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

Fort Drum, New York

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Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances

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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 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 Drum, New York 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 policy and guidance.

Fort Drum is located in the northern portion of New York State, approximately 10 miles northeast of Watertown, in Jefferson and Lewis counties, and bordering St. Lawrence County. Fort Drum is bordered by U.S. Route 11, State Route 3, a mixture of farmland and forest, and seven small towns with populations of approximately 2,000 to 8,000 each. Fort Drum is the largest Army installation in the Northeast, covering 108,737 acres. Fort Drum includes a cantonment area, Wheeler Sack Army Airfield (WSAAF), and an operational ranges area.

The Fort Drum PA identified 36 AOPIs for investigation during the SI phase. SI sampling results from 30 of the 36 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and PFBS. Previous sampling to address PFOS, PFOA, and PFBS has been performed for the remaining six AOPIs (USACE 2017[1]; USACE 2018[2]; Weston Solutions, Inc. 2021[3]). The analytical results of these investigations, supplemented by comparison to OSD risk screening levels in this PA/SI Report, are considered sufficient to complete SI requirements under CERCLA. The SI sampling summary for each of the 36 AOPIs are as follows:

- SI sampling as part of the Army PFAS PA/SI efforts has been completed at 30 of the 36 AOPIs at Fort Drum over three mobilizations. Out of the 30 AOPIs sampled in the SI, 29 had detections of PFOS, PFOA, and PFBS in groundwater and/or soil, and 16 exceeded OSD risk screening levels.
- Six AOPIs (Laundry Pad 1, Laundry Pad 2, Laundry Pad 3, Fire Training Area [FTA], Airfield Sanitary Landfill [ASL], and Small Arms Range 7 Fire) have existing PFOS, PFOA, and PFBS data collected by the Army. Four of the six AOPIs with existing data had detections of PFOS, PFOA, and/or PFBS[1,2,3], and two AOPIs exceeded the OSD risk screening levels.

[1] USACE. 2017. Draft Final Project Report. Site Wide PFC Screening Level Investigation. Fort Drum, New York. May.
[2] USACE. 2018. PFC Site Characterization Investigation Summary Report – Old Fire Training Pit, Fort Drum, New York. January.
[3] Weston Solutions, Inc. 2021. Final Subsurface Investigation Report. Investigation of Pathways Relating to Fate and Transport of Per- and Polyfluoroalkyl Substances (PFAS) For Protection of Locally Utilized Water Supplies. U.S. Army Fort Drum. Jefferson County, New York. June.

In summary, PFOS, PFOA, and/or PFBS were detected in soil, groundwater, surface water and/or sediment at 33 AOPIs; however, only 18 of the 36 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the OSD risk screening levels. The Fort Drum PA/SI identified the need for further study in a CERCLA remedial investigation (RI). **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in an RI or no action at this time at each AOPI.

Table ES-1. Summary of PFOS, PFOA, and PFBS Sampling at Fort Drum and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels (Yes/No/NA/ND/NS)?				Recommendation
	GW	SO	SW	SE	
Fire Station 3 and Nozzle Testing Area	Yes	No	NS	NS	Further study in an RI
Mountain Ramp Nozzle Testing Area	Yes	No	NS	NS	Further study in an RI
Hangar 2070 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Hangar 2072 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Hangar 2074 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Building 2725	ND	ND	NS	NS	No action at this time
Former Army Fire Station (George & Cannon, Building 3828)	No	No	NS	NS	No action at this time
Building 19855 Fire Suppression System	Yes	No	NS	NS	Further study in an RI
Hangar 2060 Fire Suppression System	Yes	No	NA	NA	Further study in an RI
Hangar 19710 Fire Suppression System	No	No	NA	ND	No action at this time
Hangar 2049 Fire Suppression System	Yes	ND	NA	NA	Further study in an RI
Hangar 2050 Fire Suppression System	Yes	No	NA	NA	Further study in an RI
Former WWTP	No	NS	NS	NS	No action at this time
Former WWTP Sludge Beds	No	NS	NS	NS	No action at this time
Former Army Fire Station (Building 1860)	Yes	NS	NS	NS	Further study in an RI
Fire Station #1 (Building 10710)	Yes	No	NS	NS	Further study in an RI

