Clearwater Lake as the aquifer is bound to the south by crystalline bedrock of the Alaska Range and to the north by the Yukon-Tanana Uplands. Surface water is not known to be a viable source of drinking

water in the vicinity of FGA; however, surface water may be used as a viable source in the Delta/Clearwater area northeast and northwest of the installation (Nelson 1995).

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 FGA.

2.9.1 Stormwater Management System Description

FGA operates under a discharge permit and stormwater pollution prevention plan which identifies two outfalls from the main cantonment area: one into Jarvis Creek and the other within 600 to 700 feet of the creek. However, most of the stormwater runoff at FGA infiltrates before it reaches a surface water body due to the relatively flat terrain and permeable soils in the area (Tetra Tech, Inc. 2008).

The installation's stormwater system is partially piped but mostly consists of unlined, shallow ditches and swales with some dry wells established as collection points in certain areas (Tetra Tech, Inc. 2008). The stormwater system is separate from the sewer system. The stormwater system generally promotes local infiltration and recharge; any overland flow follows natural drainage courses and is ultimately discharged to an open ditch that flows to Jarvis Creek. While infiltration of the stormwater through the unlined ditches is prevalent over continuous flow to Jarvis Creek, continuous flow of stormwater to Jarvis Creek is episodic and driven by intense summer rainfall or potentially spring melt. Also, melting snow and ice can create some temporary ponding of runoff water in low areas (Tetra Tech, Inc. 2008).

2.9.2 Sewer System Description

Sanitary wastewater systems at FGA are privatized and operated by Doyon Utilities in the cantonment area. The main cantonment area has a single wastewater collection system which receives both domestic and industrial waste (CH2M Hill 1992). Generated sanitary wastewater from the cantonment area is collected from buildings via pipes within the heated utility corridors and conveyed to a settling tank in Building 633. The liquid portion of the waste is pumped to two aerated lagoons east of Building 633 for biological treatment, chlorination, and discharge to Jarvis Creek. Monitoring and sampling of the effluent are conducted daily by the Base Operations Support contractor. Sludge from the settling tank is pumped to drying beds adjacent to Building 633; the current drying beds are comprised of three lined cells.

The northern two cells have a geotextile membrane covered with a layer of sand and underlain by an impermeable liner with underdrains that recycle the leachate back to the wastewater treatment plant (WWTP); these cells are only used during the summer. The southern cell is concrete lined and is used to store sludge in the winter (CH2M Hill 1992). While the WWTP and drying beds were constructed in the 1950s, the beds were unlined for some 40 years until they were upgraded and lined in 1990 (CH2M Hill 1992). Historically, the sludge was stockpiled on the cement slab near the nursery. According to personnel interviews, sludge in the drying beds now undergoes one freeze/thaw cycle before analytical testing and on-post disposal in the FGA Landfill #8 (a Class 2 landfill) as municipal waste in a specific landfill cell. The beds are cleaned out annually, and the dry sludge is transported to the FGA landfill via trucks in accordance with the landfill permit (Tetra Tech, Inc. 2008).

Sanitary wastewater from the MDA and AAAF is collected in septic tanks and treated in leach fields which are established in environmentally safe, strategic locations (Tetra Tech, Inc. 2008).

2.10 Potable Water Supply and Drinking Water Receptors

The water table of the drinking water aquifer is at least 140 to 170 feet bgs at the installation; the aquifer consists of a lower stratified gravel layer overlain by low-permeability lenses and seams (Tetra Tech, Inc. 2008). Drinking water at FGA is supplied through a privatized entity (Doyon Utilities) with two separate systems: one system supplies water for the AAAF (Wells #1 and #1A at Building 131) and one supplies water for the main cantonment area (Wells #8 and #9 at Buildings 625 and 606, respectively). In addition, one potable water well (Well #16 at Building 558) supplies drinking water to a small population at the Visitors Center, and one well in Building 501 serves as an emergency supply to Post Headquarters (Tetra Tech, Inc. 2008). Other wells on-post which are classified as potable but are used for other, non-potable applications include wells housed in Building 133 (fire suppression at AAAF), Building 680 (Well #14, dust suppression), and Building 633 (septic tank wash-out water for the recreational vehicle park and truck filling stand, sourced from Well #9).

Well #8 (screened from 356 to 396 feet bgs) and Well #9 (screened from 230 to 260 feet bgs) have a combined supply capacity of approximately 1.1 million gallons per day for the main cantonment area. Water drawn from these wells is treated with fluorine and chlorine and is stored in a holding tank in Building 606 prior to entering a looped distribution system. Most of the distribution lines in the cantonment area are located in the buried concrete utilidor network, although a portion of the distribution system that serves some of the 900-Block housing area is a direct-buried steel pipeline (Tetra Tech, Inc. 2008).

Potable water supply for the AAAF is sourced from wells in Building 131. Raw water is pumped to Building 133 and chlorinated before storage in a steel tank for distribution. Water used for fire protection at AAAF is provided via the potable water system through hydrants; a separate pump in Building 133 is maintained on standby to provide additional water pressure for fire protection (Tetra Tech, Inc. 2008).

Doyon Utilities does not operate any utilities for the MDA, which has four separate supply wells that are classified as potable water wells. Only two of these wells (located in the Water Supply Building) reportedly provide the MDA with drinking water. While the MDA wells are classified as potable, this area is an industrial use area, and water is largely used for industrial processes and as wash water. Water supply in the MDA is managed by USASMDC. Identifications provided for these wells are based on a 2017 laboratory report which reported PFAS analytical results for the following MDA potable wells: MDA Main, MDA Well #1, MDA Entry Control Point 1, and MDA Integrated Data Terminal Support Facility well, which is also identified as SW-4.

Surface water is not used as a drinking water source on-post or within 5 miles of the installation; additionally, stormwater runoff is likely to infiltrate rather than flow continuously to the nearest surface water body (Jarvis Creek).

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 FGA, which along with GIS provided by the installation identified several off-post public and private wells within 5 miles of the installation boundary (**Figure 2-4**). One potable well was located within this radius in Delta Junction (Black Rapids well), north of the installation. The EDR report

providing well search results is provided as **Appendix E**. In addition, based on a search conducted through the Alaska Department of Natural Resources (AKDNR) online database, several wells were identified north of the installation across from Jarvis Creek, and a couple wells were identified southwest of the installation (**Figure 2-4**). The well use designation and status for each of these wells was not provided on the well logs on the AKDNR online database; however, some of the wells are associated with use at the Delta Junction school, trailer parks or other residential areas, and at the Delta Junction Fire Department (AKDNR 2021) north of the installation. The served populations for these wells are not confirmed.

2.11 Ecological Receptors

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

Major vegetation communities in the FGA vicinity include mixed coniferous and deciduous forest, high brush, tundra, and wetlands. Forest types include aspen, balsam poplar, mixed hardwood, white spruce, black spruce, mixed spruce, and mixed hardwood/spruce. Some large forest stands have been burned by wildfires at the installation (approximately 4,400 acres were affected by a June 1999 forest fire, after which more land was developed at FGA, including the MDA). Lowland black spruce and heath bog communities predominate FGA. Most native vegetation has been removed from the cantonment area, but some isolated patches of forest remain north of Big Delta Avenue and the AAAF and east of the housing area. Approximately 121 plant species have been identified at FGA, with an additional 35 species potentially present (Tetra Tech, Inc. 2008).

In previous decades, several species of mammals were identified at FGA; however, because there are now multiple security fences around the installation, the presence of large mammals (other than moose) within the fenced perimeter is unlikely. Large predators (grizzly bear, black bear, and wolves), Dall sheep, bison, and barren ground caribou may be found outside the fenced areas of FGA. Coyotes, red fox, and marten can be found both inside and outside of the fenced areas of FGA. Other small mammals such as showshoe hares, shrews, and other small rodents are also present. Seventy avian species have been identified at FGA, including ptarmigan and grouse game species (Tetra Tech, Inc. 2008).

No known listed threatened or endangered plant or animal species exist at FGA; therefore, there is no federally proposed or designed critical habitat at FGA. However, some protected avian species may transit over the installation but are unlikely to remain on the property (Tetra Tech, Inc. 2008).

2.12 Previous PFAS Investigations

Previous (i.e., pre-PA) PFAS investigations relative to FGA, including both those conducted and not conducted by the Army, are summarized to provide full context of available PFAS data for FGA. However, only data collected by the Army will be used to make recommendations for further investigation. The historical data described below were not validated as part of this SI and are reported as provided in the laboratory reports or historical documents provided during the PA.

In May 2016, the USEPA issued a PFOS and PFOA Lifetime Health Advisory of 70 ng/L (USEPA 2016); subsequently, in June 2016, the Army issued a guidance publication for PFAS contamination

assessments (Army 2018). In response to these actions, the third Unregulated Contaminant Monitoring Rule, and IMCOM Operations Order 16-088, Army installations began initial PFAS sampling in 2016 at water supply wells. However, FGA is served by a privatized water supplier (Doyon Utilities) and was thus not included in this sampling event.

Historical sampling for PFAS constituents has been conducted in 2017 and 2019 around the installation, including at the current potable wells used to supply drinking water to the airfield (Wells #1 and #1A) and to the rest of the installation (Wells #8 and #9). Five other potable wells (four at the MDA and another at the AAAF) have also been sampled for PFAS constituents. These potable wells have been sampled for six to 12 PFAS constituents, including PFOS, PFOA, and PFBS. The samples were analyzed by Eurofins Eaton Analytical in South Bend, Indiana, via USEPA Method 537. It is not indicated in the laboratory reports provided by Doyon Utilities whether the samples were collected and analyzed as drinking water (i.e., with Trizma® preservative), or whether the results were validated after receipt from the laboratory.

None of the potable wells sampled for PFAS had detectable concentrations of any of the PFAS constituents analyzed (including PFOS, PFOA, and PFBS) when sampled in 2017 or 2019; the results were reported as less than the method reporting limit of 2.0 ng/L for those constituents analyzed.

Additionally, other groundwater monitoring wells associated with IRP site FGLY-006 (Fire Training Pits) have been historically sampled for PFOS and PFOA from 2013 to 2017. PFOS and/or PFOA were detected in all six of the monitoring wells that have historically been sampled for PFOS and PFOA, including at MW-2, MW-4, MW-5, MW-11, MW-16U, and MW-16L near SWMUs 85N/S, though most of these detected concentrations were “J”-flagged by the laboratory which indicates an estimated concentration. A maximum combined PFOS/PFOA concentration of 210 J ng/L (**Table 2-1**) was detected in 2013 at well MW-16U, which is located northeast of FGLY-006 and is screened from 145 to 202 feet bgs. It must be considered that, 1) the drinking water aquifer is at least 140 feet bgs at the installation, and 2) the monitoring wells sampled as part of the IRP had potentially PFAS-containing dedicated sampling equipment downhole at the time of sampling. Therefore, PFAS concentrations observed at these monitoring wells could be attributed to either PFAS releases at FGA and/or cross-contamination from the dedicated sampling equipment in the wells. The only information provided regarding validation of the historical data collected at these monitoring wells is that 100% of the June 2017 data underwent Stage 2BVM level validation, and 10% underwent Stage 3VM level validation; no qualifications of the June 2017 results (i.e., non-detect results at MW-2 and MW-5) were required. The June 2017 data were analyzed via USEPA Method 537 according to the associated data validation report. It was not indicated in historical documents what the sample analysis methods or validation procedures (if any) were for the other samples collected at the monitoring wells.

Available PFAS data from potable and monitoring wells are included in **Table 2-1**.

Finally, in July 2019, a solid sample was collected from the WWTP sludge drying bed for analysis of six PFAS constituents. PFOS (14 nanograms per gram, or 0.014 mg/kg) and PFOA (9.3 nanograms per gram, or 0.0093 mg/kg) were detected in the sample at concentrations less than the OSD risk screening levels. PFBS was not detected in the sample collected at the sludge drying bed (**Table 2-2**).

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 FGA, data was collected from three principal sources of information which are described below:

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

Preliminary locations of potential use, storage, and/or disposal of PFAS-containing materials were then evaluated in the PA (during records review, personnel interviews, and/or site reconnaissance) and were categorized as AOPIs or as areas not retained for further investigation at this time based on a combination of information collected (e.g., records reviewed, personnel interviews, internet searches). A summary of the observations made, and data collected through records reviews (**Appendix F**), installation personnel interviews (**Appendix G**), and site reconnaissance logs (**Appendix I**) during the PA process for FGA 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 IRP administrative record documents, compliance documents, FGA fire department documents, FGA directorate of public works documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for FGA is provided in **Appendix F**.

3.2 Personnel Interviews

Interviews were conducted during the site visit. If a previously identified interviewee was not available during the site visit, attempts were made to complete the interview via telephone before or following the site visit or by contacting an alternate interviewee identified by the installation POC. Additionally, several follow-up interviews were completed after the PA site visit to clarify details regarding historical use, storage, or disposal of PFAS-containing materials including use areas, timeline, and volume.

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

- Environmental compliance branch chief
- Conservation branch manager
- Environmental protection specialist
- Pesticide manager
- Fire department captain, assistant chief, and former assistant chief

- Logistics and readiness center/maintenance staff
- GIS coordinator (Chugach Environmental Solutions, LLC)
- Garrison safety staff
- Facilities supervisor
- Fire services staff (Wolf Creek Federal Services)

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 FGA 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**.

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

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

4.1 AFFF Use, Storage, and Disposal Areas

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

The use of AFFF at FGA has been widespread and frequent according to the FGA fire department personnel. The installation frequently received and stored surplus AFFF from the USASMDC headquartered in Huntsville, Alabama, up until the early 2010s. The FGA fire department personnel frequently used AFFF during training activities as a disposal mechanism due to the amount of surplus AFFF stocked. In documents provided by the Army, the total gallons of AFFF on-hand at the installation prior to the PA site visit was reported as 2,180 gallons in one document and 1,820 gallons in another document (Assistant Chief of Staff for Installation Management AFFF Call spreadsheet). However, since the PA site visit, the AFFF stored on-post in fire equipment and vehicles and in totes or containers has been disposed. AFFF was reportedly triple rinsed from fire equipment over a decontamination pad at the Current Fire Station Building 111. AFFF concentrate, equipment rinsate, and AFFF containers were disposed off post by FGA in the fall of 2019. The remainder of this section details the historical storage and use/disposal (i.e., through nozzle testing or other training, tank flushing, or wildfire responses) of AFFF as indicated by personnel interviews and site reconnaissance with fire department staff. No fire department records were available to review for the information contained in this section, and AFFF use was not indicated in historical environmental documents for FGA.

Storage: Several areas were used to store AFFF at FGA, inside and outside of buildings and in fire equipment, as follows:

- According to personnel interviews (**Appendix G**), the most volume of AFFF has historically been stored in and outside of Building 347 in the central portion of the installation. Approximately twenty

55-gallon drums of foam were stored inside (a cold-storage building), and multiple rows of 300-gallon metal totes were stored outside. Several of the AFFF storage containers cracked and leaked from seasonal temperature changes.

- AFFF was also stored in containers and in fire equipment at the Building 504 Former Fire Station until the Current Fire Station Building 111 was built.
- Following the PA site visit and initial SI field event, interviewed personnel noted in a follow-up conversation that AFFF was stored at the Current Fire Station Building 111 in both drums (55-gallon) and in crash trucks. Personnel could not verify the timeline or volume of AFFF storage at the Current Fire Station.
- Three crash trucks (Engines 13, 18, and 19) with AFFF tanks were also parked at the AAAF Hangar Building 100 historically. Note that according to personnel interviews, the AAAF Hangar Building 100 itself has never used AFFF in the deluge system. Jet-X high expansion foam has been in the hangar's deluge system since at least 2011 (**Appendix F**).
- Additionally, Building T100 (a temporary, cold-storage building) has stored 5-gallon and 50-gallon drums of AFFF during the 2000s to the time of the PA site visit in July 2018. During the site visit approximately 10 empty 50-gallon AFFF drums remaining in this building were observed.

Nozzle testing: Nozzle testing with AFFF is performed to ensure optimal flow and release of the AFFF mixture and involves spraying AFFF through fire equipment, which could release AFFF to the environment if the mixture is not fully contained. Fire equipment training also frequently includes arc training to maximize the arc, reach, and distance covered by AFFF in an emergency response. Nozzle testing with AFFF reportedly occurred at the following areas:

- During training activities at AAAF, specifically during annual nozzle testing activities at AAAF Hangar Building 100. This nozzle testing event usually occurred in the summer months and foam was dumped and sprayed to the east of the building, between the building and taxiway at the original crash truck fire station.
- After the Current Fire Station Building 111 was built, personnel also reportedly conducted nozzle testing east of the AAAF Hangar Building 100 and shot AFFF mixture across the road to the east.
- The fire department historically flowed AFFF from crash trucks during nozzle testing east of the on-post chapel (Building 845, Chapel Nozzle Testing Area). The operation period, frequency, and volumes of AFFF potentially used at this site during nozzle testing was not provided.
- Nozzle testing was also preformed monthly along the Parade Route (from the Former Fire Station Building 504 down to Building 601 near the recreational vehicle park) where pump and roll operations took place with AFFF foam along the parade route. These tests occurred approximately twice a month from 1997 into the 2000s and generally used water 99% of the time with periodic AFFF nozzle testing for a few seconds at a time, using less than 5 gallons of AFFF each time. The projectile range from the truck's nozzles was approximately 120 feet.
- Prior to 2013 (i.e., when the new fire station was constructed), AFFF was also used and sprayed on the ground during nozzle testing at the Building 504 Former Fire Station (in the area that is now a

parking lot and in the grassy pavilion area to the north and east) and east of what is now the FGA Chapel (**Appendix G**).

- Finally, fire department personnel indicated that in 2016, the fire department used a vacant lot to the northeast of the 900-Block housing units to conduct nozzle testing (i.e., the Nozzle Testing and Training Area). The AFFF was shot toward the drainage ditch in the area (**Appendix G**).

Firefighter Training: AFFF use has been documented or is likely at areas used for firefighter training activities at FGA. These areas include what is now referred to as site FGLY-006 (which consists of four SWMUs (85N/S, 94, and 133) east of the AAAF that are administratively controlled as one site under the IRP), the Fire Training Tower Building 150, the Fire Burn Pad and Pan on Butternut Road, and the AAAF Runways (and taxiways).

- The FGLY-006 Fire Training Pits were used from 1975 to 1985, and AFFF use has been confirmed here. Stormwater runoff from these pits may have flowed to the Wetland-Like Area to the southeast of the AAAF.
- After the FGLY-006 Fire Training Pits were closed, a burn pan (BRAC Site 79) and burn pad (BRAC Site 80) located approximately 1 mile south on Butternut Road were reportedly used for fire training activities from 1985 to 1990 (Jacobs Engineering Group, Inc. 1998); however, corroborating evidence of the use of AFFF at this area was not found (i.e., use was not reported in any historical documents or noted by FGA fire department personnel during interviews). The FGA fire department personnel interviews did not result in identification of this area as a fire training area. This area has been excavated and reworked and is now used as a garden and greenhouse area. The soils excavated from the fire burn pan and burn pad were staged at an unspecified landfarm area and were planned to be used as daily cover for an unspecified FGA landfill (FGA 2012).
- AFFF has reportedly not been used during training activities at the new Fire Training Tower building; however, AFFF use could not be confirmed or denied at the adjacent concrete pad which is used for burning old vehicles or other training props during exercises. Given the widespread use of the surplus AFFF at the installation, it was suspected that AFFF was used in these training areas as well.
- During the 2000s, fire crash training was conducted on/along the Echo Taxiway at the AAAF; the FGA fire department personnel indicated that this area at the AAAF is likely where the most AFFF has been used during training exercises. The FGA fire department personnel estimated use of 4,000 to 5,000 gallons of AFFF in this area (it was not clarified if this was mixture or concentrate). Lastly, the fire department reported that AFFF may have historically been used during firefighter training activities or fire truck tank flushing at the north end of active AAAF Runway 19.

No AFFF use for firefighting training (or fire responses) at the MDA or DTA sites was noted during personnel interviews.

Tank Flushing: The fire department flushed out their AFFF tanks on trucks periodically at the following areas:

- At the Building 504 Former Fire Station, adjacent to the pavilion area.
- Additionally, when fire truck tanks containing AFFF needed maintenance, the fire department would reportedly empty and flush the tanks northeast of Gate 18 (where a pipeline conveyed wastewater

from the mid-cantonment area to a dry well near Jarvis Creek on the east side of the installation). Wastewater was also sometimes flushed from the area with AFFF mixture and flowed toward Jarvis Creek according to personnel interviews.

- Fire truck tanks were also reportedly flushed in the Old Lodge Area (located where current Building 637 stands) in 1999, and at the end of the apron on the AAAF's Echo Taxiway.

Wildfire Responses: Wildfires at FGA have been responded to with AFFF, particularly in 1999 when fires burned over 4,400 acres at FGA. Areas where AFFF was used to extinguish forest fires include the following:

- The 900-Block residential area (which is most likely the area with heaviest AFFF use, as AFFF was used to create a fire break line in an attempt to save the housing units).
- The Old Lodge Area (current Building 637, where approximately 1,000 gallons of AFFF concentrate was applied but could not save the building from burning to the ground).
- The Old Post Forest Fire Area southwest of AAAF (near monitoring well 32-MW-A, around which at least 100 gallons of 6% AFFF was used).
- The 1999 fire also burned down the Main Gate, which was originally located slightly west of the current main gate.
- Near the waste pipeline that flows toward Gate 18, the fire department also reportedly responded to small fires along the pipelines with AFFF (volume and frequency unknown).

Additionally, structural fires have occurred on post in the 1980s, including at an apartment building (Building 829) and at the old Cold Regions Test Center meteorology facilities (Buildings 634 and 635). AFFF use during responses to structural fires was not reported. Typically, structural fires do not require use of Class B foam to effectively extinguish the fires.

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

Following document research, personnel interviews, and site reconnaissance at FGA, other potential PFAS source types such as WWTP sludge drying beds, sludge stockpiles, former sewage lagoons, and landfills were identified at the installation where PFAS-containing material was received/disposed during waste treatment; these areas constituted categorization as AOPIs (specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**). The use, storage, or disposal of PFAS-containing material could not be verified for other operations on-post (i.e., operations of burn pits and incinerators, laundry facilities, hazardous waste storage yards, photo processing laboratories, or other fire response sites); these areas did not constitute categorization as areas retained for further investigation. Specific discussion regarding areas not retained for further investigation is presented in **Section 5.1**.

A 2019 sample collected by Doyon Utilities at the FGA Sludge Drying Beds indicated presence of PFAS constituents (including PFOS and PFOA; PFBS was not detected) in the sludge material. Wastewater is treated at FGA as described in **Section 2.9.2**. The July 2019 sample collected at the sludge drying beds and analyzed for six PFAS constituents indicated detected concentrations of PFOS and PFOA less than the OSD risk screening levels for soil (**Table 2-2**). It is known that sludge from the Sludge Drying Beds has historically been both emplaced at Landfill #8 or stockpiled at the Nursery Sludge Stockpile. Specific

evidence of potential receipt of PFAS-containing materials at other landfills (Landfills #1 through 7) was not provided.

Additionally, according to personnel interviews, Air Force training units historically brought their own fire trucks to FGA for training activities and staged them at the airfield. It is not known if the Air Force trucks were equipped with AFFF.

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 FGA as an installation having used or stored PFAS-containing pesticides/insecticides. Additionally, the PA team reviewed available pesticide use inventory documentation provided by the installation and did not identify PFAS-containing pesticides use, storage, or disposal.

4.3 Readily Identifiable Off-Post PFAS Sources

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

FGA is largely radially surrounded by the DTA (**Figure 2-1**). Information obtained through document research and personnel interviews during the PA for FGA and for Fort Wainwright (under which the DTA is now administratively controlled) indicated that the area was only used for training maneuvers; therefore, use of PFAS-containing materials in at DTA (particularly AFFF) is unlikely. However, a plane crash occurred off-post and south of Delta Junction sometime in the 1990s. FGA personnel could not recall the exact location of the crash or if the FGA fire department responded to the crash. It is therefore also unknown if AFFF was used to respond to the crash.

The town of Delta Junction, downgradient of FGA, is a small community serving a population of under 1,000. Operations which may be associated with potential PFAS use (i.e., those sources listed in **Section 4.3**) in the area include automobile services, medical services (i.e., potential X-ray processing), fueling facilities, fire departments, and a closed airport. Delta Junction has a small fire department; the use, storage, or disposal of AFFF by the Delta Junction fire department is not known. Similarly for another fire department in the area, the Rural Deltana Volunteer fire department (to the northeast and downgradient of the installation), practices related to use, storage, or disposal AFFF are not known.

The Delta Junction Airport, a historically public-use airport, is permanently closed. The site is 80 acres. Its period of operation and practices related to the use, storage, or disposal of AFFF are not known.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at FGA, 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, 21 have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

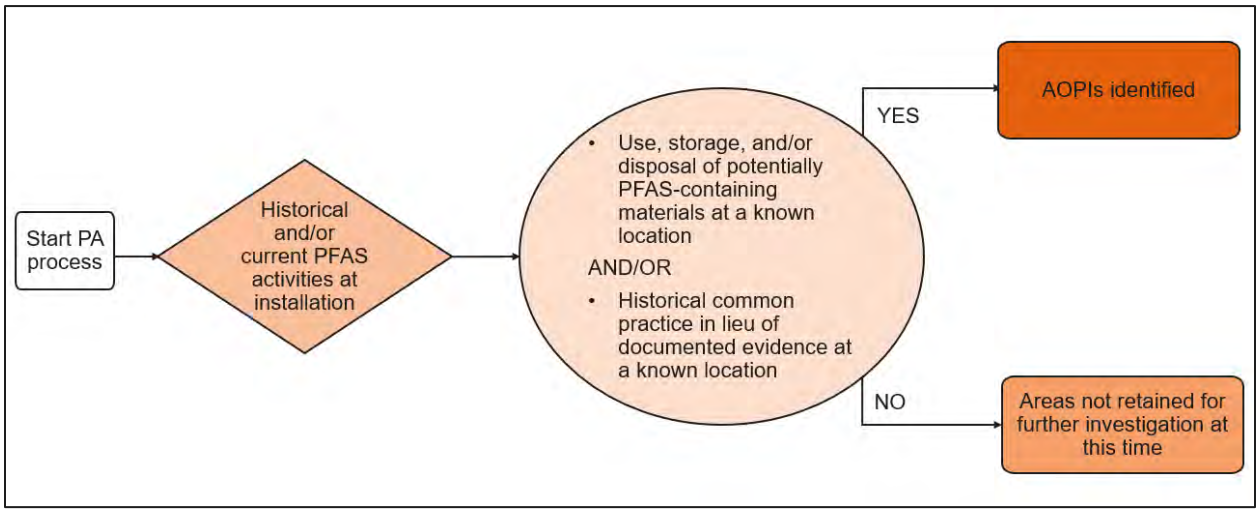

Figure 5-1: AOPI Decision Flowchart

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 FGA 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.

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
Landfills #1-7 (FGLY-007 through -012, FGLY-022)	Unknown to present	The types and quantities of waste received at the landfills are unknown; however, the various landfills are believed to have accepted sanitary waste, metals, and ashes (FGA 2017). Landfill #7 is now used as a construction and debris landfill (on top of the former Landfill #7).	No specific evidence of disposal of PFOS, PFOA, or PFBS-containing materials based on records review and personnel interviews.
Refuse Burn Pit (BRAC Site 89; FGLY-076)	1969 to 1977	Concrete pad and cages used to burn garbage and classified documents. Trucks remove the ash from the cages for transportation to landfills. Closed via a Record of Decision in 2009 with final action of soil removal and cap completed in 2010.	No evidence of disposal of PFOS, PFOA, or PFBS-containing material or use/storage or AFFF. Because the intent of the burn pit is to burn material to ash, it is unlikely that firefighting foams were used at the facility.
Hazardous Waste Storage Facility	Unknown	Personnel interviews indicated that Jet-X (which does not contain PFOS, PFOA, or PFBS) was in storage awaiting disposal at the time of the PA site visit.	No evidence of use, storage, and/or disposal of PFOS, PFOA, or PFBS-containing materials based on personnel interviews.
Incinerator/Burn Pit (FGLY-025)	1970s to present	The incinerator (Building 640) and burn pit (Building 639) near the WWTP sewage lagoons receives solid waste for volume reduction. The sides and bottom linings of the features consist of refractory brick (incinerator) and concrete (burn pit; CH2M Hill 1992).	No evidence of use, storage, and/or disposal of PFOS, PFOA, or PFBS-containing materials based on historical documents; waste was allowed to burn to ash for volume reduction.
Fire Burn Pad (FGLY-073, BRAC Site 80, and Solid Waste Management Unit (SWMU) 18; 02341.1065)	1985 to 1990	Southwest of the intersection of Butternut and Evergreen Roads, a rectangular, 2,500-square-feet concrete pad was allegedly used to burn vehicles and other large objects during firefighter training exercises (Jacobs Engineering Group, Inc. 1998). The pad was reportedly bermed on the northeast and southwest edges. In 1997, 1998, and	No use, storage, or disposal of PFOS, PFOA, or PFBS-containing materials (i.e., AFFF) are documented at this area based on historical documents and personnel interviews.

Area Description	Dates of Operation	Relevant Site History	Rationale
		2010, soil excavations were completed to address dioxin and furan contamination; excavated soils were staged at an unspecified landfarm area and were planned to be used as daily cover for an unspecified FGA landfill (FGA 2012). The area has been significantly reworked and is reportedly built over by a greenhouse according to communications with USAEC.	
Fire Burn Pan (FGLY-80, BRAC Site 79, and SWMU 17; 02341.1069)	1985 to 1990	To the west of the Fire Burn Pad, a large metal Fire Burn Pan approximately 8 feet in diameter where petroleum, oil and lubricants and solvents were allegedly used for firefighter training exercises (ADEC 2019c; Jacobs Engineering Group, Inc. 1998). Petroleum, oil and lubricants hotspot removal was completed at the site in 2010 to a maximum depth of 3 feet (Headquarters Army Environmental System [HQAES] 2021a, 2021b). The area appears significantly reworked (rows of soil mounds visible in aerial images) and is now used as a garden area according to communications with USAEC.	No use, storage, or disposal of PFOS, PFOA, or PFBS-containing materials (i.e., AFFF) are documented at this area based on historical documents and personnel interviews.
Laundry Site Building 157 (BRAC Site 103; FGLY-050) and Building 675 (FGLY-075) and	Unknown to 1960s	Building 157 was formerly located in the Old Post area and was demolished in the 1960s; based on this timeline, the use, storage, or disposal of PFAS-containing materials during laundering operations is unlikely.	No evidence of use, storage, and/or disposal of PFOS, PFOA, or PFBS-containing materials based on historical documents.
Photographic Laboratory (SWMU 42) located at Building 610	Unknown	An environmental baseline survey indicated the building was used as a former information management and photographic lab (Teledyne Solutions, Inc. 2005). Any photo processing wastes would have been directed to the sanitary sewer system. The use of	No evidence of use, storage, and/or disposal of PFOS, PFOA, or PFBS-containing materials based on historical documents.

Area Description	Dates of Operation	Relevant Site History	Rationale
		any PFAS-containing chemicals related to the photo processing operations could not be confirmed from historical documents.	
DTA	1955 to present	Maneuver and live-fire training area off post. DTA was transferred to Fort Wainwright's control in approximately 2001.	No evidence of activities (e.g., firefighter training) which would have involved the use, storage, or disposal of AFFF or other PFOS, PFOA, or PFBS-containing materials.
MDA	2002 to present	Houses anti-ballistic missiles near South Tank Farm area. Supply wells SW-1, -2, -3, -4 located within this area's boundary and are part of the groundwater monitoring network.	No evidence of use, storage, or disposal of PFOS, PFOA, or PFBS-containing materials based on records review.
Off-Post Plane Crash	1990s	A plane crash occurred off-post and south of Delta Junction sometime in the 1990s. FGA personnel could not recall the location of the crash or if the FGA fire department responded to the crash.	No evidence of use, storage, or disposal of AFFF or other PFOS, PFOA, or PFBS-containing materials; additionally, the location of the crash is uncertain.
Structural Fires	1980s	According to personnel interviews, structural fires have occurred in the 1980s including at an apartment building (Building 829) and at the old Cold Regions Test Center meteorology facilities (Buildings 634 and 635). AFFF use during responses to structural fires was not reported or suspected since structural fires do not require use of Class B foam to effectively extinguish the fires.	No evidence of use, storage, or disposal of AFFF or PFOS, PFOA, or PFBS-containing materials based on personnel interviews.
Cold Regions Test Center (Building 605; FGLY-004)	1960s to present	A vehicle maintenance shop, former paint bay, and wash rack were associated with this facility. The use of any PFAS-containing chemicals related to operations at these facilities could not be confirmed from historical documents.	No evidence of use, storage, or disposal of PFOS, PFOA, or PFBS-containing materials based on records review.

Area Description	Dates of Operation	Relevant Site History	Rationale
Pesticide Mixing and Storage Facilities, Building 349 (FGLY-014) and Building 348	1980s to present	Pesticides were mixed and stored at these facilities. An aboveground rinsate storage tank and underground wastewater holding tank were associated with the facilities. Prior to its construction, pesticides were stored in Building 318 (FGLY-052).	No evidence of use, storage, or disposal of PFOS, PFOA, or PFBS-containing materials based on records review and personnel interviews.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Seven of the AOPIs may partially or completely overlap with FGA IRP sites and/or HQAES sites (**Figure 5-2**) that have been previously investigated for constituents other than PFAS. 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 FGA IRP sites had historically been investigated for the possible presence of PFAS (i.e., at FGLY-006 Fire Training Pits; **Table 2-1**). Between the PA site visit and the SI field events, one additional AOPI (i.e., the Sludge Drying Beds) was sampled to evaluate concentrations of PFAS constituents in the sludge from the WWTP (**Table 2-2**).

The AOPI locations are shown on **Figure 5-2**. The AOPI boundaries were estimated based on personnel interviews, historical documents, and site reconnaissance and are approximate. Most of the AOPIs are in areas currently designated for industrial/commercial use and are anticipated to remain as such for the foreseeable future according to the installation's Master Plan. However, some AOPIs are located adjacent to residential housing units or may otherwise be accessed by on-post residents for community events or recreation.

5.2.1 Allen Army Airfield Runways

The AAAF Runways are identified as an AOPI following personnel interviews and site reconnaissance due to reported fire training exercises along the runways and taxiways. It was noted that frequent training occurred along the abandoned Echo Taxiway (parallel to Jarvis Creek), and fire response and dumping of crash truck tanks occurred at the end of the active Runway 19 at the northern tip of the installation. According to installation personnel (**Appendix G**), an estimated 4,000 to 5,000 gallons of AFFF concentrate was used along these runways during the time of use in the 2000s.

The abandoned Echo Taxiway and active Runway 19 are surrounded by maintained grassy areas. The Echo Taxiway pavement is old and cracked with vegetation coming through the cracks. Stormwater at the Echo Taxiway flows to a ditch which outfalls at Jarvis Creek. This AOPI does not overlap with any IRP or BRAC sites (SWMUs) according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.2 Allen Army Airfield Hangar Building 100 (FGLY-015; 02341.1015)

The AAAF Hangar Building 100 is identified as an AOPI following personnel interviews and site reconnaissance due to reported AFFF storage in trucks and nozzle testing with AFFF on the west side of the building for several summers. Three crash trucks (Engines 13, 18, and 19) with AFFF tanks were historically parked at the AAAF Hangar Building 100. Some FGA fire department personnel reported daily testing of nozzles at this hangar building (**Appendix G**). Additionally, over time, upwards of 100 full crash trucks have reportedly dumped AFFF between Building 100 and the taxiway. The majority of AFFF was sprayed out of the front door of the original crash truck fire station east of the hangar according to installation personnel (**Appendix G**). Other personnel interviews indicated that Jet-X high expansion foam has been in the hangar's deluge system since at least 2011; reportedly, AFFF has never been used in the deluge system here (**Appendix G**). However, the information available regarding potential historical use of AFFF in the deluge system is limited to that available from the personnel interviewed and their time at the installation. In 2015, two bladders of Jet-X foam reportedly ruptured at the hangar.

Building 100 is located on the south side of AAAF and is surrounded mainly by paved surfaces. Potable wells Well #1 and #1A are about 500 feet upgradient of the building. Building 100 itself is associated with IRP Site FGLY-015 (BRAC Site 92; designated as a drum storage site) according to a list of HQAES site designations provided by the Army. However, according to historical maps, the AAAF Hangar Building 100 AOPI footprint may overlap with several other historically investigated sites for which the IRP identifiers or BRAC site numbers are not clear (i.e., the former airfield tank farm, helicopter refueling area, and several underground storage tanks) (Teledyne Solutions, Inc. 2005).

5.2.3 Building 111 Current Fire Station

The Building 111 Current Fire Station is identified as an AOPI following personnel interviews and site reconnaissance due to reports of AFFF use during nozzle testing outside of and around the building and storage in the fire trucks (Engines 13, 18, and 19) housed in the building. Nozzle testing areas include that to the northeast of the fire truck bay, across the street in a gravel lot. However, the areal extent of AFFF use is not well defined (personnel interviewed indicated that AFFF may have been used in many areas surrounding the fire station; **Appendix G**). Some runoff from nozzle testing may have flowed to the drainage depression to the southeast of the building. Additionally, old AFFF was rinsed out of fire trucks on a secondary containment pad at this building (in the driveway to the northeast outside of the truck bays) in Fall 2019 (**Appendix G**). The AFFF was reportedly disposed of off-site.

This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.4 Building 150 Fire Training Tower

The Building 150 Fire Training Tower is identified as an AOPI following document research, personnel interviews, and site reconnaissance due to the identified fire training activities at this location. The FGA fire department personnel interviewed during the PA site visit did not recall using AFFF at the newer fire training tower facility. However, past use of AFFF could not be verified during personnel interviews.

Building 150 Fire Training Tower is surrounded by maintained grassy areas and a wooded area downslope to the south. The building is about 500 feet upgradient of Well #1 and Well #1A, which are

currently used for potable water supply at AAAF. This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.5 Building T100 AFFF Storage

The Building T100 AFFF Storage is identified as an AOPI following site reconnaissance due to AFFF storage in the building. AFFF was stored at this location in 5-gallon and 50-gallon drums during the 2000s to present. The building is not climate-controlled, which can cause freezing, cracking, and leaking of the 5- and 55-gallon storage containers of AFFF. Approximately 10 empty 50-gallon drums remained in storage at the time of the PA site visit. Additionally, a concrete pad that was used for burning old vehicles or other training props is located 100 feet southwest of the building; the FGA fire department personnel interviewed during the PA site visit did not recall using AFFF at the burn pad.

The temporary T100 building has a gravel floor which may allow for infiltration of AFFF to soil if it was spilled or if it leaked from containers during storage. The building and concrete pad is surrounded by maintained grass. The building is about 500 feet cross-gradient of potable wells Well #1 and #1A which are currently used for water supply at AAAF. This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.6 FGLY-006 Fire Training Pits

The FGLY-006 Fire Training Pits (IRP site FGLY-006, 02341.1006) are identified as an AOPI following document research and personnel interviews due to the confirmed use of AFFF during training activities. The site operated from 1975 to 1985 (FGA 2017; Jacobs Engineering Group, Inc. 1998). The FGLY-006 Fire Training Pits AOPI encompasses historical non-contiguous BRAC Sites (SWMUs) 85N/S, 94, and 133 (**Figure 5-2**). FGLY-006 Fire Training Pits are located to the southeast of AAAF Runway 28 (SWMUs 85N/S) and south of the tarmac area (SWMUs 94 and 133). The sites consist of grassy areas, paved surfaces, and forested areas.

At SWMU 85, the north end (85N) was an unlined depression with a rectangular pit located near the center. Aerial photographs taken in 1969 show a drum storage area in the southwestern side of the pit for chemicals used in fire training activities. Contaminants at SWMU 85N have included petroleum products, pesticides, and chlorinated solvents. Remedial actions at the site have included landfarming and bioventing in the 1990s, and a soil cap installed in 2002 (ADEC 2019a). The south end (85S) was the burn area south of the taxiway. Petroleum impacts have been observed to a depth of 17 feet at SWMU 85S.

Further site history was not detailed for SWMU 94 in the historical documents provided and reviewed as part of the PA.

SWMU 133 was also a historical firefighter training area, consisting of a grass field, a concrete fill area, and a forested area. The site historically contained a drum storage area and an unlined pit (approximately 20 by 30 feet and 6 feet deep; ADEC 2019b). The burn pit was used to burn waste fuels, oils, solvents, pesticides, paints, and other liquids generated by aircraft and motor maintenance activities. Remedial actions at the site have included landfarming, trenching, irrigation, and backfilling.

5.2.7 Wetland-like Area

The Wetland-like Area is identified as an AOPI following personnel interviews and site reconnaissance due to the potential receipt of surface water runoff from fire training activities at the FGLY-006 Fire Training Pits (specifically SWMUs 85N/S and 133 along Jarvis Taxiway) where AFFF was used. The Wetland-like Area is located in a topographic low area southeast of the airfield, near Jarvis Creek. The area is covered in vegetation. This area does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.8 Old Post Forest Fire

The Old Post Forest Fire Area is identified as an AOPI following document research, personnel interviews, and site reconnaissance due to a forest fire response southwest of the old post in 1999, during which at least 100 gallons of 6% AFFF concentrate was used. The Old Post Forest Fire Area is in a forested area on the western side of the cantonment area. The Old Post Forest Fire Area does not overlap with any IRP sites.

While it was indicated during personnel interviews that AFFF was specifically used at this AOPI in response to a forest fire, it was noted that daily testing of fire equipment nozzles occurred across much of the Old Post area throughout the summer months (late March to October). This AOPI may partially overlap the Landfill #2 (FGLY-008; BRAC Site 32).

5.2.9 Building 347 AFFF Storage

Building 347 AFFF Storage is identified as an AOPI following personnel interviews, and site reconnaissance due to storage of AFFF. At least twenty 50-gallon containers were stored inside the building, and 300-gallon totes were reportedly stored outside of the building in multiple double-stacked rows. Cold storage of AFFF can cause freezing, cracking, and leaking of the 50- and 300-gallon storage containers of AFFF which were present at Building 347. It was indicated that there was cracking and leaking from storage containers both inside and outside the building in the 1990s to the 2000s. Personnel interviews also indicated that nozzle testing of fire equipment was conducted in this storage area from approximately 2001 to 2007. Building 347 is located on a gravel pad surrounded by roads on three sides and a forested area to the east. Building 347 AFFF Storage does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.10 AFFF Parade Route

The AFFF Parade Route Area is identified as an AOPI following personnel interviews and site reconnaissance due to the pump and roll activities that were conducted with AFFF from the commissary down to the recreational vehicle park from approximately 1997 to the 2000s. Pump and roll operations were conducted to test the arc of the fire truck nozzles about twice a month. Water was typically used (about 99% of the time) for these tests, but the AFFF nozzles were tested occasionally for a few seconds at a time to ensure the apparatus could spray approximately 120 feet. Less than 5 gallons of AFFF concentrate were used during each test. The AFFF Parade Route has industrial buildings, grassy areas, and stormwater ditches to the east, and primarily grassy and forested areas and stormwater ditches to

the west. The AFFF Parade Route Area does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.11 Building 504 Former Fire Station

The Building 504 Former Fire Station is identified as an AOPI following personnel interviews and site reconnaissance due to the reported use of AFFF for fire station activities including storage, nozzle testing, and tank filling and flushing during its operation prior to 2013. Building 504 Former Fire Station is located in the cantonment area, adjacent to a grassy pavilion area to the west, a parking lot to the north, and streets to the east and south. The grassy pavilion area to the north and west and what is now the parking lot were both used for the historical nozzle testing and tank flushing activities. The pavilion is sometimes used to host community events. The paved parking lot north of Building 504 is newer (constructed in approximately early 2010s); a temporary storage building was historically in the current parking lot area. Building 504 does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.12 Old Lodge Area (Building 637)

The Old Lodge Area (located at current Building 637) is identified as an AOPI following personnel interviews and site reconnaissance due to a forest fire response in 1999, during which about 1,000 gallons of AFFF concentrate was used. This area was also reportedly historically used for daily nozzle testing and occasional tank flushing in summer months (**Appendix G**).

The original lodge building burned to the ground during the wildfire. The Old Lodge Area is now a gravel pad with industrial buildings surrounded by wooded areas to the north and west. This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.13 Sludge Drying Beds (FGLY-024; 02341.1024)

The Sludge Drying Beds (IRP site FGLY-024) were identified as an AOPI based on historical analytical data which indicated presence of PFOS and PFOA in the sludge generated from the WWTP. The historical analytical data from 2019, as discussed in **Section 2.12**, are provided in **Table 2-2**.

The Sludge Drying Beds were reportedly constructed with a functioning leachate collection and removal system. The facility consisted of six beds totaling 7,140 square feet. At the time of construction, the beds reportedly did not have diking or lining. The beds were constructed over medium-grained soils with moderate infiltration rates. Some reports indicate the beds were unlined for approximately 40 years (i.e., since their construction sometime between 1952 and 1957) before they were upgraded to lined structures in 1990 (CH2M Hill 1992); no additional information was provided regarding potential excavation and/or disposal of soil during the construction upgrade. The location of the historical unlined sludge beds is assumed to be adjacent to the north of the current lined beds. The on-post lagoons associated with the WWTP (constructed in approximately 1966) were reportedly lined (CH2M Hill 1992).

According to personnel interviews, sludge is allowed to undergo one freeze/thaw cycle prior to disposal in a designated cell at Landfill #8. Approximately 50 cubic yards of sludge (which is derived from industrial and domestic waste generated at FGA) are removed from the WWTP Imhoff tank and placed in the beds each year (CH2M Hill 1992). The sludge was not excavated from the drying beds in 2020 due to low

volume (Doyon Utilities 2021). The beds are cleaned out and the dry sludge cake is transferred to Landfill #8 every 2 or 3 years. Some sludge has reportedly been stockpiled and used as a soil amendment at the FGA nursery. Leachate collected in the current Sludge Drying Beds is recycled back to the WWTP (CH2M Hill 1992). The Sludge Drying Beds are surrounded by a maintained fence.

5.2.14 Gate 18 Area

The Gate 18 Area is identified as an AOPI following personnel interviews and site reconnaissance due to the reported AFFF releases during fire response and truck tank flushing activities along a waste pipeline (which transfers wastewater from the mid-cantonment area to a dilution station near Jarvis Creek). Approximately 1,000 gallons of mixed AFFF and water would flow towards (and sometimes into) Jarvis Creek during each instance. It is estimated that the waste and tank flushing events happened about 10 times since 1997, sometimes with approximately 50 gallons of AFFF concentrate at a time.

Gate 18 is located on the eastern side of the installation near Jarvis Creek. It is surrounded by marshy vegetated land. The Gate 18 Area AOPI and the estimated aerial extent of AFFF use coincides with BRAC Site 90 (i.e., the wastewater pipeline; HQAES Site 02341.1019) and BRAC Site 58 (i.e., what is noted as a waste injection well), according to historical maps (Teledyne Solutions, Inc. 2005; U.S. Army Space and Missile Defense Command 2009).

5.2.15 900-Block Forest Fire Area

The 900-Block Forest Fire Area is identified as an AOPI following personnel interviews and site reconnaissance due to a large forest fire response in the area in 1999, during which large quantities of AFFF were reportedly used to extinguish the fire. AFFF was reportedly used to create a fire break line south of the housing units in an attempt to save them. The area of AFFF use during the wildfire response was reportedly bounded by Robin/Landfill Road to the west and Building 725 (a school) to the north. However, personnel interviews also indicated that the 900-Block area was used for nozzle testing as well (**Appendix G**).

The 900-Block Forest Fire Area consists of forested/grassy land. The site could be accessed by residents as there are no access restrictions to the area, and housing units (900-Block buildings) exist downgradient to the northeast of the AOPI. This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.16 Nozzle Testing and Training Area

The Nozzle Testing and Training Area was identified as an AOPI based on personnel interviews due to the reported use of AFFF in the area (**Appendix G**). The empty lot and stormwater drainage ditch northeast of the 900-Block residential housing area was used for nozzle testing and training with AFFF in the 2010s. The operation period, frequency, and volumes of AFFF potentially used at this site during nozzle testing was not provided. The area is currently a grassy unlined ditch; a culvert runs under the road to direct drainage from the ditch to the east. On either side of the ditch, there are flat yards behind housing units.

This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005). The site could be accessed by residents as there are no access restrictions for the ditch area, and housing units (900-Block buildings) exist to the southwest of the AOPI.

5.2.17 Landfill #8 (FGLY-023, 02341.1023)

The Landfill #8 (IRP site FGLY-023) is identified as an AOPI following personnel interviews and review of historical data. Landfill #8 received PFAS-containing waste (i.e., solid waste from the Sludge Drying Beds at the WWTP, which has confirmed presence of PFOS and PFOA [**Table 2-2**]). Landfill #8 reportedly has no leachate collection system, as it is not required based on the size of the landfill (**Appendix F**). The estimated frequency and volume of the sludge waste received at Landfill #8 was not provided. The Landfill #8 area is fenced and access is controlled.

5.2.18 Nursery Sludge Stockpiles

The Nursery Sludge Stockpiles was identified as an AOPI based on personnel interviews and historical analytical PFOS and PFOA results from the Sludge Drying Beds. The Nursery Sludge Stockpiles received potentially PFAS-containing waste (i.e., sludge from the drying beds at the WWTP) for potential use as soil amendments. However, according to personnel interviews, approval was not received to use the dried sludge as a soil amendment at the nursery (**Appendix G**). The period of sludge receipt and stockpiling at the nursery is unknown. The area is currently a grassy plot with areas underlain by concrete surrounded by grassy overgrown fields.

This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.19 Main Gate Fire

The Main Gate Fire was identified as an AOPI based on personnel interviews due to reported use of AFFF during a historical wildfire response (**Appendix F**), estimated to be in 1999. The main gate building was on fire and was sprayed with AFFF to extinguish it. The area has reportedly been significantly reworked and repaved after the fire to construct a new building at the installation entrance. The ground surface at the site consists of paved and grassy cover with a parking lot to the south.

This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.20 Chapel Nozzle Testing Area

The Chapel Nozzle Testing Area was identified as an AOPI based on personnel interviews due to reported use of AFFF during fire equipment/nozzle testing activities (**Appendix G**). The fire department historically flowed AFFF from crash trucks during nozzle testing east of the on-post chapel (Building 845). The operation period, frequency, and volumes of AFFF potentially used at this site during nozzle testing was not provided. The middle portion of the Chapel Nozzle Testing Area is currently used as a community garden surrounded by grass. A dirt road borders the grassy area to the west/southwest.

This AOPI does not overlap with any IRP or BRAC sites according to historical maps (Teledyne Solutions, Inc. 2005).

5.2.21 Former Old Post Sewage Lagoon (FGLY-013; 02341.1013)

The Former Old Post Sewage Lagoon (IRP site FGLY-013) was identified as an AOPI based on historical documents. The lagoons may have received potentially PFAS-containing waste prior to the construction of the Sludge Drying Beds (near Building 633 on-post). The lagoons are estimated to have received waste from FGA from the mid-1950s to the 1980s or early 1990s. A corrugated metal pipe ran from the Old Post to this lagoon, and the lagoon received domestic and industrial wastewaters, such as from former hangar operations. The old overflow pipe discharged to Delta River (CH2M Hill 1992). As noted in **Section 5.2.2**, there was no evidence of AFFF being used in the deluge system at the AAAF hangar; however, it is possible the Former Old Post Sewage Lagoon may have received wastewater from other historical activities at the hangar that involved use or disposal of AFFF.

The location and AOPI boundary of the Former Old Post Sewage Lagoons are estimated from historical documents (features are no longer distinguishable on-site or on aerial photographs). According to historical documents, the facility was approximately 2 to 3 acres, and the extent of the lagoons was approximately 4 to 6 feet deep. It is estimated that 25,000 gal of wastewater discharged here per day for more than 35 years (CH2M Hill 1992). Sludge was reportedly pumped out of the on-post Imhoff tank near Building 633 (i.e., near the current Sludge Drying Beds) periodically and taken to the lagoons.

The area is located off-post in what is now the DTA (which is under administrative control of Fort Wainwright, Alaska). The AOPI is fenced and has overgrown vegetation.

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at FGA, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at FGA at all 21 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 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, groundwater, surface water, and/or 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 2020 and June 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 2020) and PQAPP (Arcadis 2019). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at FGA. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addendum are described in **Section 6.3.3**. Analytical results obtained through SI field activities are summarized in **Section 7**.

6.1 Data Quality Objectives

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

6.2 Sampling Design and Rationale

The rationale used to determine whether sampling should be conducted at each AOPI during the SI is illustrated on **Figure 6-1** below.