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels (Yes/No/NA/ND/NS)?				Recommendation
	GW	SO	SW	SE	
Former Army Fire Station (Kennedy & Dunn, Building 2419)	No	Yes	NS	NS	Further study in an RI
Building 2018 Soil Barn	No	No	NS	NS	No action at this time
Former Building 1131 AFFF Storage and Spill	Yes	ND	NS	NS	Further study in an RI
Old Sanitary Landfill	No	NS	No	NS	No action at this time
Storm Sewer AFFF Deployment	No	NS	NA	NA	No action at this time
Sludge Pile Near OSL	Yes	No	NS	NS	Further study in an RI
Former Fire Station 3 (Building 181)	No	No	NS	NS	No action at this time
Former Fire Station (Building T-2330)	Yes	No	NS	NS	Further study in an RI
Building 3829 Oil Water Separator (OWS)	No	ND	NS	NS	No action at this time
Former Building 1943 OWS	No	NS	NS	NS	No action at this time
Fire Station #2 (Building 1585)	Yes	No	NS	NS	Further study in an RI
Historical Tank Repair/ Vehicle Maintenance Shop	No	NS	NS	NS	No action at this time
Route 26 Car Crash	No	NS	No	NS	No action at this time
Laundry Pad 1	NS	No	NS	NS	No action at this time*,1
Laundry Pad 2	NS	No	NS	NS	No action at this time*,1
Laundry Pad 3	NS	No	NS	NS	No action at this time*,1
Fire Training Area	Yes	Yes	No	NS	Further study in an RI*,1,2,3
Airfield Sanitary Landfill	No	NS	NS	NS	No action at this time*,1,3
Small Arms Range 7 Fire	Yes	No	NS	NS	Further study in an RI*,3
Former Airfield Fire Station (Building 2041)	No	NS	NS	NS	No action at this time

Notes:

Light gray shading – detection above the OSD risk screening level

* - Recommendations are based solely on data collected separately from the SI[1,2,3]. The analytical results of these investigations supplemented by comparison to OSD risk screening levels in this PA/SI Report, are considered sufficient to complete SI requirements under CERCLA.

Superscripts reference footnotes shown on page ES-1

GW – groundwater

NA – the OSD risk screening level is not applicable to the media sampled

ND – PFOS, PFOA, and PFBS not detected

NS – not sampled

SE – sediment

SO – soil

SW – surface water

1 INTRODUCTION

The United States (U.S.) Army (Army) is performing preliminary assessments (PAs) and site inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), at Army installations (installations) nationwide. The Army is the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Executive Order 12580 and is conducting the PA/SI consistent with its authority under CERCLA, 42 United States Code §§ 9600, et seq. (as amended), and the Defense Environmental Restoration Program, 10 United States Code §§ 2701, et seq. The PFAS PA/SI included two distinct efforts. The PA identified locations that are areas of potential interest (AOPIs) at Fort Drum, New York 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 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 combined PA/SI for Fort Drum, New York 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 a PA, investigators collect readily available information and conduct site reconnaissance. This PA evaluated and documented 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 Fort Drum, PA/SI development followed a similar process as described in **Sections 1.3.1** through **1.3.5** below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for Fort Drum. 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), Fort Drum, and Arcadis U.S., Inc. (Arcadis). The kickoff call occurred on 15 March 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, and 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 review 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 Fort Drum.

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

- The Installation Management Command 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 from 30 April through 02 May 2019. An in-brief meeting was held to provide installation staff with the objectives of the site visit and team introductions. **Section 3** includes information regarding personnel interviewed.

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

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts and the migration potential from each preliminary location (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved, unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells, if present, was also noted during the site reconnaissance in case the monitoring wells could be proposed for SI sampling. 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 02 May 2019 with the installation and USAEC to discuss preliminary findings of the PA site visit.