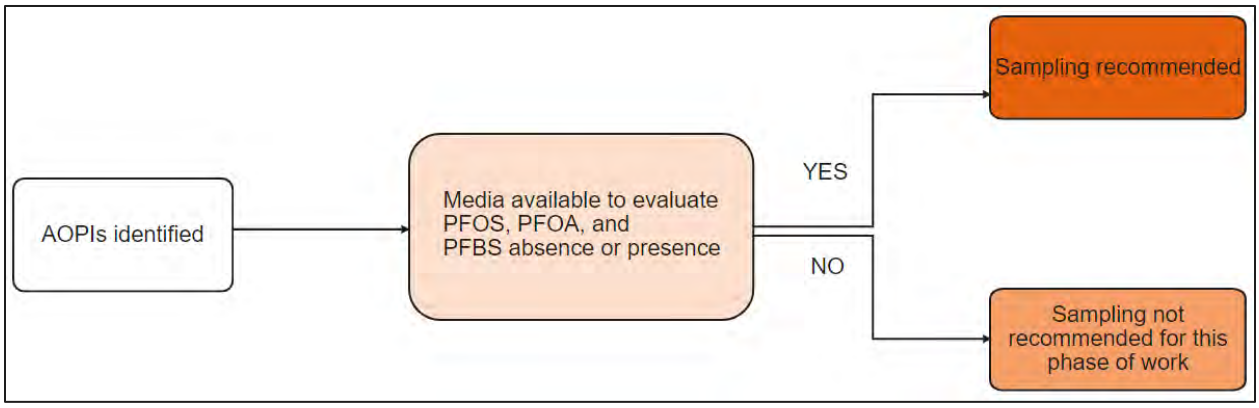

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at FGA is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Shallow soil samples were collected at 20 of the 21 AOPIs (i.e., excluding Landfill #8 where dig restrictions are in place). Two or more soil samples (up to seven samples at some AOPIs) were collected from 0 to 2 feet bgs at these 20 AOPIs to identify presence or absence of PFOS, PFOA, and PFBS. Additionally, soil samples were analyzed for total organic carbon (TOC), pH, and grain size at one soil sampling location per AOPI where soil samples were collected. TOC, pH, and grain size data were collected as they may be useful in future fate and transport studies.

If available, existing groundwater monitoring wells or supply wells were sampled downgradient of the AOPIs to identify presence or absence of PFOS, PFOA, and PFBS in groundwater. **Table 6-1** includes the available monitoring well construction details for the wells sampled during the SI; samples were collected from approximately the center of the saturated screened interval. Field parameters (temperature, pH, dissolved oxygen, oxidation-reduction potential, and specific conductivity) were also measured for water samples. Due to the depth of groundwater at the installation (approximately 150 to 250 feet bgs around FGA), soil data were used to evaluate presence or absence of PFOS, PFOA, and PFBS and to evaluate the potential for those areas to be sources of PFOS, PFOA, and PFBS to surface water and groundwater at the AOPIs where downgradient monitoring wells do not exist.

One grab surface water sample was planned at the Wetland-Like Area AOPI to inform the presence or absence of PFOS, PFOA, and PFBS in runoff from the AAAF. However, surface water was not present at the time of the event and no surface water sample was collected (**Section 6.3.3**). Surface water and sediment samples were not proposed at other AOPIs as part of this SI as there were no permanent surface water features at the AOPIs. While stormwater runoff may eventually flow to Jarvis Creek (i.e., during heavy precipitation or snow melt events), the creek was not sampled.

6.3 Sampling Methods and Procedures

Environmental data were collected and analyzed in accordance with the PQAPP (Arcadis 2019), the SOPs and TGIs included as Appendix A to the PQAPP, the QA/QC requirements identified in Worksheet #20 of the PQAPP, the approved scope and sampling methods outlined in the site-specific QAPP Addendum (Arcadis 2020), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHP (Arcadis 2020). The sampling methods described in the SOPs and TGIs establish

equipment requirements, procedures for preparing equipment and containers before sampling, sampling procedures under various conditions, and procedures for storing samples to ensure that sample contamination does not occur during collection, and transport. In general, sampling techniques used during the SI were consistent with conventional sampling techniques used in the environmental industry, but special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019) and QAPP Addendum (Arcadis 2020). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., soil sampling logs and soil descriptions, groundwater purging and sampling 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

At most existing monitoring wells, groundwater samples were collected using low-flow purging methods via either a decontaminated, portable PFAS-free pump or a dedicated, PFAS-free pump (i.e., those replaced in the wells by FGA in 2020) and high-density polyethylene (HDPE) tubing 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). PFAS-free disposable Hydrasleeves™ were used at two wells at the Landfill #8 AOPI due to the depth of the wells and difficulty achieving lift with a portable pump. At the existing supply wells, samples were collected via the existing pump infrastructure through the sampling port (i.e., pre-treatment).

Soil samples were collected using a decontaminated stainless-steel hand auger.

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

6.3.2 Quality Assurance/Quality Control

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

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of 1 per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS only (not for TOC, pH, or grain size for soil samples). Field duplicates were collected at a rate of one per 10 parent samples as required by the State of Alaska. EBs were collected for media sampled for PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment applicable to the sampled media for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which EBs were collected include HDPE tubing, hand augers, water-level meters, bladder pumps, and Hydrasleeve™ weights as applicable to the sampled media. Analytical results for blank samples are discussed in **Section 7.24**.

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 FGA SI work.

However, in some cases, modifications or clarifications to the established scope of work described in the QAPP Addendum were needed but did not affect DQOs. 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-FGA-01: Following finalization of the QAPP Addendum (Arcadis 2020), ADEC requested that IDW (purge and decontamination water) from sampling of the five new monitoring wells installed in the Buffalo Drop Zone be temporarily containerized and sampled for waste characterization for PFAS constituents. However, IDW generated from sampling these wells during the SI was combined with the IDW generated during the installation and development of the wells as agreed upon by the installation. This IDW was stored at the on-site contractor's warehouse at FGA (i.e., not at a location at the DTA as proposed in the QAPP Addendum), pending approval from ADEC to transport the waste back to the DTA for treatment via granular activated carbon and discharge to the ground surface. The approval for this final disposal action was obtained and the action was completed in August 2021.
- FCR-FGA-02: Several wells proposed to be sampled in the final QAPP Addendum (Arcadis 2020) were not able to be sampled due to access restrictions, health and safety concerns, location of the well not able to be found, or no power connected at the supply wells to activate the pump. Below is a list of the proposed wells that could not be sampled, and the corresponding wells sampled in place of each (if a replacement well was deemed necessary).
    - W-4: The supply well was not connected to power to activate the pump, and a bailer or portable pump could not be dropped down the wellhead to attempt to collect a sample. It was agreed upon that sufficient coverage was achieved to evaluate groundwater in the area via wells W-3, MW-15, MW27, MW-5, MW-23, and MW-10. Therefore, no replacement well was sampled.
    - W-6: The supply well was not connected to power to activate the pump, and a bailer or portable pump could not be dropped down the wellhead to attempt to collect a sample. Well W-5 (located in Building 329 approximately 150 feet southwest of W-6) was sampled in place of W-6.
    - W-15: The well could not be located, and no records could be provided regarding whether the well had been abandoned. No other wells are reported to exist near the Gate 18 Area AOPI. Soil samples were collected to evaluate presence or absence of PFOS, PFOA, and PFBS at this AOPI.
    - B633: The groundwater pumped at Building 633 is sourced from Well #9 (or W-9) and is a truck filling stand. The water is post-treatment water. Therefore, Well #8 (or W-8, located approximately 1,200 feet southwest of B633) was sampled instead, as the water at that well is pre-treatment water.

  - W-10: Access restrictions (i.e., confined space entry) and/or radiological hazards prohibited sampling at this well (and at W-11 just north of W-10). Well #9 (or W-9, located approximately 250 feet south of W-10) was sampled in place of W-10.
  - Note that the well at Building 680, identified in the FGA GIS as Well #14, was noted to be "Well #10" by Doyon Utilities. A sample was collected at the location with identification FGA-B680-WELL#14 as proposed in the QAPP Addendum.

- FCR-FGA-03: During the continuous PA process and after the initial September 2020 SI sampling event, eight additional AOPIs were identified. The AOPIs were sampled during a second mobilization in June 2021 for soil and/or groundwater in accordance with the sampling design and rationale completed at other AOPIs. This work was completed in the same field mobilization to sample the five new wells in the DTA that had not yet been installed and three wells on-post that had not yet been redeveloped (for PFAS-free pump replacement) at the time of the initial field mobilization (September 2020). Additionally, supplemental soil samples were collected at select AOPIs where it was suspected that soil sampling results from the September 2020 were biased low compared to what was expected based on reports of heavy AFFF use in the areas. The supplemental samples were collected to better inform whether to recommend the AOPIs for further study in a remedial investigation. Fire department personnel accompanied the field staff for during the second mobilization for soil sample placement at several of the AOPIs (newly identified and older) to target areas where AFFF use was heaviest or most likely.

6.3.4 Decontamination

Non-dedicated reusable sampling equipment (e.g., hand augers, water-level meters, bladder pumps, and Hydrasleeve™ weights) that came into direct contact with sampling media was decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019; Appendix A).

6.3.5 Investigation-Derived Waste

IDW was disposed as agreed upon by the installation and as noted in the QAPP Addendum (Arcadis 2020) with the exception noted in **Section 6.3.3**. IDW included soil cuttings, purged groundwater, decontamination fluids, and disposable equipment.

Excess soil cuttings from the shallow (0 to 2 feet bgs) boreholes were used to backfill the holes at their respective locations. Purged groundwater and decontamination water generated from sampling wells on post was temporarily containerized, and the on-site contractor disposed the IDW in the granular activated carbon filtration tank on post near monitoring well MW-5. This filtration tank was also used by FGA to dispose IDW generated during the redevelopment of the on-post wells for the PFAS-free pump replacement activities. Purged groundwater and decontamination water generated from sampling the five off-post wells in the DTA was temporarily containerized, and the on-post contractor stored the liquid at their warehouse per direction from the installation. In August 2021, the IDW generated on the DTA and stored at FGA was transported back to the DTA for treatment via granular activated carbon, then discharged to the ground surface, following approval by ADEC.

Equipment IDW includes personal protective equipment and other disposable materials (e.g., gloves, plastic sheeting, Lexan tubes, and HDPE and silicon tubing) that may come in contact with sampling media. Equipment IDW was bagged and disposed at on-post waste receptacles.

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 constituents, including PFOS, PFOA, and PFBS, were analyzed for in groundwater and soil samples using an analytical method that is ELAP-accredited and compliant with QSM 5.3 (DoD and Department of Energy 2019), Table B-15.

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

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

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

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

6.4.2 Data Validation

All analytical data generated during the SI, except grain size, 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 FGA. 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 FGA 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 FGA QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at FGA 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.
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 for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at FGA 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 study 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 FGA (field duplicate results are provided in the associated tables). Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the QAPP Addendum (Arcadis 2020). The sample results discussion below focuses on the PFOS, PFOA, and PFBS analytical results because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 and **7-2** provide a summary of the groundwater and soil analytical results for PFOS, PFOA, and PFBS. **Table 7-3** 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 FGA with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-15** show the PFOS, PFOA, and PFBS analytical results in groundwater and/or soil 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 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 are provided on the field forms in **Appendix K**. Soil descriptions are also provided on the field forms in **Appendix K**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Depth to groundwater in the wells sampled generally ranged from approximately 145 to 290 feet at the on-post wells and from 103 to 175 feet at the off-post wells sampled in the DTA (note: some wells were gauged and sampled in September 2020 and others in June 2021; **Table 6-1**). Depth to groundwater generally decreases from southwest to northeast, congruent with the groundwater flow direction.

Table 7-3 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
AAAF Runways	No
AAAF Hangar Building 100	Yes
Building 111 Current Fire Station	Yes
Building 150 Fire Training Tower	Yes
Building T100 AFFF Storage	Yes
FGLY-006 Fire Training Pits	No
Wetland-like Area	No
Old Post Forest Fire Area	No
Building 347 AFFF Storage	No
AFFF Parade Route	Yes

AOPI Name	OSD Exceedances (Yes/No)
Building 504 Former Fire Station	Yes
Old Lodge Area (Current Building 637)	Yes
Sludge Drying Beds	No
Gate 18 Area	No
900-Block Forest Fire Area	No
Nozzle Testing and Training Area	No
Landfill #8	No
Nursery Sludge Stockpile	No
Main Gate Fire	No
FGA Chapel	No
Former Old Post Sewage Lagoons	No

7.1 Allen Army Airfield Runways

The subsections below detail the soil and groundwater sampling results for the AAAF Runways AOPI.

7.1.1 Soil

Five shallow soil samples were collected at the AAAF Runways AOPI where personnel interviews indicated that AFFF had been used during firefighting training activities: two off of the pad at the north end of the active Runway 19, and three along the abandoned Echo Taxiway during the initial SI mobilization. PFOS was detected in two of the five samples (both collected along Echo Taxiway), with concentrations of 0.00080 J mg/kg (FGA-AAAF-2-SO) and 0.0017 mg/kg (FGA-AAAF-3-SO). PFOA and PFBS were not detected in any of the five samples (**Figure 7-2**; **Table 7-2**).

Two additional soil samples were collected along the abandoned Echo taxiway during the second SI mobilization for confirmation since the concentrations observed in the soil samples collected during the initial mobilization were suspected to be biased low compared to what was expected based on reports of heavy AFFF use in the area. PFOS was detected (0.017 mg/kg) in one sample less than the OSD risk screening level; this concentration was greater than those previously observed from the September 2020 initial SI sampling event. PFOA and PFBS were not detected in these two supplemental samples (**Figure 7-2**; **Table 7-2**).

7.1.2 Groundwater

One of the off-post monitoring wells installed by FGA in 2020 (i.e., MW-35; **Figure 7-15**) is located downgradient of the AAAF Runways AOPI. PFOS, PFOA, and PFBS were not detected in the well during the SI, as discussed later in **Section 7.22**. Well MW-35 may also intercept groundwater originating at the Former Old Post Sewage Lagoons, as noted later in **Section 7.22**.

7.2 Allen Army Airfield Hangar Building 100

The subsections below detail the soil and groundwater sampling results for the AAAF Hangar Building 100 AOPI.

7.2.1 Soil

Four shallow soil samples were collected around the AAAF Hangar Building 100 AOPI. PFOS was detected in three of the four samples, ranging from 0.00095 J mg/kg to 0.015 mg/kg, all less than the residential OSD risk screening level. The maximum PFOS concentration was observed in the soil sample collected east of the Hangar Building 100 (FGA-AFB-100-4-SO), near supply well W-3. PFOA was also detected in this sample at a concentration of 0.0015 mg/kg, less than the OSD risk screening level. PFOA was not detected in the other three soil samples, and PFBS was not detected in any of the four soil samples collected at this AOPI (**Figure 7-3**; **Table 7-2**).

7.2.2 Groundwater

Two existing groundwater wells (MW-25 and W-3 [a supply well]) were sampled near the AAAF Hangar Building 100 AOPI. The wells are located potentially upgradient of the suspected AFFF use areas; however, the areal extent of AFFF use through nozzle testing at this AOPI is uncertain and the AOPI footprint could extend further south towards the wells (**Figure 7-3**), or potential AFFF use southwest of the building could impact concentrations of PFOS, PFOA, and PFBS at wells MW-25 and W-3 based on the understood groundwater flow direction (i.e., to the northeast).

At MW-25, PFOA was detected at a concentration of 52 ng/L (in the FD), exceeding the OSD risk screening level. PFBS was also detected at this well at a concentration of 76 ng/L, less than the OSD risk screening level. PFOS was not detected at MW-25. PFOS, PFOA, and PFBS were detected in supply well W-3 at concentrations of 2.8 J ng/L, 2.1 J ng/L, and 6.7 ng/L, respectively, all less than the OSD risk screening levels (**Figure 7-3; Table 7-1**). Detections of PFOS, PFOA, and/or PFBS observed in these wells (including the exceedance of the OSD risk screening level for PFOA at MW-25) may also be attributed to other upgradient AOPIs (i.e., Building T100 AFFF Storage, Building 150 Fire Training Tower, and Building 111 Current Fire Station [located cross-gradient, in close proximity] AOPIs), and the source(s) should be determined during a future study.

7.3 Building 111 Current Fire Station

The subsections below detail the soil and groundwater sampling results for the Building 111 Current Fire Station AOPI.

7.3.1 Soil

Four soil samples were collected at this AOPI (**Figure 7-3**) at locations indicated by the fire department where AFFF was used during nozzle testing. PFOS was detected in all four samples at concentrations ranging from 0.0022 mg/kg (FGA-B111-2-SO and FGA-B111-3-SO) to 0.037 mg/kg (FGA-B111-1-SO), all less than the OSD risk screening levels. PFOA was detected in three of the four samples (i.e., excluding FGA-B111-2-SO) at concentrations ranging from 0.00049 J mg/kg (FGA-B111-3-SO) to 0.0020 mg/kg

(FGA-B111-1-SO), all less than the OSD risk screening levels. PFBS was not detected in any of the four samples (**Table 7-2**).

7.3.2 Groundwater

Additionally, as discussed in **Section 7.2.2**, adjacent existing wells MW-25 and W-3 (a supply well) were sampled near AOPI (**Figure 7-3**). The footprint of AFFF use at the Building 111 Current Fire Station is not well defined and could extend beyond what is shown on **Figure 7-3**. At MW-25 (a cross-gradient well in close proximity), PFOA was detected at a concentration of 52 ng/L in the FD, exceeding the OSD risk screening level. PFBS was also detected at this well at a concentration of 76 ng/L, less than the OSD risk screening level. PFOS was not detected at MW-25. PFOS, PFOA, and PFBS were detected in supply well W-3 at concentrations of 2.8 J ng/L, 2.1 J ng/L, and 6.7 ng/L, respectively, all less than the OSD risk screening levels (**Table 7-1**). Given the proximity of Building 111 Current Fire Station to other AOPIs where use, storage, or disposal of PFAS-containing materials was also confirmed (and PFOS, PFOA, and PFBS were detected in soil), it cannot be differentiated which AOPI(s) may be contributing to the PFOS, PFOA, and/or PFBS concentrations detected in groundwater at MW-25 and W-3. Detections of PFOS, PFOA, and/or PFBS observed in these wells (including the exceedance of the OSD risk screening level for PFOA at MW-25) may be attributed to this Building B111 Current Fire Station AOPI and/or the Building T100 AFFF Storage, Building 150 Fire Training Tower, and the adjacent AAAF Hangar Building 100 AOPI (which footprint may extend further south). The source(s) of detected PFOS, PFOA, and/or PFBS in wells MW-25 and W-3 should be determined during a future study.

7.4 Building 150 Fire Training Tower

The subsections below detail the soil and groundwater sampling results for the Building 150 Fire Training Tower AOPI.

7.4.1 Soil

Two shallow soil samples were collected at the Building 150 Fire Training Tower AOPI: one on the north side of the tower building and one to the west where surface runoff would have flowed (**Figure 7-3**). PFOS was detected in both samples collected, ranging from 0.00093 J mg/kg (FGA-B150-1-SO) to 0.0047 mg/kg (FGA-B150-2-SO), less than the OSD risk screening levels. PFOA and PFBS were not detected in either sample (**Table 7-2**).

7.4.2 Groundwater

Additionally, as discussed in **Section 7.2.2**, existing wells MW-25 and W-3 (a supply well) were sampled downgradient of the AOPI (**Figure 7-3**). Detections of PFOS, PFOA, and/or PFBS (including the exceedance of the OSD risk screening level for PFOA at MW-25) may be attributed to multiple AOPIs in the area (i.e., Building T100 AFFF Storage, Building 111 Current Fire Station, and/or AAAF Hangar Building 100), and the source(s) should be determined during a future study. Well #1 in Building 131 was also sampled cross-gradient of this AOPI; PFOS, PFOA, and PFBS were not detected in the well.

7.5 Building T100 AFFF Storage

The subsections below detail the soil and groundwater sampling results for the Building T100 AFFF Storage AOPI.

7.5.1 Soil

Two shallow soil samples were collected outside of the temporary building at the Building T100 AFFF Storage AOPI, and one additional sample was collected off the concrete pad southeast of the building where burned props were observed during the PA site visit. PFOS was detected in both samples outside of the building at concentrations less than the OSD risk screening level, ranging from 0.0012 mg/kg (FGA-T100-1-SO) to 0.0018 mg/kg (FGA-T100-2-SO). PFOA and PFBS were not detected in either sample. PFOS, PFOA, and PFBS were not detected in the sample collected off the concrete pad (**Figure 7-3**; **Table 7-2**).

7.5.2 Groundwater

Additionally, as discussed in **Section 7.2.2**, existing wells MW-25 and W-3 (a supply well) were sampled downgradient of the AOPI (**Figure 7-3**; **Table 7-1**). Detections of PFOS, PFOA, and/or PFBS (including the exceedance of the OSD risk screening level for PFOA at MW-25) may be attributed to multiple AOPIs in the area (i.e., Building 150 Fire Training Tower, Building 111 Current Fire Station, and/or AAAF Hangar Building 100), and the source(s) should be determined during a future study. Well #1 in Building 131 was also sampled cross-gradient of this AOPI; PFOS, PFOA, and PFBS were not detected in the well.

7.6 FGLY-006 Fire Training Pits

The subsections below detail the soil and groundwater sampling results for the FGLY-006 Fire Training Pits AOPI.

7.6.1 Soil

Seven shallow soil samples were collected at the FGLY-006 Fire Training Pits AOPI across the four SWMU sites (i.e., SWMU 85N/S, 94, and 133). PFBS was not detected in any of the seven soil samples collected at this AOPI (**Figure 7-4**; **Table 7-2**).

- One sample was collected in the footprint of SWMU 85N (FGA-FGLY-006-1-SO). PFOS and PFOA were detected in the sample with concentrations of 0.0010 J- mg/kg PFOS and 0.00052 J mg/kg PFOA (in the field duplicate), both less than the OSD risk screening levels.
- Two samples were collected within the footprint of SWMU 85S. PFOS was detected in both samples with concentrations ranging from 0.00069 J mg/kg (FGA-FGLY-006-2-SO) to 0.0040 mg/kg (FGA-FGLY-006-3-SO), less than the OSD risk screening levels. PFOA was detected in one sample (FGA-FGLY-006-3-SO) with a concentration of 0.00089 J mg/kg, less than the OSD risk screening levels.
- Two samples were collected within the footprint of SWMU 133. PFOS was detected in both samples with concentrations ranging from 0.0025 mg/kg (FGA-FGLY-006-5-SO) to 0.084 mg/kg (FGA-FGLY-006-4-SO), less than the OSD risk screening levels. PFOA was not detected in either sample.

- Two samples were collected within the footprint of SWMU 94. PFOS was detected in both samples with concentrations ranging from 0.00052 J mg/kg (FGA-FGLY-006-7-SO) to 0.00080 J mg/kg (FGA-FGLY-006-6-SO), less than the OSD risk screening levels. PFOA was not detected in either sample.

7.6.2 Groundwater

Seven existing groundwater monitoring wells were sampled in the vicinity of the FGLY-006 Fire Training Pits AOPI (**Figure 7-4**; **Table 7-1)**.

- Existing wells MW-23 and MW-10 are located at the upgradient boundary of SWMU 94. PFOS was not detected in either well. However, PFOA was detected in well MW-10 (4.2 ng/L), and PFBS was detected in both wells (5.0 ng/L in MW-10 and 5.6 ng/L in MW-23), all less than the OSD risk screening levels.
- Additionally, wells MW-15, MW-27, and MW-5 (located downgradient of SWMU 94 and between SWMUs 94 and 133) were sampled. PFOA and PFBS were detected in MW-27 (3.4 J ng/L and 12 ng/L, respectively, less than the OSD risk screening levels); PFOS was not detected in the well. PFOS, PFOA, and PFBS were not detected in well MW-15 or MW-5.
- Existing wells MW-2 and MW-11 are located downgradient of all four SWMUs near Jarvis Creek. PFBS was detected in well MW-2 (4.2 ng/L, less than the OSD risk screening level), but PFOS and PFOA were not detected in the well. PFOS, PFOA, and PFBS were not detected in MW-11.

These seven wells are also located downgradient of the Old Post Forest Fire Area AOPI; detections of PFOS, PFOA, and/or PFBS in the wells (i.e., MW-2, MW-27, MW-23, and MW-10) at concentrations less than the OSD risk screening levels may be attributed to multiple AOPIs.

As described in **Section 2.12**, the historical groundwater data from June 2016 (**Table 2-1**) have indicated presence of PFOS (0.036 J micrograms per liter [µg/L, or 36 ng/L) and PFBS (0.036 µg/L, or 36 ng/L) in well MW-2 in June 2016. Additionally, these historical data have indicated presence of PFOS (0.076 J µg/L [76 ng/L], an exceedance of the OSD risk screening level), PFOA (0.018 J µg/L [18 ng/L]), and PFBS (0.094 µg/L [94 ng/L) in well MW-11. The historical detections in these two wells (and exceedance of the OSD risk screening level in MW-11 for PFOS) is suspected to be partially attributed to dedicated equipment that was previously down-hole and may have been comprised of PFAS-containing parts, and/or historical sampling practices that may not have incorporated PFAS-specific sampling protocols. The decreased and/or non-detected concentrations of PFOS, PFOA, and PFBS in the two wells observed during the SI is likely due to the PFAS-free pump replacement and redevelopment activities completed by FGA in 2020 prior to the SI sampling event.

7.7 Wetland-Like Area

The subsections below detail the soil and groundwater sampling results for the Wetland-Like Area AOPI. The one proposed surface water sample proposed at this AOPI could not be collected due to dry conditions (**Section 6.3.3**).

7.7.1 Soil

Three shallow soil samples were collected at the Wetland-Like Area AOPI. PFOS was detected in one of the three samples (FGA-WET-3-SO, 0.0015 mg/kg) at a concentration less than the OSD risk screening levels. PFOA and PFBS were not detected in any of the three samples (**Figure 7-4**, **Table 7-2**).

7.7.2 Groundwater

As noted later in **Section 7.22**, off-post well MW-36 may intercept groundwater originating at the Wetland-Like Area. PFOS detected in well MW-36 (18 ng/L) may be attributed to multiple AOPIs including the Wetland-Like Area.

7.8 Old Post Forest Fire Area

The subsections below detail the soil and groundwater sampling results for the Old Post Forest Fire Area AOPI.

7.8.1 Soil

Two shallow soil samples were collected at the Old Post Forest Fire Area AOPI during the initial SI mobilization. PFOS, PFOA, and PFBS were not detected in either sample. Two additional soil samples were collected at the AOPI during the second SI mobilization for confirmation since the concentrations observed in the soil samples collected during the initial mobilization were suspected to be biased low compared to what was expected based on personnel reports of heavy AFFF use in the area during a wildfire response. One soil sample was located at the western edge of the forested area and field where fire department personnel indicated that nozzle testing may have occurred, and the rest were located within the area thought to be where AFFF was used during the wildfire response. PFOS was only detected in one of the four samples (0.00060 J mg/kg at FGA-OPFF-3-SO, at the edge of the forested area where nozzle testing may have occurred) at a concentration less than the OSD risk screening level. PFOA and PFBS were not detected in any of the samples (**Table 7-2**; **Figure 7-5**).

7.8.2 Groundwater

Two existing groundwater monitoring wells (31/32/112-MW-A and 32-MW-A) were sampled in association with the Old Post Forest Fire Area AOPI. These wells are also located downgradient of the Main Gate Fire AOPI. PFOS, PFOA, and PFBS were not detected in either well (**Figure 7-5**, **Table 7-1**). However, as noted in **Section 7.6**, this AOPI is located upgradient of MW-27, MW-23, and MW-10, at which PFOA and/or PFBS were detected (at concentrations less than the OSD risk screening levels) and may be attributed to the Old Post Forest Fire Area AOPI and/or the FGLY-006 Fire Training Pits AOPI.

7.9 Building 347 AFFF Storage

The subsections below detail the soil and groundwater sampling results for the Building 347 AFFF Storage AOPI.

7.9.1 Soil

Two shallow soil samples were collected at the Building 347 AFFF Storage AOPI: one near the loading area of the building and one where it was indicated that tanks of AFFF were stacked and stored outside of the building. PFOS was detected at a concentration of 0.0032 mg/kg, less than the residential OSD risk screening level, in the sample collected by the loading area of the building (FGA-B347-1-SO). PFOA and PFBS were not detected in this sample. PFOS, PFOA, and PFBS were not detected in the other soil sample (FGA-B347-2-SO) (**Figure 7-5**; **Table 7-2**). An additional soil sample was collected at the building's bay door during the second SI mobilization for confirmation since the concentrations observed in the soil samples collected during the initial mobilization were suspected to be biased low compared to what was expected based on reports of transferring AFFF from containers to trucks at this location. PFOS, PFOA, and PFBS were not detected in the follow-on sample.

7.9.2 Groundwater

One existing groundwater supply well (W-5) was sampled cross- or downgradient of the Building 347 AFFF Storage AOPI. This well is also located downgradient of the Main Gate Fire AOPI. PFOS, PFOA, and PFBS were not detected in the sample (**Figure 7-5**; **Table 7-1**). Additionally, as noted later in **Section 7.22**, off-post well MW-36 may intercept groundwater originating at the Building 347 AFFF Storage AOPI. PFOS detected in well MW-36 (18 ng/L) may be attributed to multiple AOPIs including the Building 347 AFFF Storage AOPI.

7.10 AFFF Parade Route

The subsections below detail the soil and groundwater sampling results for the AFFF Parade Route AOPI.

7.10.1 Soil

Three shallow soil samples were collected along the AFFF Parade Route AOPI. PFOS was detected in all three samples, ranging from 0.0030 mg/kg (FGA-PARADE-2-SO) to 0.13 mg/kg (FGA-PARADE-3-SO), the latter of which exceeded the residential OSD risk screening level. PFOA was also detected in the FGA-PARADE-3-SO sample at a concentration of 0.0044 mg/kg, less than the residential OSD risk screening level; PFBS was not detected in the sample. PFOA and PFBS were not detected in the other two samples collected along the AFFF Parade Route (**Figure 7-6**; **Table 7-2**). The FGA-PARADE-3-SO sample was collected near the Building 504 Former Fire Station AOPI (i.e., the start of the pump and roll AFFF Parade Route), at which other exceedances of the residential OSD risk screening level for PFOS were observed (**Section 7.11**; **Figure 7-6**).

7.10.2 Groundwater

Two existing groundwater monitoring wells (MW-6 and MW-8) were sampled downgradient of and in association with the AFFF Parade Route AOPI. These wells are also located downgradient of the Building 504 Former Fire Station AOPI. PFOS was not detected in either well. PFOA was detected less than the OSD risk screening level in MW-6 (3.2 J ng/L). PFBS was detected in both wells at concentrations less than the OSD risk screening level (41 ng/L at MW-6 and 5.0 to 5.5 ng/L at MW-8). The sample collected

at MW-8 on 08 June 2021 was mistakenly collected through low-density polyethylene tubing; the use of low-density polyethylene materials during sampling for PFAS constituents is not recommended (Arcadis 2019) as it may bias sample results low. Therefore, another sample was collected on 09 June 2021 at the well through HDPE tubing. The analytical results for the two samples collected at MW-8 were similar (**Table 7-1**). Detections of PFOA and/or PFBS in these wells at concentrations less than the OSD risk screening levels may be attributed to other upgradient AOPIs (i.e., Building 504 Former Fire Station AOPI).

Additionally, as noted later in **Section 7.22**, off-post well MW-36 may intercept groundwater originating at the AFFF Parade Route AOPI. PFOS detected in well MW-36 (18 ng/L) may be attributed to multiple AOPIs including the AFFF Parade Route.

7.11 Building 504 Former Fire Station

The subsections below detail the soil and groundwater sampling results for the Building 504 Former Fire Station AOPI.

7.11.1 Soil

Three shallow soil samples were collected at the Building 504 Former Fire Station AOPI. PFOS was detected in all three samples with concentrations ranging from 0.052 mg/kg (FGA-B504-3-SO) to 0.69 J mg/kg (FGA-B504-2-SO); concentrations exceeded the residential OSD risk screening levels at two of the soil sampling locations (**Figure 7-6**; **Table 7-2**) with the maximum concentration observed adjacent to the building. PFOA was detected in two of the three samples with concentrations ranging from 0.0023 mg/kg (FGA-B504-2-SO) to 0.0027 mg/kg (FGA-B504-3-SO), less than the OSD risk screening levels. PFBS was not detected in any of the three samples.

7.11.2 Groundwater

Two monitoring wells (MW-6 and MW-8) were sampled downgradient of the AFFF Parade Route AOPI; these wells are also downgradient of the Building 504 Former Fire Station AOPI (**Figure 7-6**). Detections of PFOA and/or PFBS in these wells at concentrations less than the OSD risk screening levels may be attributed to both the AFFF Parade Route AOPI and the Building 504 Former Fire Station AOPI.

Additionally, as noted later in **Section 7.22**, off-post well MW-36 may intercept groundwater originating at the Building 504 Former Fire Station AOPI. PFOS detected in well MW-36 (18 ng/L) may be attributed to multiple AOPIs including the Building 504 Former Fire Station AOPI.

7.12 Old Lodge Area (Building 637)

The subsections below detail the soil and groundwater sampling results for the Old Lodge Area (Building 637) AOPI.

7.12.1 Soil

Three shallow soil samples were collected at the Old Lodge Area AOPI located at current Building 637. PFOS was detected in all three samples with concentrations ranging from 0.0039 mg/kg (FGA-B637-2-

SO) to 0.50 J mg/kg (FGA-B637-3-SO; the latter of which exceeds the residential OSD risk screening level at location FGA-B637-3-SO). PFOA was detected in two of the three samples with concentrations ranging from 0.0015 mg/kg (FGA-B637-3-SO) to 0.0018 J mg/kg (FGA-B637-2-SO), less than the OSD risk screening levels. PFBS was not detected in any of the three soil samples collected at this AOPI (**Table 7-2**; **Figure 7-6**).

7.12.2 Groundwater

Two existing groundwater monitoring wells (88-MW-B and 372059) were sampled downgradient of the Old Lodge Area (current Building 637) AOPI. Additionally, monitoring well 88-MW-C was sampled on the upgradient edge of the AOPI (**Figure 7-6**). PFOS was not detected in any of these three wells. However, PFOA and PFBS were detected in all three wells. PFOA concentrations ranged from 3.9 ng/L (well 372059) to 17 ng/L (88-MW-B), and PFBS concentrations ranged from 9.4 ng/L (88-MW-B) to 17 ng/L (well 372059), all less than the OSD risk screening levels (**Table 7-1**). These wells are potentially located downgradient of multiple AOPIs: well 372059 is also located downgradient of the AFFF Parade Route, Building 504 Former Fire Station, and 900-Block Forest Fire Area, and wells 88-MW-C and 88-MW-B are also located downgradient of the 900-Block Forest Fire Area. Detected concentrations of PFOA and/or PFBS in the wells at concentrations less than the OSD risk screening levels may be attributed to multiple AOPIs.

7.13 Sludge Drying Beds (FGLY-024; 02341.1024)

The subsection below details the soil sampling results for the Sludge Drying Beds AOPI. None of the groundwater samples collected during the SI were associated with the Sludge Drying Beds AOPI.

7.13.1 Soil

Two soil samples were collected at this AOPI during the SI. Doyon Utilities was onsite during the sampling and recommended that the samples be taken within the footprint of each of the historical Sludge Drying Beds north of and adjacent to where sludge from the WWTP is currently directed for drying. PFOS was detected at FGA-SDB-2-SO (0.0048 mg/kg, less than the OSD risk screening levels); PFOA and PFBS were not detected in the sample. PFOS, PFOA, and PFBS were not detected in the other sample (FGA-SDB-1-SO) (**Figure 7-6**; **Table 7-2**).

As noted in **Section 2.12**, a biosolids sample was collected in 2019 from the current Sludge Drying Beds. The PFOS concentration in the sample collected in 2019 from the current beds (0.014 mg/kg) was greater than that observed in the sample collected during the SI from the historical beds. PFOA was also detected in the sample collected from the current beds (0.0093 mg/kg).

7.14 Gate 18 Area

The subsections below detail the soil and groundwater sampling results for the Gate 18 Area AOPI.

7.14.1 Soil

Three shallow soil samples were collected at the Gate 18 Area AOPI during the initial SI mobilization (i.e., where tank flushing reportedly occurred). PFOS was detected in two of the samples with concentrations ranging from 0.0011 mg/kg (FGA-GATE18-2-SO) to 0.027 mg/kg (FGA-GATE18-1-SO; **Figure 7-7** and **Table 7-2**), less than the OSD risk screening levels; PFOA and PFBS were not detected in these two samples. At the third sampling location near Jarvis Creek, PFOS, PFOA, and PFBS were not detected (**Figure 7-7**; **Table 7-2**). Non-detected concentrations of the constituents at this location may be due to dilution and washout from Jarvis Creek as the stream elevation rises and falls throughout the year.

As noted in **Section 4.1**, it was reported that AFFF mixture was flowed to the creek during tank flushing events. Two additional soil samples were collected closer to the gate entrance during the second SI mobilization for confirmation since the concentrations observed in the soil samples collected during the initial mobilization were suspected to be biased low compared to what was expected based on reports of heavy AFFF use in the area. PFOS was detected in both samples (0.00094 J mg/kg at FGA-GATE18-4-SO and 0.010 mg/kg at FGA-GATE18-5-SO) less than the OSD risk screening levels. PFOA was also detected in the FGA-GATE18-5-SO sample (0.00065 J mg/kg) less than the OSD risk screening levels. PFBS was not detected in either of the supplemental samples.

7.14.2 Groundwater

One existing groundwater supply well (W-15) was proposed for sampling in association at this AOPI; however, the well could not be located, and the sample could not be collected. The status of the well is unknown.

7.15 900-Block Forest Fire Area

The subsections below detail the soil and groundwater sampling results for the 900-Block Forest Fire Area AOPI.

7.15.1 Soil

A total of six shallow soil samples were collected at the 900-Block Forest Fire Area AOPI. During the initial September 2020 SI sampling event, three of these samples were collected near the 900-Block residential buildings (**Figure 7-8**). PFOS, PFOA, and PFBS were not detected in any of these three samples.

An additional three shallow soil samples were collected during the second SI mobilization for confirmation since the concentrations observed in the soil samples collected during the initial mobilization were suspected to be biased low compared to what was expected based on reports of heavy AFFF use in the area during a wildfire response. These soil samples were collected further south and west to attempt to sample further behind the fire break line (**Figure 7-8**). PFOS was detected at a concentration of 0.011 J mg/kg at FGA-B900-4-SO (**Table 7-2**), less than the OSD risk screening levels**;** PFOA and PFBS were not detected in the sample. PFOS, PFOA, and PFBS were not detected in the other two supplemental samples.

7.15.2 Groundwater

Three existing groundwater supply wells were sampled downgradient of and in association with the 900-Block Forest Fire Area AOPI: Well #9 (located in Building 606), Well #8 (located in Building 625), and Well #14 (located in Building 680). PFOS, PFOA, and PFBS were not detected in any of the three groundwater samples (**Figure 7-6**; **Table 7-1**). The supply wells are located approximately 0.5 mile downgradient of the AOPI and are screened at approximately 230 to 260 feet bgs (Well #9), 356 to 396 feet bgs (Well #8), and 219 to 249 feet bgs (Well #14). Well #14 is also located downgradient of the Chapel Nozzle Testing Area and Nozzle Testing and Training Area AOPIs.

In addition, two monitoring wells were sampled upgradient and what is understood to be outside of the footprint of AFFF usage at this AOPI: MW-28 and MW-31. PFOA, PFOA, and PFBS were not detected in either well (**Figure 7-8**; **Table 7-1**).

7.16 Nozzle Testing and Training Area

The subsections below detail the soil and groundwater sampling results for the Nozzle Testing and Training Area AOPI.

7.16.1 Soil

Three soil samples were collected at this AOPI along the ditch where the fire department indicated AFFF was used during nozzle testing. PFOS was detected in the sample collected at FGA-NTTA-3-SO at a concentration of 0.017 mg/kg, less than the OSD risk screening levels; PFOA and PFBS were not detected in the sample. PFOS, PFOA, and PFBS were not detected in the other two soil samples collected at this AOPI (**Figure 7-9**; **Table 7-2**).

7.16.2 Groundwater

Well #14 (located at Building 680) northeast of this AOPI may intercept groundwater originating at this AOPI (**Figure 7-6**). PFOS, PFOA, and PFBS were not detected in Well #14 (**Table 7-1**).

7.17 Landfill #8 (FGLY-023, 02341.1023)

The subsection below details the groundwater sampling results for the Landfill #8 AOPI. Soil was not sampled at this AOPI due to no dig-restrictions and uncertainty of where potentially PFAS-containing material was emplaced.

7.17.1 Groundwater

Two existing groundwater monitoring wells (AP-615 and AP-616) located downgradient of the landfill were sampled during the SI. PFOA was detected in well AP-615 at a concentration of 7.9 ng/L, less than the OSD risk screening level; PFOS and PFBS were not detected in the well. PFOS, PFOA, and PFBS were not detected in the sample collected at well AP-616 (**Figure 7-10**; **Table 7-1**).

7.18 Nursery Sludge Stockpiles

The subsections below detail the soil and groundwater sampling results for the Nursery Sludge Stockpiles AOPI.

7.18.1 Soil

Two soil samples were collected at this AOPI: one immediately adjacent to the concrete stockpile area (FGA-NSS-1-SO) and one in a low-lying drainage area adjacent to the concrete stockpile area (FGA-NSS-2-SO). PFOS was detected in both samples at concentrations less than the OSD risk screening levels (0.0019 mg/kg at FGA-NSS-1-SO and 0.0011 J mg/kg at FGA-NSS-2-SO). PFOA and PFBS were not detected in either sample (**Figure 7-11**; **Table 7-2**).

7.18.2 Groundwater

As noted later in **Section 7.22**, off-post well MW-36 may intercept groundwater originating at the Nursery Sludge Stockpiles. PFOS detected in well MW-36 (18 ng/L) may be attributed to multiple AOPIs including the Nursery Sludge Stockpiles.

7.19 Main Gate Fire

The subsections below detail the soil and groundwater sampling results for the Main Gate Fire AOPI.

7.19.1 Soil

Two soil samples were collected at this AOPI: one located in the western portion of the grassy plot in a low-lying area (FGA-MGF-1-SO) and one located on the eastern portion of the grassy plot near a drainage in a location where runoff may have flowed (FGA-MGF-2-SO). PFOS, PFOA, and PFBS were not detected in either sample (**Figure 7-12**; **Table 7-2**).

7.19.2 Groundwater

As noted in **Section 7.10**, existing groundwater monitoring wells sampled in association with other AOPIs (i.e., W-5) may intercept groundwater originating at the Main Gate Fire AOPI. PFOS, PFOA, and PFBS were not detected in well W-5 (**Figure 7-5**, **Table 7-1**).

7.20 Chapel Nozzle Testing Area

The subsections below detail the soil and groundwater sampling results for the Chapel Nozzle Testing Area AOPI.

7.20.1 Soil

Three soil samples were collected at this AOPI, east of the Chapel outside of the fence of the current garden area, specifically in low lying areas (**Figure 7-13**). PFOS, PFOA, and PFBS were not detected in any of the three samples (**Table 7-2**).

7.20.2 Groundwater

As noted in **Section 7.16**, Well #14 (located in Building 680; **Figure 7-6**) sampled in association with the 900-Block AOPI is also downgradient of the Chapel Nozzle Testing Area. PFOS, PFOA, and PFBS were not detected in the well.

7.21 Former Old Post Sewage Lagoons (FGLY-013; 02341.1013)

The subsections below detail the soil and groundwater sampling results for the Former Old Post Sewage Lagoons AOPI.

7.21.1 Soil

Two soil samples were collected at this AOPI within the fenced area of the former lagoons. The locations were in the approximate center of the fenced area and biased to areas with sparser vegetation to attempt to sample where the former lagoons were as the features were no longer distinguishable. PFOS was detected in both samples at concentrations less than the OSD risk screening levels (0.11 mg/kg at FGA-FOPSL-1-SO and 0.095 mg/kg at FGA-FOPSL-2-SO). PFOA was also detected in both samples at concentrations less than the OSD risk screening levels (0.00066 J mg/kg at FGA-FOPSL-1-SO and 0.00061 J mg/kg at FGA-FOPSL-2-SO). PFBS was not detected in either sample (**Figure 7-14**; **Table 7-2**).

7.21.2 Groundwater

Two of the off-post monitoring wells installed by FGA in 2020 (i.e., MW-34 or MW-35; **Figure 7-15**) are located downgradient of the Former Old Post Sewage Lagoon AOPI and may intercept groundwater originating from beneath the AOPI. PFOS, PFOA, and PFBS were not detected in either of these wells during the SI, as discussed later in **Section 7.22**.

7.22 Downgradient Off-Post Groundwater Samples

Five new monitoring wells (MW-32 through MW-36; **Figure 7-15**) were installed off post by FGA in Summer 2020. The wells are located downgradient of the installation in the DTA across Jarvis Creek. Sample results from the June 2021 SI remobilization event indicate non-detect results for PFOS, PFOA, and PFBS at these new wells except for one detection of PFOS at MW-36 (18 ng/L, less than the OSD risk screening level; **Table 7-1**). The detection of PFOS at MW-36 may be attributed to multiple AOPIs on-post (no potential areas of potential use, storage, or disposal of PFAS-containing materials were identified at the DTA as the area is only used for training maneuvers). Based on the groundwater flow direction (i.e., to the northeast) mapped at FGA, the AOPIs potentially upgradient of MW-36 may include the Wetland-like Area, Main Gate Fire, Building 347 AFFF Storage, the AFFF Parade Route, Building 504 Former Fire Station, and Nursery Sludge Stockpiles AOPIs. Groundwater originating at other AOPIs in the southern portion of the cantonment area likely flows off-post, south and cross-gradient of MW-36. Groundwater from beneath AOPIs in the northern portion of the installation likely flows off-post north of MW-36.

Monitoring wells MW-34 and/or MW-35 may intercept groundwater originating from beneath the AAAF Runways and Former Old Post Sewage Lagoons AOPIs; PFOS, PFOA, and PFBS were not detected in these wells. Groundwater originating at other AOPIs across the installation likely flows off-post, south of wells MW-34 and MW-35.

Based on the understood groundwater flow direction at the installation, monitoring wells MW-32 and MW-33 are not likely to intercept groundwater originating at any of the AOPIs as they are located cross-gradient of all AOPIs.

7.23 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data as they may be useful in future fate and transport studies. The TOC in the soil samples ranged from 1,690 to 73,900 mg/kg. The average TOC at this installation (17,301 mg/kg; **Appendix N**) was typically within range of that for topsoil (5,000 to 30,000 mg/kg). The combined percentage of fines (i.e., silt and clay) in soils at FGA ranged from 4.5 to 86.4% with an average of 39.9%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The average percent moisture of the soil (16%) was typical for clayey loams (0 to 20%). The pH of the soil was slightly acidic with an average pH of 6 standard units. Based on these geochemical and geophysical soil characteristics (i.e., high percentage of fines and TOC) underlying the installation during the SI, PFAS constituents are expected to be relatively less mobile at FGA than in soils with lower percentages of fines and TOC.

7.24 Blank Samples

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

7.25 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-16** through **7-20** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

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

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

Release and transport mechanisms include dissolution/desorption from soil to groundwater, transport via sediment carried in and dissolution to stormwater and surface water, recharge of groundwater from 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:

- The AOPIs are not likely to be accessed by off-installation receptors. Therefore, the soil exposure pathways for these receptors are considered incomplete.
- Recreational users are not likely to contact groundwater during outdoor recreational activities; therefore, the groundwater exposure pathway for on-installation recreational users is incomplete.

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

Figure 7-16 shows the CSM for 14 of the 21 AOPIs where PFOS and/or PFOA was detected in the soil samples collected during the SI. Historical releases to soil and paved surfaces have resulted from use, storage, and/or disposal of AFFF (or runoff from areas where AFFF was used, stored, or disposed). This CSM applies to the AAAF Runways, AAAF Hangar Building 100, Building 111 Current Fire Station, Building 150 Fire Training Tower, Building T100 AFFF Storage, FGLY-006 Fire Training Pits, Wetland-Like Area, Old Post Forest Fire Area, Building 347 AFFF Storage, AFFF Parade Route, Old Lodge Area (Building 637), Sludge Drying Beds, Nursery Sludge Stockpiles, and Former Old Post Sewage Lagoons AOPIs.

- PFOS, PFOA, and/or PFBS were detected in soil and site workers (i.e., installation personnel) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete. The AOPIs are not likely to be

accessed by on-installation residents and recreational users. Therefore, the soil exposure pathways for these receptors are incomplete.

- PFOS, PFOA, and/or PFBS were detected in wells that are downgradient of multiple AOPIs. Therefore, it is conceivable that where PFOS, PFOA, and/or PFBS were detected in soil, it may represent a source to deep groundwater. To account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.
- Groundwater originating at the AOPIs flows off-post through the installation's northeastern boundary. As noted above, PFOS, PFOA, and/or PFBS were detected in wells that are downgradient of multiple AOPIs. Therefore, the groundwater exposure pathways for off-installation receptors are considered potentially complete.
- The only permanent on-post surface water body (Cannister Lake) is not used for drinking water and is located upgradient of the AOPIs. Stormwater runoff at FGA ultimately flows to Jarvis Creek; however, most runoff infiltrates the ground surface through unlined ditches before it reaches a surface water body due to the relatively flat terrain and permeable soils in the area (**Section 2.9.1**). Continuous flow of stormwater to Jarvis Creek is episodic and only occurs during intense summer rainfall or rapid spring melt. On-installation site workers could contact constituents in surface water and sediment of the unlined ditches, therefore these exposure pathways are considered potentially complete. On-installation residents and recreational users are not expected to access drainage ditches downstream or downgradient of these AOPIs; therefore, the surface water and sediment exposure pathways for these receptors are incomplete.
- Stormwater runoff from AOPIs where PFOS, PFOA, or PFBS was detected in soil (and could therefore contain those constituents) could ultimately flow off-post during episodic events to Jarvis Creek and then to the Delta River. Neither of these water bodies are used as a drinking water source within 5 miles of the installation. However, recreational users off-post could contact constituents in surface water and sediment through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-17 shows the CSM for the Building 504 Former Fire Station, 900-Block Forest Fire Area, and Nozzle Testing and Training Area AOPIs. Historical releases to soil and paved surfaces have resulted from use, storage, and/or disposal of AFFF (or runoff from areas where AFFF was used, stored, or disposed).

- PFOS, PFOA, and/or PFBS were detected in soil and site workers (i.e., installation personnel) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- The grassy pavilion area near the Building 504 Former Fire Station is sometimes used to host community events. The 900-Block Forest Fire Area and Nozzle Testing and Training Area AOPIs are in areas adjacent to residential housing. The AOPIs could therefore be accessed by on-installation recreational users, and the soil exposure pathway (via incidental ingestion, dermal contact and inhalation of dust) for this receptor is also considered to be complete. While on-installation residents could access the AOPIs, it would be under a recreational exposure scenario. Therefore, the soil exposure pathway for the on-installation resident is incomplete.

- PFOS, PFOA, and/or PFBS were detected in wells that are downgradient of multiple AOPIs. Therefore, it is conceivable that where PFOS, PFOA, and PFBS were detected in soil, it may represent a source to deep groundwater. To account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are considered potentially complete.
- Groundwater originating at the AOPIs flows off-post through the installation's northeastern boundary. As noted above, PFOS, PFOA, and/or PFBS were detected in wells that are downgradient of multiple AOPIs. Therefore, the groundwater exposure pathways for off-installation receptors are considered potentially complete.
- The only permanent on-post surface water body (Cannister Lake) is not used for drinking water and is located upgradient of the AOPIs. Stormwater runoff at FGA ultimately flows to Jarvis Creek; however, most runoff infiltrates the ground surface through unlined ditches before it reaches a surface water body due to the relatively flat terrain and permeable soils in the area (**Section 2.9.1**). Continuous flow of stormwater to Jarvis Creek is episodic and only occurs during intense summer rainfall or rapid spring melt. On-installation site workers and recreational users (i.e., nearby residents under a recreational exposure scenario) could contact constituents in surface water and sediment of the unlined ditches, therefore these exposure pathways are considered potentially complete. The surface water and sediment exposure pathways for on-installation residents are incomplete.
- Stormwater runoff from AOPIs where PFOS, PFOA, or PFBS was detected in soil (and could therefore contain those constituents) could ultimately flow off-post during episodic events to Jarvis Creek and then to the Delta River, neither of which are used as a drinking water source within 5 miles of the installation. However, recreational users off-post could contact constituents in surface water and sediment through incidental ingestion and dermal contact; as such, the surface water and sediment exposure pathways for off-installation recreational users are considered potentially complete.

Figure 7-18 shows the CSM for the Chapel Nozzle Testing Area and Main Gate Fire AOPIs. AFFF was reportedly released to soil and paved surfaces during firefighter training exercises or fire responses at these AOPIs.

- PFOS, PFOA, and PFBS were not detected in the soil samples collected during the SI. The exact use areas of AFFF at the two AOPIs is uncertain, and the ground may have been reworked at both areas (i.e., for reconstruction of the Main Gate building and for gardening at the Chapel Nozzle Testing Area). It cannot be certain that surface soils at other locations within the AOPIs do not contain detectable concentrations of the constituents. However, PFOS, PFOA, and/or PFBS were not detected in wells located downgradient of the AOPIs (i.e., well W-5 downgradient of the Main Gate Fire AOPI and Well #14 downgradient of the Chapel Nozzle Testing Area), supporting the conclusion that PFOS, PFOA, and/or PFBS are not present in soil at these AOPIs. Based on the SI soil and groundwater sample data, the soil and groundwater exposure pathways are considered incomplete.
- Based on no detections of PFOS, PFOA, or PFBS in soil or groundwater samples collected in association with the AOPIs, the AOPIs are not likely to be a source to surface water (e.g., via stormwater runoff) or sediment on- or off-post. Therefore, the surface water and sediment exposure pathways for on- and off-post receptors are also considered incomplete.