1.3.3 Post-Site Visit

Information collected before, during, and after the PA 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 served 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 to determine whether further investigation was warranted. The Fort Drum SI field work to date was completed in three mobilizations. The first mobilization consisted of Phase 1 SI sampling and included five AOPIs prioritized due to their proximity to Fort Drum potable wells. The second mobilization consisted of Phase 2 SI sampling and included 22 AOPIs. The third mobilization consisted of additional SI sampling at three select AOPIs and initial SI sampling at three AOPIs. Before the first and second mobilizations, an SI scoping teleconference was held between the Army PA team and Fort Drum. The Phase 1 SI scoping teleconference was held on 16 October 2019. The Phase 2 SI scoping teleconference was held on 18 March 2020. Before the third mobilization, a Field Change Report (FCR) (further described in **Section 6.3.3**) detailing the sampling work plan was approved by the Army PA team and Fort Drum.

The objectives of the SI kickoff teleconference were to:

- Discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI
- Gauge regulatory involvement (New York State Department of Environmental Conservation [NYSDEC]) requirements or preferences
- Confirm the plan for investigation-derived waste (IDW) handling and disposal
- Identify specific installation access requirements and potential schedule conflicts
- Discuss general SI deliverable and field work schedule information and logistics

A Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP) was developed and finalized in October 2019 for the USAEC PFAS PA/SI (Arcadis 2019a). 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 for the Phase 1 and Phase 2 SI (i.e., one QAPP Addendum for the first and second mobilizations) to define the DQOs, present the sampling design and rationale, and provide qualifications for project personnel. FCRs were developed for the third mobilization to present the sampling design and rationale for the associated AOPIs. The SI field work was completed in accordance with the PQAPP (Arcadis 2019a) and the approved installation-specific QAPP Addenda and FCRs. A Site Safety and Health Plan (SSHP) was also developed for the Phase 1 and Phase 2 SI

(i.e., one SSHP for each phase) as an attachment to the respective QAPP Addenda to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHPs were designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for Army installations nationwide.

The DQOs, sampling design and rationale, and field methods employed for the SI are summarized from the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) and subsequent FCRs developed for Fort Drum in **Sections 6.1** through **6.3**.

After finalization of the applicable QAPP Addendum and SSHP for each phase, 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 Table B-15 of the DoD Quality Systems Manual (QSM) 5.1.1 (DoD 2018) and 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 Fort Drum, 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

Fort Drum is located in the northern portion of New York State approximately 10 miles northeast of Watertown, in Jefferson and Lewis Counties, and bordering St. Lawrence County. Fort Drum is bordered by U.S. Route 11, State Route 3, a mixture of farmland and forest, as well as seven small towns with populations of approximately 2,000 to 8,000 each (**Figure 2-1**). Route 26, Route 3A, and portions of the Black River intersect the southern portion of Fort Drum. Approximately 31,000 military personnel, their dependents, and civilian employees reside/work at Fort Drum daily. Fort Drum is roughly rectangular in shape, measuring approximately 6 miles in width and 20 miles in length, and covers 108,737 acres, making Fort Drum the largest Army installation in the Northeast (Fort Drum 2017). Fort Drum includes a cantonment area, Wheeler Sack Army Airfield (WSAAF), and an operational ranges area (**Figure 2-1**).

2.2 Mission and Brief Site History

Fort Drum has been used as a military training site since 1908 and was referred to as Pine Plains, Pine Camp, and Camp Drum. The post was officially designated as Fort Drum in 1974 and a permanent garrison was assigned. On 11 September 1984, Fort Drum became the home of the 10th Mountain (previously referred to as Light Infantry) Division. The mission of the 10th Mountain Division is to rapidly deploy by air, sea, and land anywhere in the world. Since the early 1990s, Fort Drum has continued to construct and expand facilities to include training ranges, airfield facilities, and support facilities for rapid deployment (Fort Drum 2017).

The current mission at Fort Drum is multi-faceted: command the active components, units, and individuals assigned to Fort Drum, provide administrative and logistical support to tenant activities, provide support to all Army units and activities in the Army Regulation 5-9 area of responsibility; provide support to all units in training to include active and reserve components, and plan for and support mobilization, deployment, and annual training of almost 50,000 reserve component soldiers (Fort Drum 2017).