Figure 7-19 shows the CSM for the Gate 18 Area. AFFF was historically released during fire response training and during fire truck tank flushing activities. AFFF was sometimes flowed to Jarvis Creek (i.e., the release was to soil and surface water media).

- PFOS, PFOA, and/or PFBS were detected in soil and site workers (i.e., installation personnel) could contact constituents in soil via incidental ingestion, dermal contact and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete. The AOPI is not likely to be accessed by on-installation residents and recreational users. Therefore, the soil exposure pathways for these receptors are considered incomplete.
- Groundwater could not be sampled at the AOPI (**Section 6.3.3**). To account for potential future use of the downgradient on-post groundwater, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are conservatively considered potentially complete.
- Groundwater originating at this AOPI flows off-post through the installation's northeastern boundary. As noted above, groundwater could not be sampled at the AOPI. Therefore, the groundwater exposure pathways for off-installation receptors are conservatively considered potentially complete.
- The only permanent on-post surface water body (Cannister Lake) is not used for drinking water and is located upgradient of the AOPIs. Stormwater runoff at FGA ultimately flows to Jarvis Creek; however, most runoff infiltrates the ground surface through unlined ditches before it reaches a surface water body due to the relatively flat terrain and permeable soils in the area (**Section 2.9.1**). Continuous flow of stormwater to Jarvis Creek is episodic and only occurs during intense summer rainfall or rapid spring melt. On-installation site workers could contact constituents in surface water and sediment of the unlined ditches, therefore these exposure pathways are considered potentially complete. On-installation residents and recreational users are not expected to access drainage ditches downstream or downgradient of these AOPIs; therefore, the surface water and sediment exposure pathways for these receptors are incomplete.
- Stormwater runoff from the AOPI flows off-post to Jarvis Creek and then to the Delta River, neither of which are used as a drinking water source within 5 miles of the installation. However, recreational users off-post could contact constituents in surface water and sediment through incidental ingestion and dermal contact. In addition, AFFF was reportedly flowed to Jarvis Creek historically. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are considered potentially complete.

Figure 7-20 shows the CSM for Landfill #8 where PFAS-containing solid waste (i.e., from the WWTP Sludge Drying Beds) has been emplaced.

- Soil was not sampled at this AOPI and site workers (i.e., installation personnel) are not expected to contact constituents in subsurface soil. Therefore, the subsurface soil exposure pathway (via incidental ingestion, dermal contact and inhalation of dust) for on-installation site workers is incomplete. The AOPI is not likely to be accessed by on-installation residents and recreational users. Therefore, the soil exposure pathways for these receptors are considered incomplete.

- PFOA was detected in groundwater downgradient of the AOPI. 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.
- Groundwater originating at the AOPI flows off-post through the installation's northeastern boundary. As noted above, PFOS, PFOA, and/or PFBS were detected in groundwater downgradient of the AOPI. Therefore, the groundwater exposure pathways for off-installation receptors are considered potentially complete.
- Considering the potential constituent source at this AOPI is in the subsurface, surface runoff is not an applicable migration pathway. Additionally, based on the available data provided by the installation, groundwater does not discharge to surface water in the area. Therefore, surface water and sediment are not included as potential exposure media in the CSM figure.

Following the SI sampling, 19 of the 21 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 FGA based on the use, storage, and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of Per-and Polyfluoroalkyl Substances (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release of PFOS, PFOA, and PFBS to the environment occurred.

OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at FGA. Following the evaluation, 21 AOPIs were identified.

The water table of the drinking water aquifer at FGA is at least 140 to 170 feet bgs. Drinking water at FGA is supplied through a privatized entity (Doyon Utilities) to the main cantonment area from Well #8 (located at Building 625 and screened from 356 to 396 feet bgs) and from backup Well #9 (located at Building 606 and screened from 230 to 260 feet bgs). These wells were sampled and analyzed for PFOS, PFOA, and PFBS in July 2017 and October 2019; results were all non-detect (**Table 2-1**).

All 21 AOPIs were sampled during the SI field events at FGA to identify presence or absence of PFOS, PFOA, and PFBS at each AOPI. Nineteen of the 21 AOPIs had detections of PFOS, PFOA, and PFBS in soil and/or groundwater, and seven AOPIs exceeded OSD risk screening levels. The data are summarized below by media type.

Groundwater: For the purposes of this evaluation, the OSD risk screening levels used to compare groundwater data are 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS. PFOS, PFOA, and/or PFBS were detected in 13 of the 30 groundwater wells sampled during the SI. At MW-25, where the maximum PFOA concentration and only exceedance of the OSD risk screening level was observed (52 ng/L PFOA in the FD), groundwater impacts may be attributed to multiple upgradient or cross-gradient AOPIs: AAAF Hangar Building 100, Building T100 AFFF Storage, Building 150 Fire Training Tower, and Building 111 Current Fire Station. PFOS was detected (18 ng/L) in one of the new off-post wells (MW-36) in the DTA. Based on the groundwater flow direction (i.e., to the northeast) mapped at FGA, the AOPIs potentially upgradient of MW-36 may include the Wetland-like Area, Main Gate Fire, Building 347 AFFF Storage, and potentially the AFFF Parade Route, Building 504 Former Fire Station, and Nursery Sludge Stockpiles AOPIs.

Shallow Soil (0 to 2 feet): For the purposes of this evaluation, the OSD risk screening levels used to compare soil data are: 0.13 mg/kg for PFOS and PFOA and 1.9 mg/kg for PFBS (residential receptor scenario). For the industrial/commercial receptor scenario, the OSD risk screening levels are: 1.6 mg/kg for PFOS and PFOA and 25 mg/kg for PFBS. PFOS and/or PFOA were detected at 44 of the 71 soil sampling locations completed during the SI (PFBS was not detected in any of the samples). Presence of PFOS and/or PFOA was identified in soil at 18 of the 21 AOPIs, and the residential OSD risk screening levels were exceeded at three AOPIs (Building 504 Former Fire Station, Old Lodge Area Building 637, and AFFF Parade Route AOPIs). The maximum PFOS and PFOA concentrations detected in soil were from samples collected at the Building 504 Former Fire Station (0.69 J mg/kg PFOS, which exceeded the

residential OSD risk screening level) and at the AFFF Parade Route (0.0044 mg/kg PFOA, less than the OSD risk screening level). No soil concentrations of PFOS exceeded the industrial/commercial risk screening level. No PFOA concentrations in soil exceeded the OSD risk screening levels.

Following the SI sampling, 19 out of the 21 AOPIs were considered to have complete or potentially complete exposure pathways.

Complete exposure pathways include:

- Soil exposure pathways for on-installation site workers at 18 AOPIs (i.e., excluding the Chapel Nozzle Testing Area, Main Gate Fire, and Landfill #8 AOPIs).
- Soil exposure pathways for on-installation recreational users at three AOPIs (Building 504 Former Fire Station, 900-Block Forest Fire Area, and Nozzle Testing and Training Area).

Potentially complete exposure pathways include:

- Groundwater exposure pathways for on-installation site workers and residents and off-installation receptors at 19 AOPIs (i.e., excluding the Chapel Nozzle Testing Area and Main Gate Fire AOPIs).
- Surface water and sediment exposure pathways for on-installation recreational users at three AOPIs (Building 504 Former Fire Station, 900-Block Forest Fire Area, and Nozzle Testing and Training Area).
- Surface water and sediment exposure pathways for on-installation site workers and off-installation receptors at 18 AOPIs (i.e., excluding the Chapel Nozzle Testing Area, Main Gate Fire, and Landfill #8 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 FGA, PFOS, PFOA, and PFBS sampling and recommendations for each AOPI; further investigation is warranted at FGA. 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 FGA, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS detected greater than OSD Risk Screening Levels? (Yes/No/ND/NS)		Recommendation
	GW	SO	
Allen Army Airfield Runways	No	No	No action at this time
Allen Army Airfield Hangar Building 100	Yes	No	Further study in a remedial investigation
Building 111 Current Fire Station	Yes	No	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	
Building 150 Fire Training Tower	Yes	No	Further study in a remedial investigation
Building T100 AFFF Storage	Yes	No	Further study in a remedial investigation
FGLY-006 Fire Training Pits	No	No	No action at this time
Wetland-like Area	No	No	No action at this time
Old Post Forest Fire Area	No	ND	No action at this time
Building 347 AFFF Storage	No	No	No action at this time
AFFF Parade Route	No	Yes	Further study in a remedial investigation
Building 504 Former Fire Station	No	Yes	Further study in a remedial investigation
Old Lodge Area (Current Building 637)	No	Yes	Further study in a remedial investigation
Sludge Drying Beds	NS	No	No action at this time
Gate 18 Area	NS	No	No action at this time
900-Block Forest Fire Area	No	No	No action at this time
Nozzle Testing and Training Area	NS	No	No action at this time
Landfill #8	No	NS	No action at this time
Nursery Sludge Stockpile	No	No	No action at this time
Main Gate Fire	ND	ND	No action at this time
Chapel Nozzle Testing Area	NS	ND	No action at this time
Former Old Post Sewage Lagoons	ND	No	No action at this time

Notes:
Light gray shading – detection greater than the OSD risk screening level
GW – groundwater
ND – non-detect
NS – not sampled
SO – soil

Data collected during the PA (**Sections 3** through **5**) and SI (**Sections 6** through **8**) were sufficient to draw conclusions and recommendations summarized above. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at FGA 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. Soil samples collected in areas where heavy AFFF use was reported by the FGA fire department personnel had lower concentrations of PFOS, PFOA, and/or PFBS than expected based on the reported history of the areas. It is possible that Class A firefighting foams (which do not contain PFAS constituents) were used, especially in areas of wildfire response. Additionally, the location of AFFF use reported by the FGA fire department may be inaccurate, or the ground may have been significantly reworked for new construction or for debris cleanup after the wildfires.

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

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

Finally, the available PFOS, PFOA, and PFBS analytical data is limited to historical data provided by the installation (as presented in **Tables 2-1** and **2-2**) and the data collected during this SI. The sampling scope of the SI focused on identifying presence or absence of PFOS, PFOA, and PFBS at the AOPIs. SI sampling at locations at or in close proximity of the AOPIs and at off-post monitoring wells did not delineate the extent of PFOS, PFOA, and PFBS impacts or identify the primary migration pathways for the chemicals. Some AOPIs (e.g., the AFFF Parade Route, Old Lodge Area, and AAAF Hangar Building 100) encompass large areas where AFFF was potentially used during historical activities; source areas should be further defined in a remedial investigation. Available data, including PFOS, PFOA, and PFBS, is 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 FGA in accordance with the guidance provided by the OSD.

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ACRONYMS

°F	degrees Fahrenheit
µg/L	micrograms per liter
%	percent
AAAF	Allen Army Airfield
ADEC	Alaska Department of Environmental Conservation
AFFF	aqueous film-forming foam
AKDNR	Alaska Department of Natural Resources
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DoD	Department of Defense
DQO	data quality objective
DTA	Donnelly Training Area
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FGA	Fort Greely, Alaska
FGLY	Fort Greely, Alaska (former Army Environmental Database-Restoration site designations)
GIS	geographic information system
GW	groundwater
HDPE	high-density polyethylene
HQAES	Headquarters Army Environmental System
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
MDA	Missile Defense Agency
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
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
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SWMU	solid waste management unit
TGI	technical guidance instruction
TOC	total organic carbon

U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USARAK	United States Army Alaska
USASMDC	United States Army Space and Missile Defense Command
USEPA	United States Environmental Protection Agency
WWTP	wastewater treatment plant

TABLES

Table 2-1 - Historical Groundwater PFAS Analytical Data
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

Well ID	Sample ID	Sample Date	PFDA	PFHxA	PFDoA	PFTA	PFTrDA	PFUnA	PFHpA	PFHxS	PFNA	PFBS	PFOS	PFOA
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
AAAF GW7A	AAAF GW7A	February 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
FGA Main	FGA Main	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Bldg #131 Well #1	Bldg #131 Well #1	July 2017	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Well #1	October 2019	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Bldg #131 Well #1A	FGA 1A	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Bldg #131 Well #1A	July 2017	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Well #1A	October 2019	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Bldg #625 Well #8	FGA Well #8	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Bldg #625 Well #8	July 2017	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Well #8	October 2019	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Bldg #606 Well #9	Bldg #606 Well #9	July 2017	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
	Well #9	October 2019	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
MDA Main	MDA Main	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
MDA Well #1	MDA Well #1	February 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
MDA ECP 1	MDA ECP 1	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
MDA ISFAC (SW-4)	MDA ISFAC	January 2017	--	--	--	--	--	--	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
MW-2	1309MW2GW-10	October 2013	--	--	--	--	--	--	--	--	--	--	0.005 U	0.005 U
	MW-2	June 2016	--	--	--	--	--	--	--	--	--	--	**0.036 J**	0.009 U
	MW-2	September 2016	--	--	--	--	--	--	--	--	--	--	0.014 U	0.0087 U
	MW-2	June 2017	--	--	--	--	--	--	--	--	--	--	ND	ND
	MW-2	September 2017	--	--	--	--	--	--	--	--	--	--	ND	ND
MW-4	M1309MW4GW-10	October 2013	--	--	--	--	--	--	--	--	--	--	0.005 U	0.005 U
	MW-4	June 2016	--	--	--	--	--	--	--	--	--	--	**0.090 J**	0.009 U
	MW-4	September 2016	--	--	--	--	--	--	--	--	--	--	0.014 U	0.0087 U
MW-5	MW-5	June 2016	--	--	--	--	--	--	--	--	--	--	ND	ND
	MW-5	September 2016	--	--	--	--	--	--	--	--	--	--	ND	ND
	MW-5	June 2017	--	--	--	--	--	--	--	--	--	--	ND	ND
	MW-5	September 2017	--	--	--	--	--	--	--	--	--	--	ND	**0.0069 J**
MW-11	MW-11	June 2016	--	--	--	--	--	--	--	--	--	--	**0.076 J**	**0.018 J**
	MW-11	September 2016	--	--	--	--	--	--	--	--	--	--	ND	ND
MW-16U	1309MW16UGW-10	October 2013	--	--	--	--	--	--	--	--	--	--	0.005 U	**0.210 J**
	MW-16U	June 2016	--	--	--	--	--	--	--	--	--	--	**0.054 J**	**0.024 J**
	MW-16U	September 2016	--	--	--	--	--	--	--	--	--	--	ND	**0.130**
MW-16L	MW-16L	September 2013	--	--	--	--	--	--	--	--	--	--	0.005 U	0.005 U
	1309MW16LGW-10	October 2013	--	--	--	--	--	--	--	--	--	--	<0.005 U	<0.005 U
	MW-16L	June 2016	--	--	--	--	--	--	--	--	--	--	**0.076 J**	**0.023 J**
	MW-16L	September 2016	--	--	--	--	--	--	--	--	--	--	<0.014 U	**0.023 J**

Notes:
1. **Bolded data** = Concentration detected above laboratory reporting limit.
2. Grey shading = Concentration exceeds the residential tap water risk screening level provided as guidance by the Office of the Secretary of Defense ([OSD]; OSD 2021). The tap water risk screening levels are 0.040 µg/L (40 ng/L) for PFOS and PFOA and 0.600 µg/L (600 ng/L) for PFBS.

Acronyms:
µg/L = micrograms per liter (parts per billion)
AAAF = Allen Army Airfield
Bldg = building
ECP = entry control point
FGA/FGLY = Fort Greely
GW = groundwater
ID = identification
ISFAC = Integrated Data Terminal Support Facility
J = indicates an estimated value
MDA = Missile Defense Area
MW = monitoring well
ND = Non detect*
* = in some instances, the reporting limit for non-detect results was not provided in the data source file; therefore, the result is reported as ND only
PFBS = perfluorobutanesulfonic acid
PFDA = perfluorodecanoic acid
PFDoA = perfluorododecanoic acid
PFHpA = perfluoroheptanoic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexanesulfonic acid
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
PFTA = perfluorotetradecanoic acid
PFTrDA = perfluorotridecanoic acid
PFUnA = perfluoroundecanoic acid
SW = supply well
U = Concentration not detected greater than the laboratory reporting limit. Non-detect concentrations are shown as not detected greater than the method reporting limit, if provided.

Sources:
1. Bering-Kaya Support Services. 2017. Final 2016 Groundwater Monitoring and Data Analysis Report. November.
2. Eurofins Eaton Analytical. Various Laboratory Reports: #382505 (March 2017), #394152 (August 2017), #394153 (August 2017), #467925 (October 2019), and #467924 (October 2019).
3. Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.
4. WHPacific, Inc. 2014. Draft 2013 Groundwater Monitoring and Data Analysis Report, Fort Greely, Alaska. April.
5. Bering-Kaya Support Services. Unknown year. Historical Analytical Data Summaries 2012-2017. Unknown month.

Table 2-2 - Historical Biosolids PFAS Analytical Data
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

Constituent		PFBS (ng/g)		PFHpA (ng/g)		PFHxS (ng/g)		PFNA (ng/g)		PFOS (ng/g)		PFOA (ng/g)	
OSD Industrial/Commercial (ng/g)		25,000		N/A		N/A		N/A		1,600		1,600	
OSD Residential (ng/g)		1,900		N/A		N/A		N/A		130		130	
Sample ID	Sample Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Drying Bed	July 2019	0.51	U	2.0		0.84		5.3		14		9.3	

Notes and Acronyms:

1. Results are reported in the units provided by the laboratory to retain significant figures.
2. **Bolded data** = Concentration detected above laboratory reporting limit.
3. Concentrations were compared to the Office of the Secretary of Defense (OSD) risk screening levels (which were converted from milligrams per kilogram to ng/g in this table for comparison) for soil for the residential and industrial/commercial exposure scenarios (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.) since the exposure scenario to the biosolids may be similar to that of soil.

ID = identification
J = indicates an estimated value
ng/g = nanograms per gram (parts per billion; 1000 nanograms per gram equals one milligram per kilogram [part per million])
PFBS = perfluorobutanesulfonic acid
PFHpA = perfluoroheptanoic acid
PFHxS = perfluorohexanesulfonic acid
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
U = Concentration not detected greater than the laboratory method detection limit. Non-detect concentrations are shown as not detected greater than the method detection limit provided in the laboratory

Sources:
(Provided by Doyon Utiliites at Fort Greely) Eurofins Lancaster Laboratories Environmental. 2019. Analysis Report for Group #2056731, Drying Bed Solid, Fort Greely Biosolids Monitoring. August 26.

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

ARCADIS

AOPI(s) Evaluated	Well ID	TOC Elevation (ft amsl)	Access Date	Depth to Water on Access Date (ft btoc)	Calculated Groundwater Elevation (ft amsl)	Installed Boring Depth (ft bgs)	Screened Interval (ft bgs)
Allen Army Airfield Hangar Building 100, Building T100 AFFF Storage, Building 150 Fire Training Tower, and Building 111 Current Fire Station	MW-25	1278.4	9/14/2020	160.27	1118.13	200.3	162 - 192
	W-3	1270.0	9/17/2020	NM	NC	198.0	UNK
Building T100 AFFF Storage and Building 150 Fire Training Tower	Building 131, Well #1	1278.0	9/17/2020	NM	NC	235.0	228 - 235
Building 347 AFFF Storage and Main Gate Fire	W-5	1293.3	9/17/2020	NM	NC	1291.0	UNK
Old Lodge Area Building 637, AFFF Parade Route, Building 504 Former Fire Station, and 900-Block Forest Fire Area	372059	UNK	9/17/2020	NM	NC	235.0	UNK
Old Lodge Area Building 637 and 900-Block Forest Fire Area	88-MW-C	1304.1	9/15/2020	192.27	1111.84	220.0	179.5 - 218.5
	88-MW-B	1292.9	9/16/2020	182.56	1110.29	214.5	174 - 214
Chapel Nozzle Testing Area, Nozzle Testing and Training Area, and 900-Block Forest Fire Area	Building 680, Well #14	1286.6	9/17/2020	NM	NC	249.0	219 - 249
900-Block Forest Fire Area	Building 625, Well #8 (W-8)	UNK	9/17/2020	NM	NC	396.0	356 - 396
	Building 606, Well #9 (W-9)	UNK	9/17/2020	NM	NC	260.0	230 - 260
900-Block Forest Fire Area (potentially upgradient wells)	MW-28	1340.2	9/18/2020	217.55	1122.65	249.6	215 - 254
	MW-31	1345.9	9/18/2020	222.42	1123.48	258.7	226 - 256
FGLY-006 Fire Training Pits and Old Post Forest Fire Area	MW-10	1282.7	9/14/2020	165.82	1116.88	192.0	152 - 192
	MW-11	1264.8	9/16/2020	152.33	1112.47	178.0	138 - 178
	MW-15	1278.0	9/16/2020	161.59	1116.41	236.0	161 - 219
	MW-2	1261.7	9/16/2020	145.61	1116.10	181.0	141 - 181
	MW-23	1281.1	9/14/2020	164.01	1117.09	198.2	175 - 195
	MW-27	1285.7	9/15/2020	169.39	1116.31	190.5	168.5 - 188.5
	MW-5	1274.5	6/8/2021	177.95	1096.55	196.0	154 - 194
Landfill #8	AP-615	1381.4	6/8/2021*	272.49	1108.91	300.0	263.3 - 302.9
	AP-616	1397.3	6/8/2021*	289.79	1107.51	294.9	253.0 - 296.6
Old Post Forest Fire Area and Main Gate Fire	31/32/112MW-A	1299.2	9/15/2020	182.75	1116.41	212.0	172.5 - 211.5
	32-MW-A	1296.7	9/15/2020	179.33	1117.38	215.0	173 - 213
AFFF Parade Route and Building 504 Former Fire Station AOPI	MW-6	1296.9	6/8/2021	195.41	1101.49	203.0	159 - 199
	MW-8	1309.7	6/9/2021	202.04	1107.66	215.5	175 - 215
General Evaluation (downgradient, off-post wells)	MW-32	1194.8	6/9/2021	103.08	1091.69	122.0	81.7 - 121.3
	MW-33	1199.2	6/9/2021	118.05	1081.10	131.0	90.7 - 130.5
	MW-34	1211.5	6/9/2021	130.54	1080.93	147.0	105.4 - 145
	MW-35	1240.4	6/9/2021	146.52	1093.85	162.0	121.6 - 161.5
	MW-36	1270.8	6/8/2021	175.12	1095.69	197.0	156.6 - 196.4

Notes:

*Wells AP-615 and AP-616 were gauged on 6/8/2021; the wells were sampled the following day on 6/9/2021 via Hydrasleeve™ (at AP-615, which was allowed to sit in the well overnight) and bailer (at AP-616, at which the Hydrasleeve™ that had been deployed overnight was empty upon retreival).

Acronyms:

AFFF = aqueous film-forming foam
amsl = above mean sea level
AOPI = area of potential interest
bgs = below ground surface
ft = feet
FGA = Fort Greely (also historically abbreviated FGLY)
NC = not calculated
NGVD = National Geodetic Vertical Datum
NM = not measured (water level meter could not be placed downhole at supply well locations)
TBD = to be determined
TOC = top of casing
TOS = top of screen
UNK - unknown

Sources: Well information provided by a combination of the following: A table titled "Groundwater Monitoring Well Data Summary" provided by Fort Greely in June 2019; a 2013 Basewide Groundwater Monitoring Report by WHPacific; an excel file titled Well History provided by Fort Greely in June 2019; and email communications with Fort Greely's Directorate of Public Works staff.

Table 7-1 - Groundwater Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

				Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				OSD Tapwater RiskScreening Level	40		40		600	
Associated AOPI(s)	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Allen Army Airfield Hangar Building 100, Building T100 AFFF Storage, Building 150 Fire Training Tower, and Building 111 Current Fire Station	FGA-MW-25	FGA-MW-25-091420	09/14/2020	N	3.4	U	**51**		**76**	
		FGA-FD-2-GW-091420	09/14/2020	FD	3.8	U	**52**		**76**	
	FGA-W-3	FGA-W-3-091720	09/17/2020	N	**2.8**	J	**2.1**	J	**6.7**	
Building T100 AFFF Storage and Building 150 Fire Training Tower	FGA-B131-WELL-1	FGA-B131-WELL#1-091720	09/17/2020	N	3.7	U	3.7	U	3.7	U
Building 347 AFFF Storage and Main Gate Fire	FGA-W-5	FGA-W-5-091720	09/17/2020	N	3.5	U	3.5	U	3.5	U
Old Lodge Area Building 637, AFFF Parade Route, Building 504 Former Fire Station, and 900-Block Forest Fire Area	FGA-372059	FGA-372059-091720	09/17/2020	N	3.6	U	**3.9**		**17**	
Old Lodge Area Building 637 and 900-Block Forest Fire Area	FGA-88-MW-C	FGA-88-MW-C-091520	09/15/2020	N	3.5	U	**13**		**11**	
	FGA-88-MW-B	FGA-88-MW-B-091620	09/16/2020	N	3.7	U	**17**		**9.4**	
Chapel Nozzle Testing Area, Nozzle Testing and Training Area, and 900-Block Forest Fire Area	FGA-B680-WELL-14	FGA-B680-WELL#14-091720	09/17/2020	N	3.6	U	3.6	U	3.6	U
900-Block Forest Fire Area	FGA-W-8	FGA-W-8-091720	09/17/2020	N	4.0	U	4.0	U	4.0	U
	FGA-W-9	FGA-W-9-091720	09/17/2020	N	3.8	U	3.8	U	3.8	U
900-Block Forest Fire Area (potentially upgradient wells)	FGA-MW-28	FGA-MW-28-091820	09/18/2020	N	3.6	U	3.6	U	3.6	U
		FGA-FD-3-GW-091820	09/18/2020	FD	3.7	U	3.7	U	3.7	U
	FGA-MW-31	FGA-MW-31-091820	09/18/2020	N	3.7	U	3.7	U	3.7	U
FGLY-006 Fire Training Pits and Old Post Forest Fire Area	FGA-MW-10	FGA-MW-10-091420	09/14/2020	N	3.9	U	**4.2**		**5.0**	
	FGA-MW-23	FGA-MW-23-091420	09/14/2020	N	3.7	U	3.7	U	**5.6**	
	FGA-MW-15	FGA-MW-15-091620	09/16/2020	N	3.7	U	3.7	U	3.7	U
	FGA-MW-27	FGA-MW-27-091520	09/15/2020	N	3.7	U	**3.4**	J	**12**	
	FGA-MW-5	FGA-MW-5-060821	06/08/2021	N	4.2	U	4.2	U	4.2	U
		FGA-FD-1-GW-060821	06/08/2021	FD	3.9	U	3.9	U	3.9	U
	FGA-MW-11	FGA-MW-11-091620	09/16/2020	N	3.4	U	3.4	U	3.4	U
	FGA-MW-2	FGA-MW-2-091620	09/16/2020	N	3.5	U	3.5	U	**4.2**	
		FGA-FD-1-GW-091620	09/16/2020	FD	3.6	U	3.6	U	**4.2**	
Landfill #8	FGA-AP-615	FGA-AP-615-060921	06/09/2021	N	4.2	U	**7.9**		4.2	U
	FGA-AP-616	FGA-AP-616-060921	06/09/2021	N	4.1	U	4.1	U	4.1	U
Old Post Forest Fire Area	FGA-31/32/112-MW-A	FGA-31/32/112MW-A-091520	09/15/2020	N	3.7	U	3.7	U	3.7	U
	FGA-32-MW-A	FGA-32-MW-A-091520	09/15/2020	N	3.6	U	3.6	U	3.6	U
AFFF Parade Route and Building 504 Former Fire Station AOPI	FGA-MW-6	FGA-MW-6-060821	06/08/2021	N	4.0	U	**3.2**	J	**41**	
	FGA-MW-8	FGA-MW-8-060821	06/08/2021	N	3.8	U	3.8	U	**5.0**	
		FGA-MW-8-060921	06/09/2021	N	4.4	U	4.4	U	**5.5**	
General Evaluation (downgradient, off-post wells)	FGA-MW-32	FGA-MW-32-060921	06/09/2021	N	3.6	U	3.6	U	3.6	U
		FGA-FD-2-GW-060921	06/09/2021	FD	3.9	U	3.9	U	3.9	U
	FGA-MW-33	FGA-MW-33-060921	06/09/2021	N	4.2	U	4.2	U	4.2	U
	FGA-MW-34	FGA-MW-34-060921	06/09/2021	N	3.7	U	3.7	U	3.7	U
	FGA-MW-35	FGA-MW-35-060921	06/09/2021	N	4.0	U	4.0	U	4.0	U
	FGA-MW-36	FGA-MW-36-060821	06/08/2021	N	**18**		4.2	U	4.2	U

Table 7-1 - Groundwater Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection.
2. Grey shaded values indicate the result was detected greater than the Office of the Secretary of Defense (OSD) risk screening levels (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Acronyms/Abbreviations:
AFFF = aqueous film-forming foam
AOPI = area of potential interest
FD = field duplicate sample
FGA = Fort Greely, Alaska
ID = identification
N = primary sample
ng/L = nanograms per liter (parts per trillion)
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier

Qualifier	Description
J	The analyte was positively identified; however the associated numerical value is an estimated concentration only
U	The analyte was analyzed for but the result was not detected above thelimit of quantitation (LOQ).

Table 7-2 - Soil Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

				Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	1.6		1.6		25	
				OSD Residential RiskScreening Levels	0.13		0.13		1.9	
Associated AOPI	Location	Sample ID / Parent Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Allen Army Airfield Runways	FGA-AAAF-1	FGA-AAAF-1-SO-092120	09/21/2020	N	0.0010	U	0.0010	U	0.0010	U
		FGA-FD-1-SO-092120	09/21/2020	FD	0.0010	U	0.0010	U	0.0010	U
	FGA-AAAF-2	FGA-AAAF-2-SO-092120	09/21/2020	N	**0.00080**	J	0.00092	U	0.00092	U
	FGA-AAAF-3	FGA-AAAF-3-SO-092120	09/21/2020	N	**0.0017**		0.0011	U	0.0011	U
	FGA-AAAF-4	FGA-AAAF-4-SO-092120	09/21/2020	N	0.0012	U	0.0012	U	0.0012	U
	FGA-AAAF-5	FGA-AAAF-5-SO-092120	09/21/2020	N	0.0011	U	0.0011	U	0.0011	U
	FGA-AAAF-6	FGA-AAAF-6-SO-061021	06/10/2021	N	0.00087	U	0.00087	U	0.00087	U
		FGA-FD-1-SO-061021	06/10/2021	FD	0.00096	U	0.00096	U	0.00096	U
	FGA-AAAF-7	FGA-AAAF-7-SO-061021	06/10/2021	N	**0.017**		0.0011	U	0.0011	U
Allen Army Airfield Hangar Building 100	FGA-AFB-100-1	FGA-AFB-100-1-SO-092120	09/21/2020	N	**0.00096**		0.00095	U	0.00095	U
		FGA-FD-3-SO-092120	09/21/2020	FD	**0.0017**		0.0010	U	0.0010	U
	FGA-AFB-100-2	FGA-AFB-100-2-SO-092120	09/21/2020	N	0.00094	U	0.00094	U	0.00094	U
	FGA-AFB-100-3	FGA-AFB-100-3-SO-092120	09/21/2020	N	**0.00095**	J	0.0010	U	0.0010	U
	FGA-AFB-100-4	FGA-AFB-100-4-SO-092120	09/21/2020	N	**0.015**		**0.0015**		0.0011	U
Building 111 Current Fire Station	FGA-B111-1	FGA-B111-1-SO-061021	06/10/2021	N	**0.037**		**0.0020**		0.00096	U
		FGA-FD-3-SO-061021	06/10/2021	FD	**0.035**		**0.0017**		0.0010	U
	FGA-B111-2	FGA-B111-2-SO-061021	06/10/2021	N	**0.0022**		0.00089	U	0.00089	U
	FGA-B111-3	FGA-B111-3-SO-061021	06/10/2021	N	**0.0022**		**0.00049**	J	0.00091	U
	FGA-B111-4	FGA-B111-4-SO-061021	06/10/2021	N	**0.018**		**0.00080**	J	0.0011	U
Building 150 Fire Training Tower	FGA-B150-1	FGA-B150-1-SO-092220	09/22/2020	N	**0.00093**	J	0.0013	U	0.0013	U
	FGA-B150-2	FGA-B150-2-SO-092220	09/22/2020	N	**0.0047**		0.00099	U	0.00099	U
Building 347 AFFF Storage	FGA-B347-1	FGA-B347-1-SO-092220	09/22/2020	N	**0.0032**		0.0011	U	0.0011	U
	FGA-B347-2	FGA-B347-2-SO-092220	09/22/2020	N	0.00098	U	0.00098	U	0.00098	U
	FGA-B347-3	FGA-B347-3-SO-061021	06/10/2021	N	0.0010	U	0.0010	U	0.0010	U
Building 504 Former Fire Station	FGA-B504-1	FGA-B504-1-SO-092220	09/22/2020	N	**0.22**	J	0.00097	U	0.00097	U
	FGA-B504-2	FGA-B504-2-SO-092220	09/22/2020	N	**0.69**	J	**0.0023**		0.0013	U
	FGA-B504-3	FGA-B504-3-SO-092220	09/22/2020	N	**0.052**		**0.0027**		0.0013	U
Old Lodge Area Building 637	FGA-B637-1	FGA-B637-1-SO-092220	09/22/2020	N	**0.014**		0.0014	U	0.0014	U
	FGA-B637-2	FGA-B637-2-SO-092220	09/22/2020	N	**0.0039**		**0.0018**	J	0.0015	U
	FGA-B637-3	FGA-B637-3-SO-092220	09/22/2020	N	**0.50**	J	**0.0015**		0.0011	U
900-Block Forest Fire Area	FGA-B900-1	FGA-B900-1-SO-091820	09/18/2020	N	0.0013	U	0.0013	U	0.0013	U
		FGA-FD-5-SO-091820	09/18/2020	FD	0.0012	U	0.0012	U	0.0012	U
	FGA-B900-2	FGA-B900-2-SO-091820	09/18/2020	N	0.0014	U	0.0014	U	0.0014	U
	FGA-B900-3	FGA-B900-3-SO-091820	09/18/2020	N	0.0013	U	0.0013	U	0.0013	U
	FGA-B900-4	FGA-B900-4-SO-061021	06/10/2021	N	**0.0011**	J	0.0013	U	0.0013	U
	FGA-B900-5	FGA-B900-5-SO-061021	06/10/2021	N	0.0015	U	0.0015	U	0.0015	U
	FGA-B900-6	FGA-B900-6-SO-061021	06/10/2021	N	0.0012	U	0.0012	U	0.0012	U
Building T100 AFFF Storage	FGA-T100-1	FGA-T100-1-SO-092220	09/22/2020	N	**0.0012**		0.0012	U	0.0012	U
	FGA-T100-2	FGA-T100-2-SO-092220	09/22/2020	N	**0.0018**		0.00099	U	0.00099	U
	FGA-T100-3	FGA-T100-3-SO-092220	09/22/2020	N	0.0010	U	0.0010	U	0.0010	U

Table 7-2 - Soil Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

				Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	1.6		1.6		25	
				OSD Residential RiskScreening Levels	0.13		0.13		1.9	
Associated AOPI	**Location**	**Sample ID / Parent Sample ID**	**Sample Date**	**Sample Type**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Chapel Nozzle Testing Area	FGA-CHAPEL-1	FGA-CHAPEL-1-SO-061021	06/10/2021	N	0.0012	U	0.0012	U	0.0012	UJ
		FGA-FD-2-SO-061021	06/10/2021	FD	0.0011	U	0.0011	U	0.0011	U
	FGA-CHAPEL-2	FGA-CHAPEL-2-SO-061021	06/10/2021	N	0.0011	U	0.0011	U	0.0011	U
	FGA-CHAPEL-3	FGA-CHAPEL-3-SO-061021	06/10/2021	N	0.0011	U	0.0011	U	0.0011	U
FGLY-006 Fire Training Pits	FGA-FGLY-006-1	FGA-FGLY-006-1-SO-092120	09/21/2020	N	**0.0010**	J-	0.00099	UJ	0.00099	U
		FGA-FD-2-SO-092120	09/21/2020	FD	**0.0010**		**0.00052**	J	0.00091	U
	FGA-FGLY-006-2	FGA-FGLY-006-2-SO-092120	09/21/2020	N	**0.00069**	J	0.0012	U	0.0012	U
	FGA-FGLY-006-3	FGA-FGLY-006-3-SO-092120	09/21/2020	N	**0.0040**		**0.00089**	J	0.0011	U
	FGA-FGLY-006-4	FGA-FGLY-006-4-SO-092120	09/21/2020	N	**0.084**		0.0011	U	0.0011	U
	FGA-FGLY-006-5	FGA-FGLY-006-5-SO-092120	09/21/2020	N	**0.0025**		0.00099	U	0.00099	U
	FGA-FGLY-006-6	FGA-FGLY-006-6-SO-092120	09/21/2020	N	**0.0008**	J	0.0011	U	0.0011	U
	FGA-FGLY-006-7	FGA-FGLY-006-7-SO-092120	09/21/2020	N	**0.00052**	J	0.00099	U	0.00099	U
Former Old Post Sewage Lagoon	FGA-FOPSL-1	FGA-FOPSL-1-SO-061021	06/10/2021	N	**0.11**		**0.00066**	J	0.0010	U
	FGA-FOPSL-2	FGA-FOPSL-2-SO-061021	06/10/2021	N	**0.095**		**0.00061**	J	0.0012	U
Gate 18 Area	FGA-GATE18-1	FGA-GATE18-1-SO-091820	09/18/2020	N	**0.027**		0.0012	U	0.0012	U
	FGA-GATE18-2	FGA-GATE18-2-SO-091820	09/18/2020	N	**0.0011**		0.00096	U	0.00096	U
	FGA-GATE18-3	FGA-GATE18-3-SO-091820	09/18/2020	N	0.0011	U	0.0011	U	0.0011	U
	FGA-GATE18-4	FGA-GATE18-4-SO-061021	06/10/2021	N	**0.00094**	J	0.0010	U	0.0010	U
	FGA-GATE18-5	FGA-GATE18-5-SO-061021	06/10/2021	N	**0.010**		**0.00065**	J	0.00098	U
Main Gate Fire	FGA-MGF-1	FGA-MGF-1-SO-061021	06/10/2021	N	0.0010	U	0.0010	U	0.0010	U
	FGA-MGF-2	FGA-MGF-2-SO-061021	06/10/2021	N	0.00087	U	0.00087	U	0.00087	U
Nursery Sludge Stockpile	FGA-NSS-1	FGA-NSS-1-SO-061021	06/10/2021	N	**0.0019**		0.0011	U	0.0011	U
	FGA-NSS-2	FGA-NSS-2-SO-061021	06/10/2021	N	**0.0011**	J	0.0013	U	0.0013	U
Nozzle Testing and Training Area	FGA-NTTA-1	FGA-NTTA-1-SO-061021	06/10/2021	N	0.0010	U	0.0010	U	0.0010	U
	FGA-NTTA-2	FGA-NTTA-2-SO-061021	06/10/2021	N	0.0011	U	0.0011	U	0.0011	U
	FGA-NTTA-3	FGA-NTTA-3-SO-061021	06/10/2021	N	**0.017**		0.0013	U	0.0013	U
Old Post Forest Fire Area	FGA-OPFF-1	FGA-OPFF-1-SO-092220	09/22/2020	N	0.0011	U	0.0011	U	0.0011	U
		FGA-FD-4-SO-092220	09/22/2020	FD	0.0012	U	0.0012	U	0.0012	U
	FGA-OPFF-2	FGA-OPFF-2-SO-092220	09/22/2020	N	0.0012	U	0.0012	U	0.0012	U
	FGA-OPFF-3	FGA-OPFF-3-SO-061021	06/10/2021	N	**0.00060**	J	0.0011	U	0.0011	U
	FGA-OPFF-4	FGA-OPFF-4-SO-061021	06/10/2021	N	0.0011	U	0.0011	U	0.0011	U
AFFF Parade Route	FGA-PARADE-1	FGA-PARADE-1-SO-092220	09/22/2020	N	**0.058**		0.00098	U	0.00098	U
	FGA-PARADE-2	FGA-PARADE-2-SO-092220	09/22/2020	N	**0.0030**		0.00090	U	0.00090	U
	FGA-PARADE-3	FGA-PARADE-3-SO-092220	09/22/2020	N	**0.13**		**0.0044**		0.0014	U
Sludge Drying Beds	FGA-SDB-1	FGA-SDB-1-SO-061021	06/10/2021	N	0.00094	U	0.00094	U	0.00094	U
	FGA-SDB-2	FGA-SDB-2-SO-061021	06/10/2021	N	**0.0048**		0.0010	U	0.0010	U
Wetland-Like Area	FGA-WET-1	FGA-WET-1-SO-092120	09/21/2020	N	0.0011	U	0.0011	U	0.0011	U
	FGA-WET-2	FGA-WET-2-SO-092120	09/21/2020	N	0.0012	U	0.0012	U	0.0012	U
	FGA-WET-3	FGA-WET-3-SO-092120	09/21/2020	N	**0.0015**		0.0012	U	0.0012	U

Table 7-2 - Soil Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Greely, Alaska

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 the residential and commerical/industrial scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).
3. Gray shaded values indicate the result was detected greater than or equal to the OSD risk screening level for the residential scenario. Italicized values indicate the result was detected greater than the OSD risk screening level for the industrial/commercial and residential scenario.

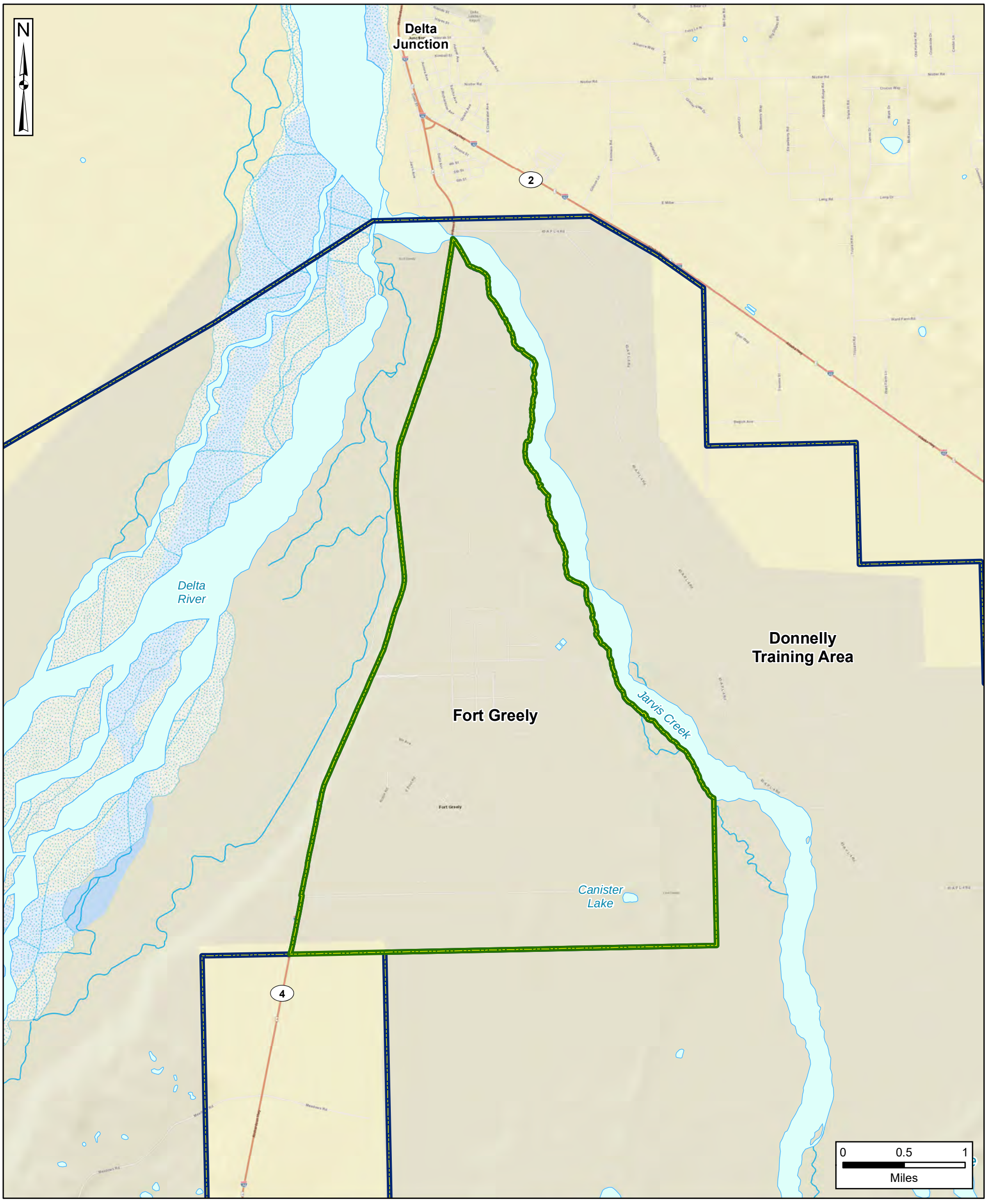
Acronyms/Abbreviations:
AFFF = aqueous film-forming foam
AOPI = area of potential interest
FD = field duplicate sample
FGA = Fort Greely, Alaska
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier

Qualifier	Description
J	The analyte was positively identified; however the associated numerical value is an estimated concentration only
J-	The result is an estimated quantity; the result may be biased low.
U	The analyte was analyzed for but the result was not detected above the limit of quantitation (LOQ).
UJ	The analyte was analyzed for but was not detected. The reported limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 2-1
Site Location



Installation Boundary

Donnelly Training Area Boundary (not included in scope of this study)

Water Body (Perennial)

Water Body (Intermittent)

River/Stream

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Street Map Data

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 2-2
Site Layout

Installation Boundary
Donnelly Training Area Boundary
Building
River/Stream
Water Body (Perennial)
Water Body (Intermittent)
Groundwater Flow Direction
Surface Water Flow Direction
Installation Potable Water Well
Supply Water Well

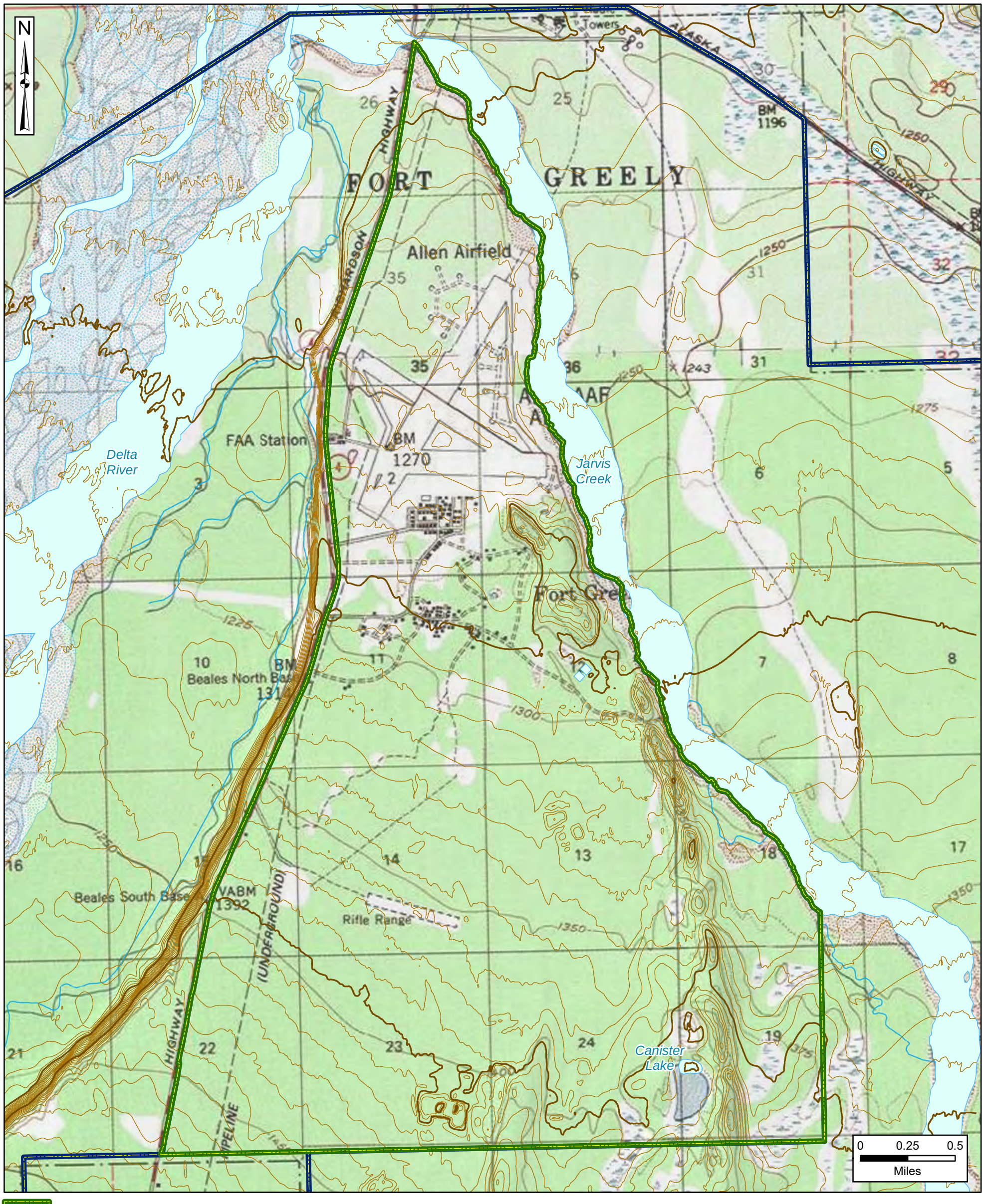
Note:
1. Groundwater flow direction is as inferred from monitoring well gauging activities as part of historical investigations conducted under the Installation Restoration Program (WHPacific, Inc. 2015. Final 2014 Groundwater Monitoring and Data Analysis Report, Fort Greely, Alaska. July.).

Data Sources:
Fort Greely, GIS Data, 2018
Google Earth, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 2-3
Topographic Map

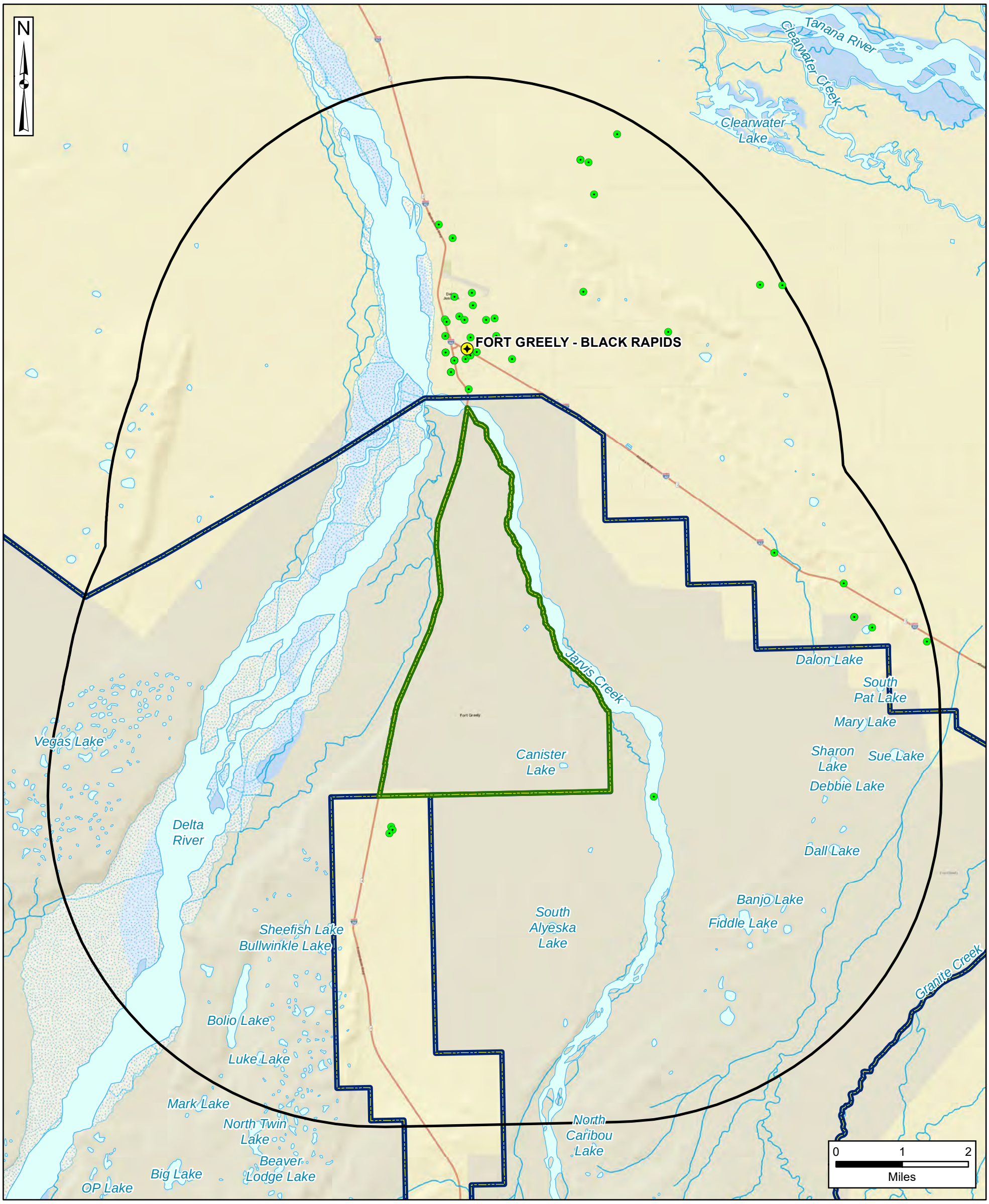


Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Topo Map

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 2-4
Off-Post Potable Well Locations



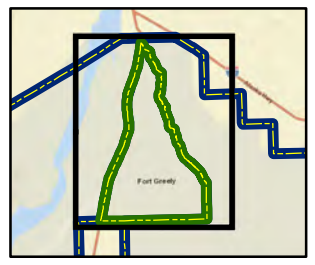
*Well data was obtained from Alaska Department of Natural Resources (DNR). Well use designation and status were not provided.

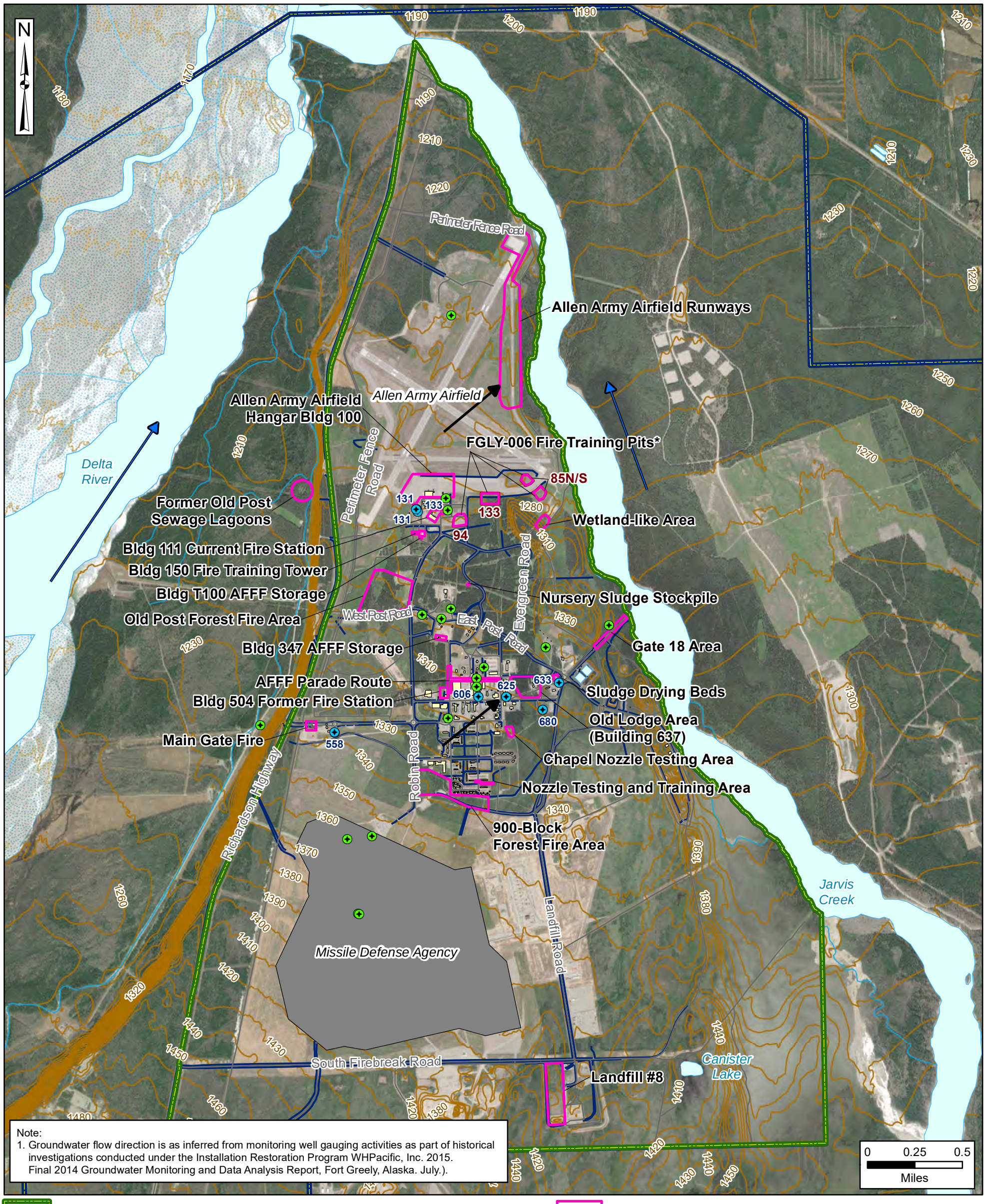
Data Sources:
EDR, Well Data, 2018
AK DNR, Well Data, 2020
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, World Street Map

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 5-2
AOPI Locations





Note:
1. Groundwater flow direction is as inferred from monitoring well gauging activities as part of historical investigations conducted under the Installation Restoration Program WHPacific, Inc. 2015. Final 2014 Groundwater Monitoring and Data Analysis Report, Fort Greely, Alaska. July.).

- Installation Boundary
- Donnelly Training Area Boundary
- Building
- River/Stream
- Water Body (Perennial)
- Water Body (Intermittent)
- Groundwater Flow Direction
- Surface Water Flow Direction
- Installation Potable Water Well
- Supply Water Well
- SWMU
- Approximate AOPI Boundary
- Elevation Contour (feet)
- Storm Sewer Open Drainage

* The FGLY-006 Fire Training Pits AOPI includes SWMUs 85N/S, 94, and 133.

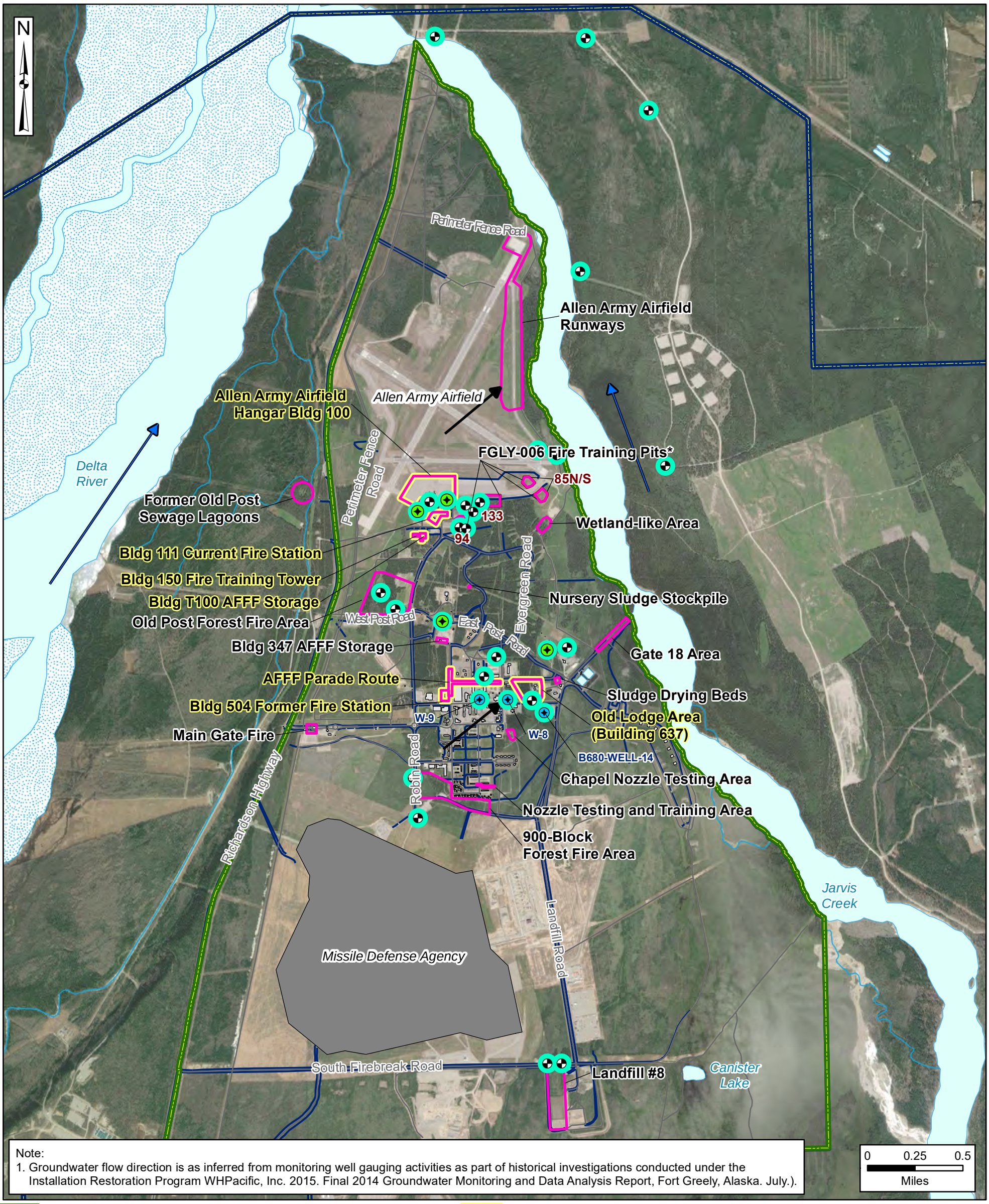
AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg = building
SWMU = solid waste management unit

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

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



Note:
1. Groundwater flow direction is as inferred from monitoring well gauging activities as part of historical investigations conducted under the Installation Restoration Program WHPacific, Inc. 2015. Final 2014 Groundwater Monitoring and Data Analysis Report, Fort Greely, Alaska. July.).

- Installation Boundary
- Donnelly Training Area Boundary
- Building
- Water Body (Perennial)
- Water Body (Intermittent)
- River/Stream
- Groundwater Flow Direction
- Surface Water Flow Direction
- Installation Potable Water Well
- Supply Water Well
- Monitoring Well
- SWMU Boundary
- Approximate AOPI Boundary
- AOPI with OSD Risk Screening Level Exceedance
- Storm Sewer Open Drainage
- Groundwater Sampling Location (Existing Well)

* The FGLY-006 Fire Training Pits AOPI includes SWMUs 85N/S, 94, and 133.

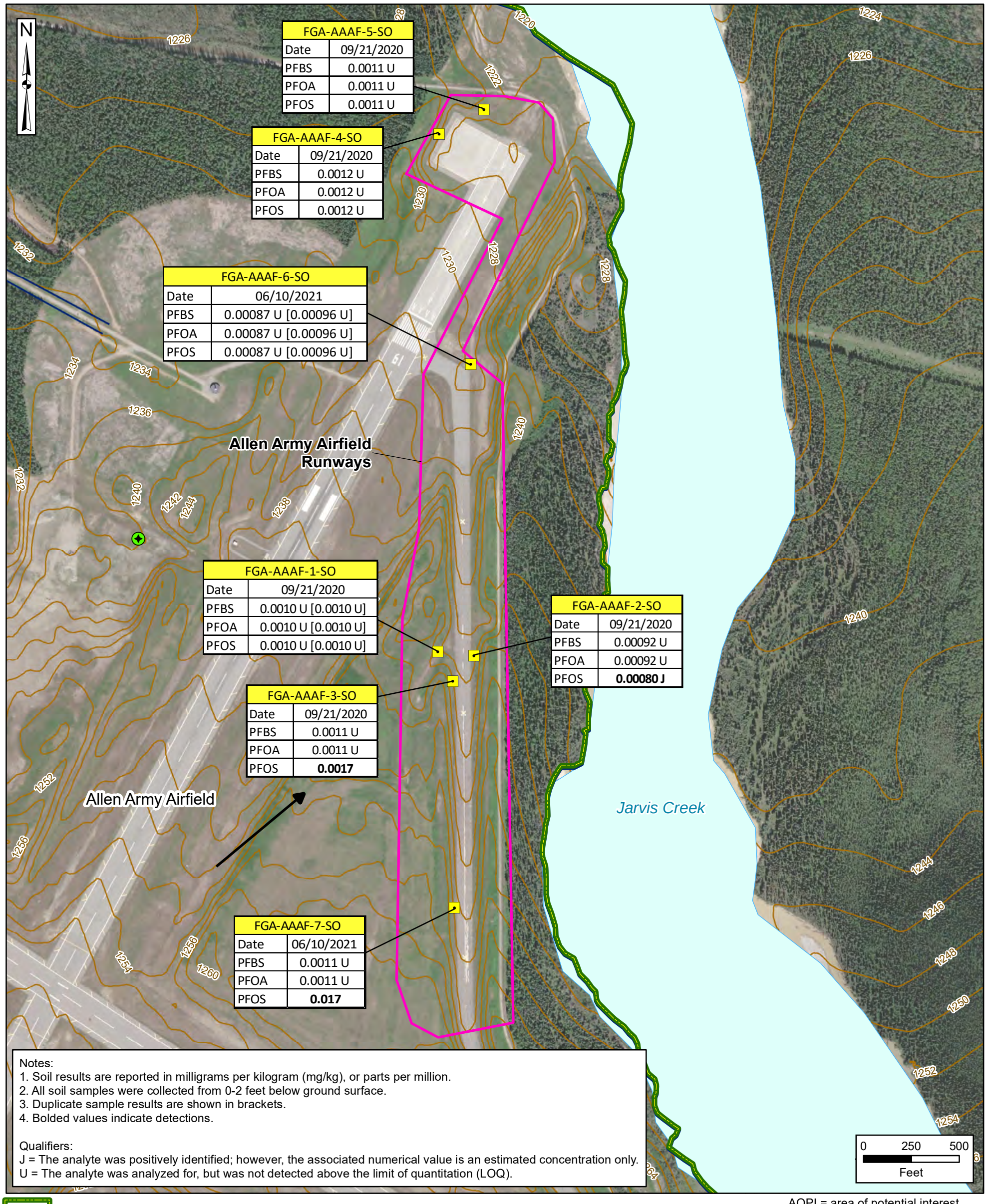
AFFF = aqueous film-forming foam
AOPI = area of potential interest
OSD = Office of the Secretary of Defense
SWMU = solid waste management unit

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 7-2
PFOS, PFOA, and PFBS Analytical Results - Allen Army Airfield Runways



Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface.
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
- Approximate AOPI Boundary
- Water Body (Perennial)
- River/Stream
- Elevation Contour (feet)
- Storm Sewer Open Drainage
- Groundwater Flow Direction
- Supply Water Well
- Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 7-3
PFOS, PFOA, and PFBS Analytical Results - AAAF Hangar Bldg 100, Bldg T100 AFFF Storage, Bldg 150 Fire Training Tower and Bldg 111 Current Fire Station

FGA-AFB-100-1-SO	
Date	09/21/2020
PFBS	0.00095 U [0.0010 U]
PFOA	0.00095 U [0.0010 U]
PFOS	**0.00096 [0.0017]**

FGA-AFB-100-2-SO	
Date	09/21/2020
PFBS	0.00094 U
PFOA	0.00094 U
PFOS	0.00094 U

FGA-AFB-100-4-SO	
Date	09/21/2020
PFBS	0.0011 U
PFOA	**0.0015**
PFOS	**0.015**

Allen Army Airfield Hangar Bldg 100

FGA-AFB-100-3-SO	
Date	09/21/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00095 J**

FGA-B131-WELL#1*	
Date	09/17/2020
PFBS	3.7 U
PFOA	3.7 U
PFOS	3.7 U

FGA-MW-25	
Date	09/14/2020
PFBS	**76 [76]**
PFOA	**51 [52]**
PFOS	3.4 U [3.8 U]

FGA-W-3	
Date	09/17/2020
PFBS	**6.7**
PFOA	**2.1 J**
PFOS	**2.8 J**

FGA-B150-2-SO	
Date	09/22/2020
PFBS	0.00099 U
PFOA	0.00099 U
PFOS	**0.0047**

FGA-B111-1-SO	
Date	06/10/2021
PFBS	0.00096 U [0.0010 U]
PFOA	**0.0020 [0.0017]**
PFOS	**0.037 [0.035]**

FGA-B111-3-SO	
Date	06/10/2021
PFBS	0.00091 U
PFOA	**0.00049 J**
PFOS	**0.0022**

Bldg 111 Current Fire Station

FGA-B111-2-SO	
Date	06/10/2021
PFBS	0.00089 U
PFOA	0.00089 U
PFOS	**0.0022**

FGA-B150-1-SO	
Date	09/22/2020
PFBS	0.0013 U
PFOA	0.0013 U
PFOS	**0.00093 J**

FGA-T100-2-SO	
Date	09/22/2020
PFBS	0.00099 U
PFOA	0.00099 U
PFOS	**0.0018**

FGA-T100-1-SO	
Date	09/22/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	**0.0012**

FGA-B111-4-SO	
Date	06/10/2021
PFBS	0.0011 U
PFOA	**0.00080 J**
PFOS	**0.018**

Bldg 150 Fire Training Tower

Bldg T100 AFFF Storage

FGA-T100-3-SO	
Date	09/22/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.
6. Concentrations of PFOA in groundwater 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. * Indicates a potable water supply well sampled downgradient of AOPIs; the sample was collected from the well pre-treatment.

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).

0 100 200 Feet

- Installation Boundary
- Approximate AOPI Boundary
- Elevation Contour (feet)
- Storm Sewer Open Drainage
- Groundwater Flow Direction
- Installation Potable Water Well
- Supply Water Well
- Monitoring Well
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location

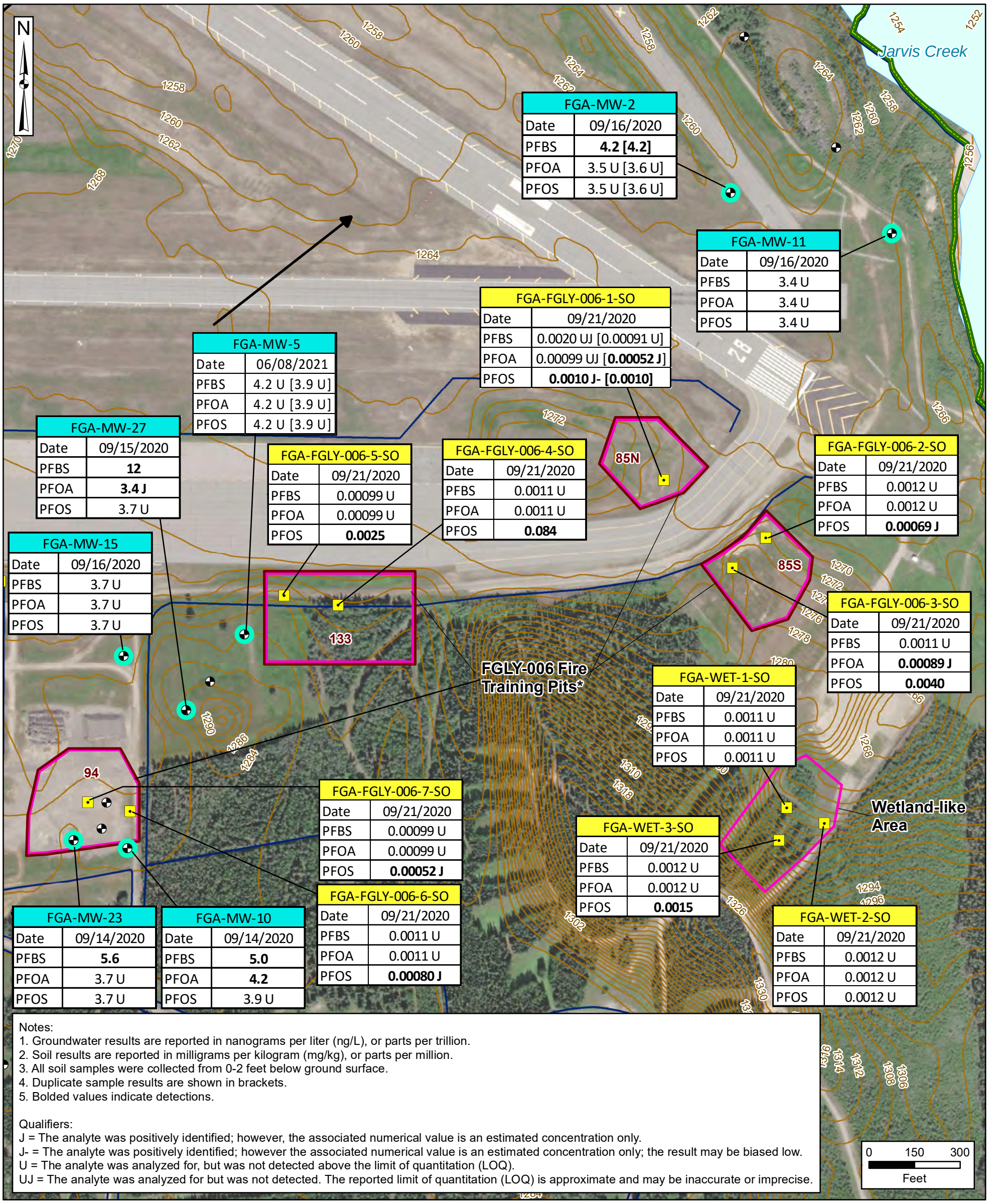
AAAF = Allen Army Airfield
AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 7-4
PFOS, PFOA, and PFBS Analytical Results - FGLY-006 Fire Training Pits and Wetland-like Area



Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Duplicate sample results are shown in brackets.
5. Bolded values indicate detections.

Qualifiers:
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only.
J- = The analyte was positively identified; however the associated numerical value is an estimated concentration only; 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 limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.

- Installation Boundary
- Approximate AOPI Boundary
- SWMU Boundary (Coincides with AOPI Boundary)
- Water Body (Perennial)
- Elevation Contour (feet)
- Storm Sewer Open Drainage
- Groundwater Flow Direction
- Monitoring Well
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SWMU = solid waste management unit
*The FGLY-006 Fire Training Pits AOPI includes SWMUs 85N/S, 94, and 133.

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Greely, AK

Figure 7-5
PFOS, PFOA, and PFBS Analytical Results - Old Post Forest Fire Area and Bldg 347 AFFF Storage

FGA-32-MW-A	
Date	09/15/2020
PFBS	3.6 U
PFOA	3.6 U
PFOS	3.6 U

FGA-OPFF-2-SO	
Date	09/22/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	0.0012 U

FGA-OPFF-3-SO	
Date	06/10/2021
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.00060 J**

FGA-OPFF-4-SO	
Date	06/10/2021
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

FGA-W-5	
Date	09/17/2020
PFBS	3.5 U
PFOA	3.5 U
PFOS	3.5 U

FGA-31/32/112-MW-A	
Date	09/15/2020
PFBS	3.7 U
PFOA	3.7 U
PFOS	3.7 U

FGA-OPFF-1-SO	
Date	09/22/2020
PFBS	0.0011 U [0.0012 U]
PFOA	0.0011 U [0.0012 U]
PFOS	0.0011 U [0.0012 U]

FGA-B347-3-SO	
Date	06/10/2021
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

FGA-B347-1-SO	
Date	09/22/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.0032**

FGA-B347-2-SO	
Date	09/22/2020
PFBS	0.00098 U
PFOA	0.00098 U
PFOS	0.00098 U

Old Post Forest Fire Area

Bldg 347 AFFF Storage

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Duplicate sample results are shown in brackets.
5. 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).

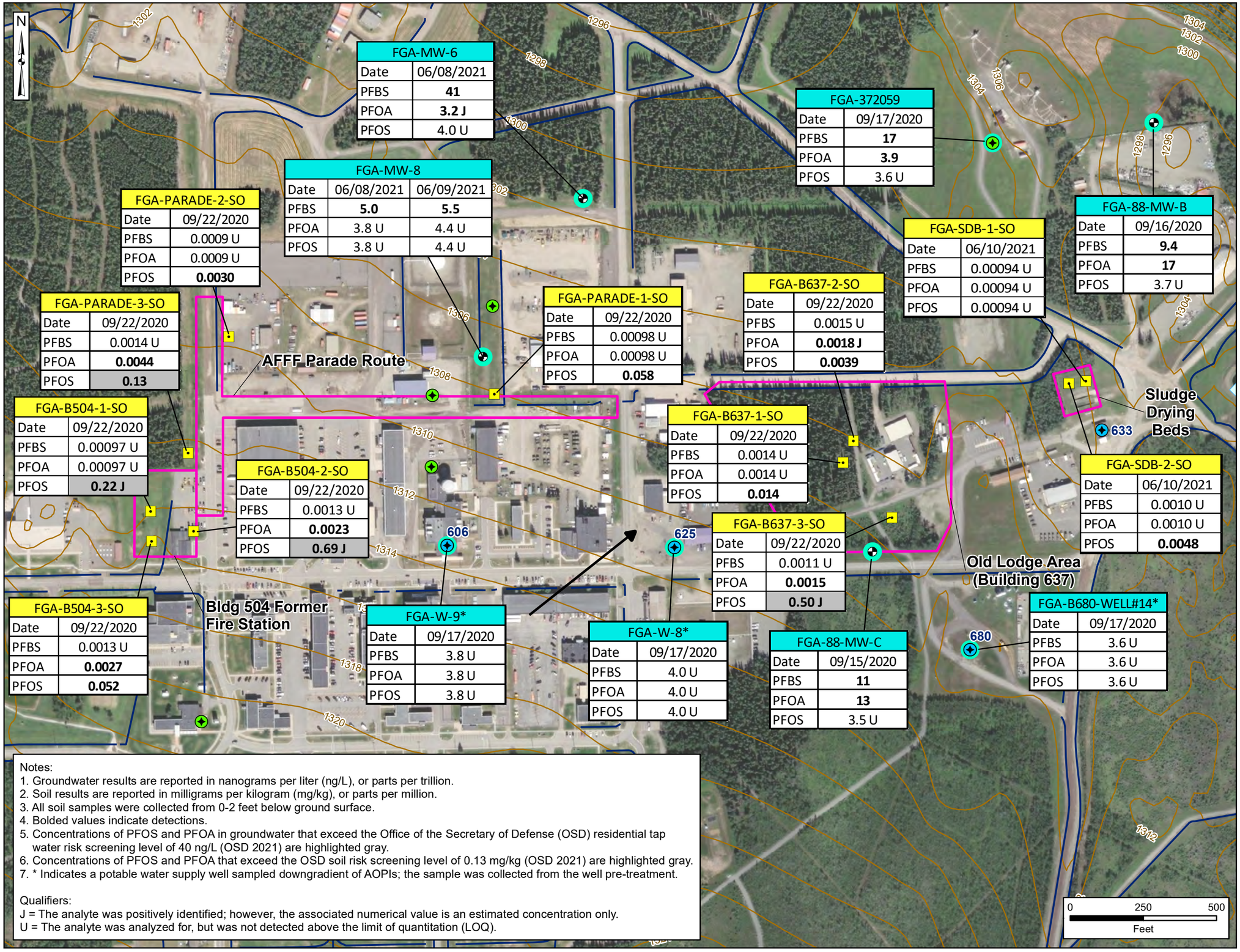
0 150 300
Feet

Installation Boundary
Approximate AOPI Boundary
Elevation Contour (feet)
Storm Sewer Open Drainage
Groundwater Flow Direction
Supply Water Well
Monitoring Well
Groundwater Sampling Location (Existing Well)
Shallow Soil Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North



Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA in groundwater 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 OSD soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray.
7. * Indicates a potable water supply well sampled downgradient of AOPIs; the sample was collected from the well pre-treatment.

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).

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Figure 7-6
PFOS, PFOA, and PFBS Analytical Results - AFFF Parade Route, Bldg 504 Former Fire Station, Old Lodge Area (Bldg 637), and Sludge Drying Beds

Legend
- Installation Boundary
- Approximate AOPI Boundary
- Water Body (Perennial)
- Elevation Contour (feet)
- Storm Sewer Open Drainage
- Groundwater Flow Direction
- Installation Potable Water Well
- Supply Water Well
- Monitoring Well
- Groundwater Sampling Location (Existing Well)
- Shallow Soil Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Greely, AK

Figure 7-7
PFOS, PFOA, and PFBS Analytical Results - Gate 18 Area

FGA-GATE18-3-SO	
Date	09/18/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

FGA-GATE18-2-SO	
Date	09/18/2020
PFBS	0.00096 U
PFOA	0.00096 U
PFOS	**0.0011**

FGA-GATE18-1-SO	
Date	09/18/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	**0.027**

FGA-GATE18-4-SO	
Date	06/10/2021
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.00094 J**

FGA-GATE18-5-SO	
Date	06/10/2021
PFBS	0.00098 U
PFOA	**0.00065 J**
PFOS	**0.010**

W-15*

Gate 18 Area

Jarvis Creek

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Bolded values indicate detections.
5. * Well was proposed for sampling but could not be located during the September 2020 field event.

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).

0 150 300
Feet

Installation Boundary
Approximate AOPI Boundary
Water Body (Perennial)
River/Stream
Elevation Contour (feet)
Storm Sewer Open Drainage
Groundwater Flow Direction
Supply Water Well (Status Unknown)
Shallow Soil Sampling Location

AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Greely, AK

Figure 7-8
PFOS, PFOA, and PFBS Analytical Results - 900-Block Forest Fire Area

FGA-MW-28	
Date	09/18/2020
PFBS	3.6 U [3.7 U]
PFOA	3.6 U [3.7 U]
PFOS	3.6 U [3.7 U]

FGA-B900-1-SO	
Date	09/18/2020
PFBS	0.0013 U [0.0012 U]
PFOA	0.0013 U [0.0012 U]
PFOS	0.0013 U [0.0012 U]

FGA-B900-4-SO	
Date	06/10/2021
PFBS	0.0013 U
PFOA	0.0013 U
PFOS	**0.0011 J**

FGA-B900-6-SO	
Date	06/10/2021
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	0.0012 U

900-Block Forest Fire Area

FGA-B900-5-SO	
Date	06/10/2021
PFBS	0.0015 U
PFOA	0.0015 U
PFOS	0.0015 U

FGA-B900-2-SO	
Date	09/18/2020
PFBS	0.0014 U
PFOA	0.0014 U
PFOS	0.0014 U

FGA-B900-3-SO	
Date	09/18/2020
PFBS	0.0013 U
PFOA	0.0013 U
PFOS	0.0013 U

FGA-MW-31	
Date	09/18/2020
PFBS	3.7 U
PFOA	3.7 U
PFOS	3.7 U

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. All soil samples were collected from 0-2 feet below ground surface.
4. Duplicate sample results are shown in brackets.
5. 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).

0 150 300
Feet

Installation Boundary
Approximate AOPI Boundary
Groundwater Flow Direction
Elevation Contour (feet)
Storm Sewer Open Drainage
Monitoring Well
Groundwater Sampling Location (Existing Well)
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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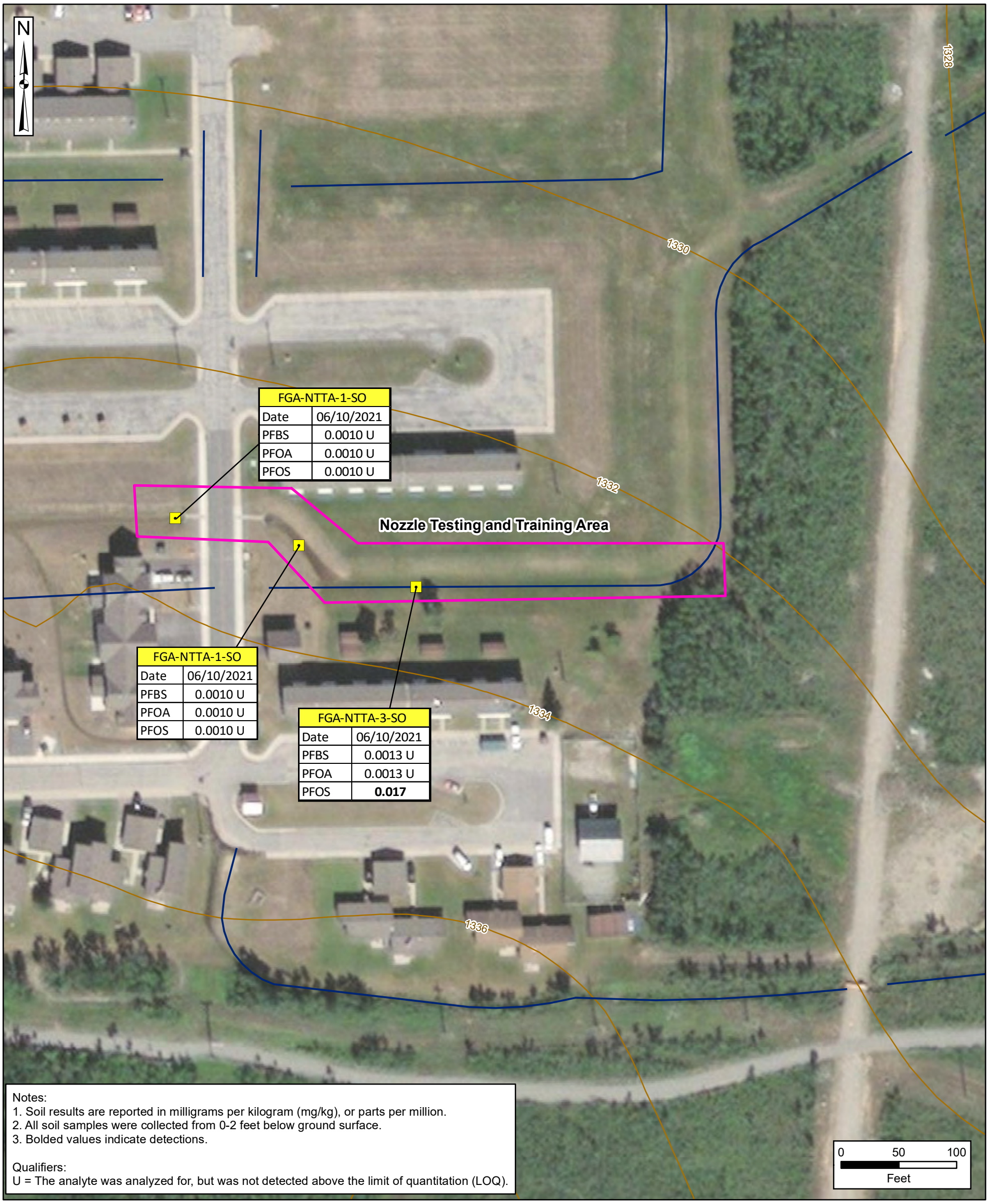
Fort Greely, AK

Figure 7-9
PFOS, PFOA, and PFBS Analytical Results - Nozzle Testing and Training Area



Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface.
3. Bolded values indicate detections.

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

Installation Boundary
Approximate AOPI Boundary
Elevation Contour (feet)
Storm Sewer Open Drainage
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Greely, AK

Figure 7-10
PFOS, PFOA, and PFBS Analytical Results - Landfill #8

FGA-AP-616	
Date	06/09/2021
PFBS	4.1 U
PFOA	4.1 U
PFOS	4.1 U

FGA-AP-615	
Date	06/09/2021
PFBS	4.2 U
PFOA	**7.9**
PFOS	4.2 U

Landfill #8

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Bolded values indicate detections.

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

0 100 200
Feet

Installation Boundary
Approximate AOPI Boundary
Elevation Contour (feet)
Storm Sewer Open Drainage
Monitoring Well
Groundwater Sampling Location (Existing Well)

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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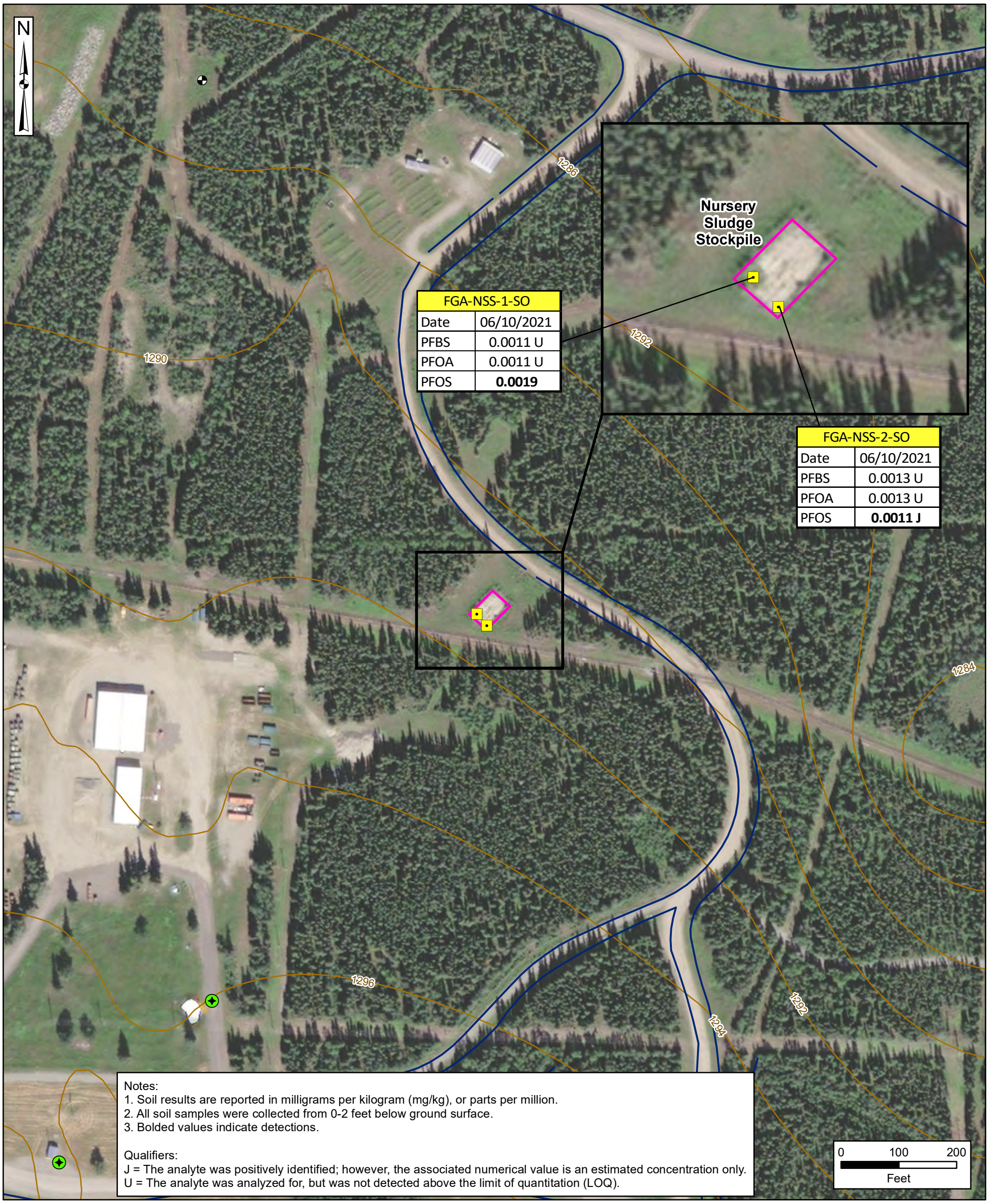
Fort Greely, AK

Figure 7-11
PFOS, PFOA, and PFBS Analytical Results - Nursery Sludge Stockpile



Installation Boundary
Approximate AOPI Boundary
Supply Water Well
Elevation Contour (feet)
Storm Sewer Open Drainage
Monitoring Well
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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Fort Greely, AK

Figure 7-12
PFOS, PFOA, and PFBS Analytical Results - Main Gate Fire

Main Gate Fire

FGA-MGF-1-SO	
Date	06/10/2021
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	0.0010 U

FGA-MGF-2-SO	
Date	06/10/2021
PFBS	0.00087 U
PFOA	0.00087 U
PFOS	0.00087 U

Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface.

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

0 100 200
Feet

Installation Boundary
Approximate AOPI Boundary
Elevation Contour (feet)
Storm Sewer Open Drainage
Installation Potable Water Well
Supply Water Well
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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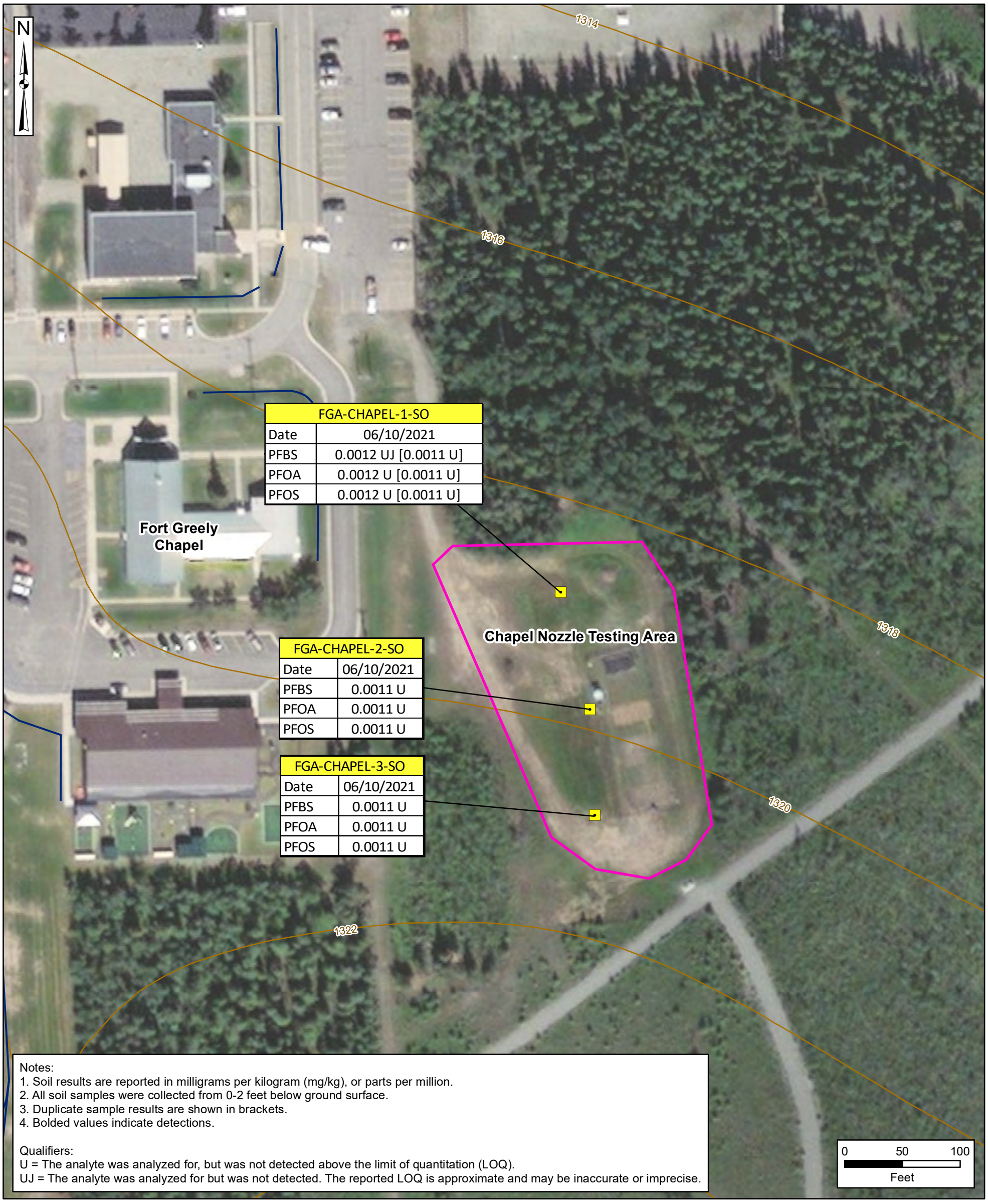
Fort Greely, AK

Figure 7-13
PFOS, PFOA, and PFBS Analytical Results - Chapel Nozzle Testing Area



Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface.
3. Duplicate sample results are shown in brackets.
4. Bolded values indicate detections.

Qualifiers:
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
Approximate AOPI Boundary
Elevation Contour (feet)
Storm Sewer Open Drainage
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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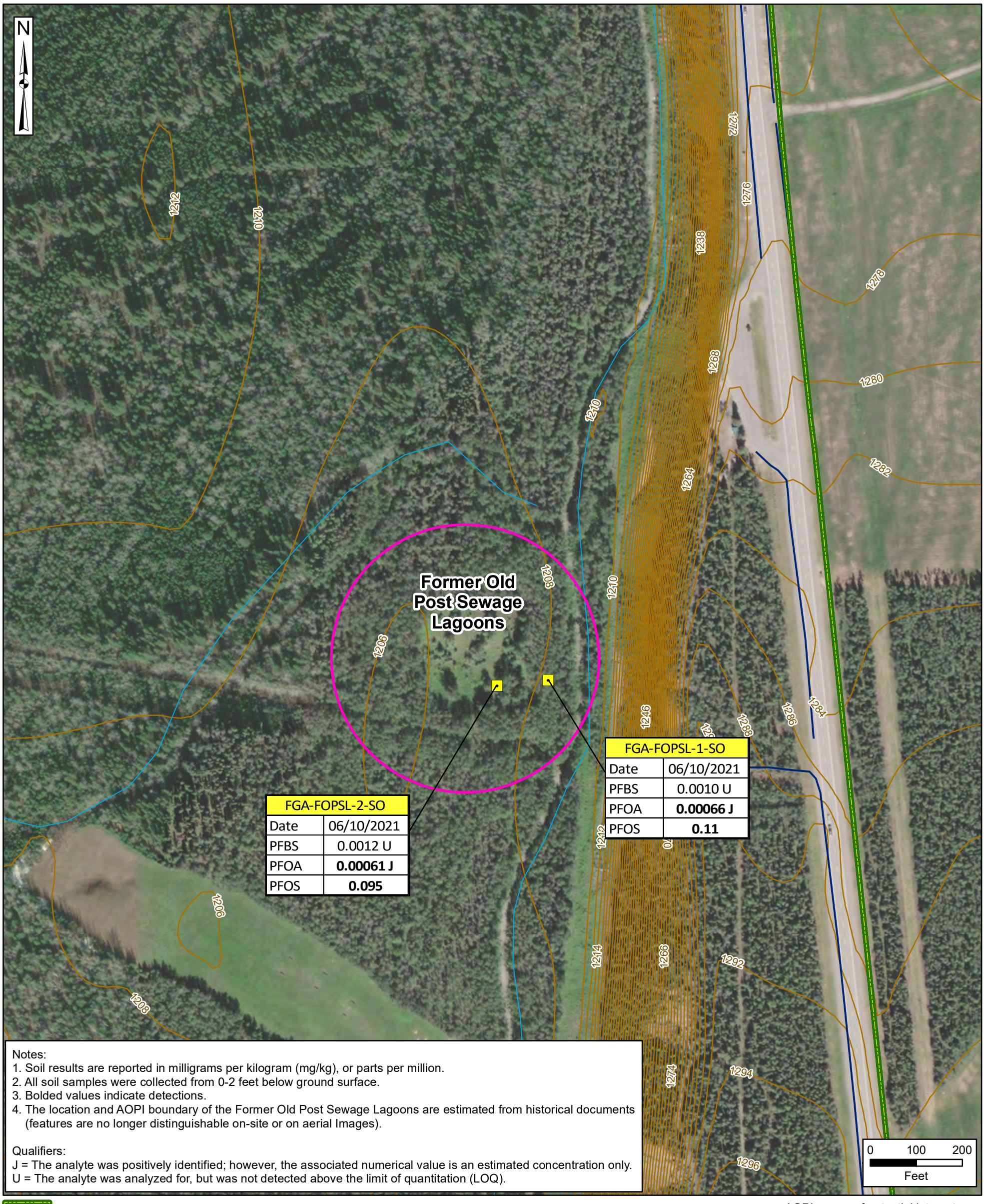
Fort Greely, AK

Figure 7-14
PFOS, PFOA, and PFBS Analytical Results - Former Old Post Sewage Lagoons



Notes:
1. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.
2. All soil samples were collected from 0-2 feet below ground surface.
3. Bolded values indicate detections.
4. The location and AOPI boundary of the Former Old Post Sewage Lagoons are estimated from historical documents (features are no longer distinguishable on-site or on aerial Images).

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
AOPI
River/Stream
Elevation Contour (feet)
Storm Sewer Open Drainage
Shallow Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

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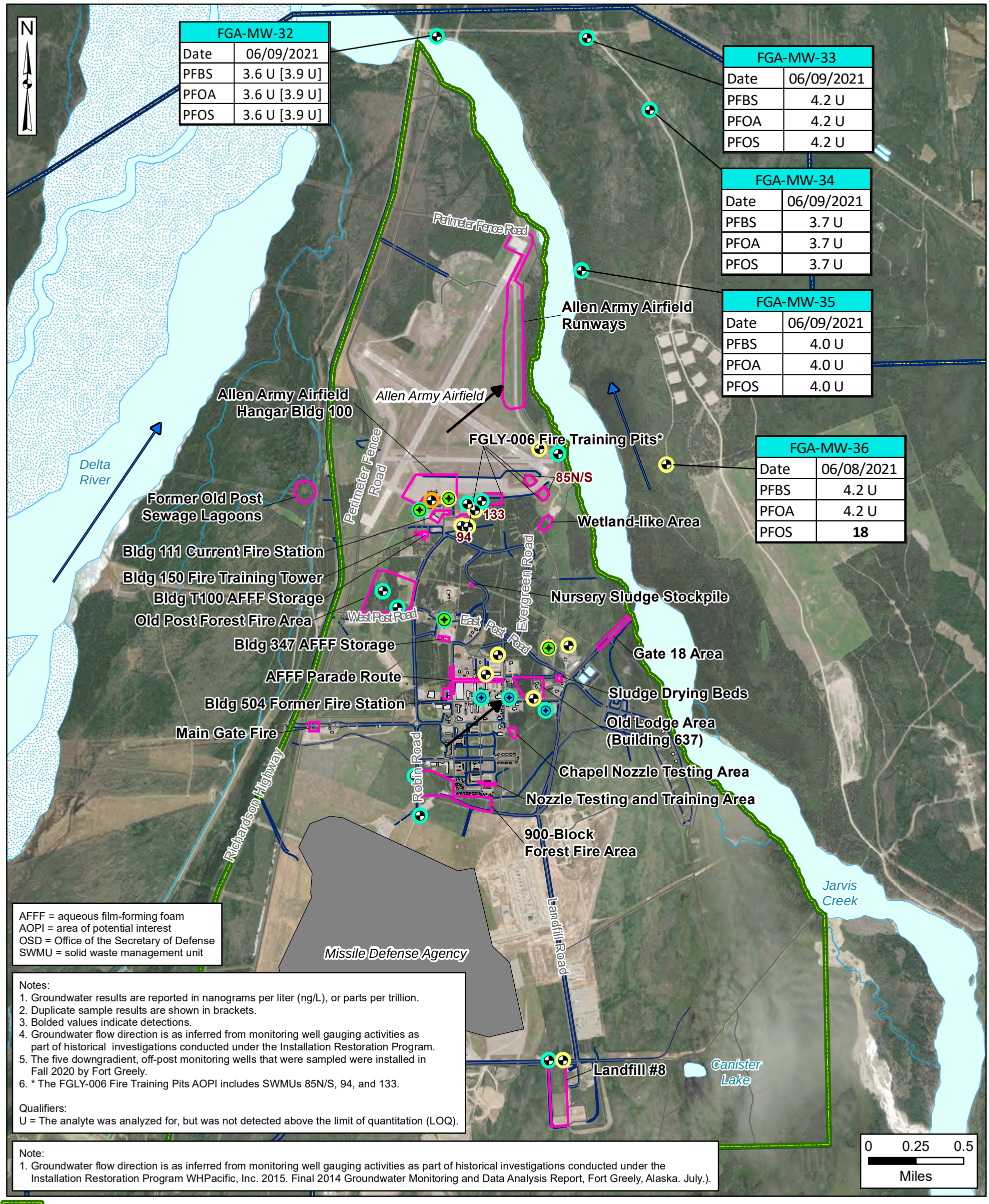
Figure 7-15
PFOS, PFOA, and PFBS Analytical Results - Downgradient Sampling Locations at New Monitoring Wells



AFFF = aqueous film-forming foam
AOPI = area of potential interest
OSD = Office of the Secretary of Defense
SWMU = solid waste management unit

Notes:
1. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Duplicate sample results are shown in brackets.
3. Bolded values indicate detections.
4. Groundwater flow direction is as inferred from monitoring well gauging activities as part of historical investigations conducted under the Installation Restoration Program.
5. The five downgradient, off-post monitoring wells that were sampled were installed in Fall 2020 by Fort Greely.
6. * The FGLY-006 Fire Training Pits AOPI includes SWMUs 85N/S, 94, and 133.

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

Note:
1. Groundwater flow direction is as inferred from monitoring well gauging activities as part of historical investigations conducted under the Installation Restoration Program WHPacific, Inc. 2015. Final 2014 Groundwater Monitoring and Data Analysis Report, Fort Greely, Alaska. July.).

- Installation Boundary
- Donnelly Training Area Boundary
- Building
- Water Body (Perennial)
- Water Body (Intermittent)
- River/Stream
- Groundwater Flow Direction
- Surface Water Flow Direction
- Installation Potable Water Well
- Supply Water Well
- Monitoring Well
- SWMU Boundary
- Approximate AOPI Boundary
- Storm Sewer Open Drainage

Groundwater Sampling Locations (Existing Wells)

- No Detections
- PFOS/PFOA/PFBS Detected < OSD Risk Screening Level
- PFOS/PFOA/PFBS Detected > OSD Risk Screening Level

Data Sources:
Fort Greely, GIS Data, 2018
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 6 North

Arcadis U.S., Inc.

7550 Teague Road

Suite 210

Hanover, Maryland 21076

Tel 410 987 0032

Fax 410 987 4392

www.arcadis.com