Major units and tenant activities include: the 10th Mountain Division, New York Army National Guard Combined Support Maintenance Shop and Unit Training Equipment Sites, 174th Tactical Fighter Wing, New Jersey Army National Guard Armored Division Mobilization and Training Equipment Site, an explosive ordnance disposal detachment, defense reutilization and marketing office, Army Air Force Exchange Service, Army medical department and dental activities, equipment concentration sites, and the USACE Fort Drum Resident Office (Fort Drum 2017).

2.3 Current and Projected Land Use

Except for WSAAF, the majority of improved land on Fort Drum is located within the cantonment area (**Figure 2-2**). The cantonment area includes residential housing, barracks, lodging, and support facilities

as well as the Garrison Headquarters, administrative buildings, vehicle maintenance shops, classrooms, educational facilities, and recreational facilities. WSAAF is located immediately northeast of the cantonment area (**Figure 2-1**). The WSAAF and associated aviation ranges and surrounding airspace area are used by the Army, U.S. Air Force, National Guard, U.S. Marine Corps, and U.S. Navy for various training missions. The ranges training area (**Figure 2-1**) is located in in the northeast portion of the installation and comprises of the majority of Fort Drum. There are a total of 70 training areas throughout Fort Drum which are dedicated to the following functions: weapons training, maneuver training with varying terrain, and urban environment training using built-up features (Matrix Design Group 2018).

Since the early 1990s, Fort Drum has continued to construct and expand facilities to include training ranges, airfield facilities, and support facilities for rapid deployment. Significant land use changes at Fort Drum are not anticipated in the projected future.

2.4 Climate

The average monthly temperatures at Fort Drum range between 09 to 40 degrees Fahrenheit in winter months and between 56 to 80 degrees Fahrenheit in the summer months. Fort Drum receives an average annual rainfall of 43 inches and an average annual snowfall of 114 inches (U.S. Climate Data 2019).

2.5 Topography

Fort Drum lies within the Ontario Lowlands, commonly known as the Pine Plains. It is characterized by a broad expanse of mostly flat, sandy surfaces with small sand plains, drumlin fields, swamps and disturbed drainage patterns that are the result of Pleistocene continental glaciation. Elevations at Fort Drum in the cantonment and WSAAF areas range from approximately 420 to 730 feet above mean sea level (**Figure 2-3**). WSAAF is located on a plateau that is approximately 3 miles long and approximately 1 mile wide. The plateau is part of the regional drainage divide between the Indian and Black River drainage basins (Arcadis 2014).

2.6 Geology

The WSAAF and cantonment areas of Fort Drum are situated atop the Pine Plains deltaic deposit, which is comprised primarily of fine- to medium-grained sand, with silt and clay content increasing with depth. The Pine Plains aquifer is underlain by a discontinuous lacustrine silt and clay unit, which overlies a basal boulder and gravel till above sedimentary bedrock consisting of sandstone, shale, and limestone/dolostone. The thicknesses of the sedimentary units vary greatly across the WSAAF and cantonment areas, ranging from less than 50 feet to greater than 250 feet (Arcadis 2014).

2.7 Hydrogeology

The Pine Plains aquifer is the uppermost water-bearing unit at the site. The water table depth within the Pine Plains aquifer ranges from 10 feet to greater than 50 feet below grade across the WSAAF and cantonment areas. A second overburden water-bearing unit occurs within the deeper boulder/gravel till, which is semi-confined by the overlying silt and clay (where present) and hydraulically connected to bedrock (Arcadis 2014).

A groundwater divide is present in the unconfined aquifer in the southern portion of the WSAAF. North of this divide, groundwater flows north to the Indian River Basin, which includes Pleasant Creek and the various tributaries at the northern boundary of the installation. South of the divide, groundwater flows south to the Black River Basin. The approximate area in which the flow divide occurs is illustrated on **Figure 2-2**. The precise location of the groundwater divide within this area varies locally and with depth, as well as seasonally and with precipitation.

2.8 Surface Water Hydrology

Fort Drum lies within the Black River and Indian River drainage basins. The Black River flows west along the south-southwestern Fort Drum boundary, entering and exiting Fort Drum just southeast of WSAAF (**Figure 2-2**). Along the south-southwestern Fort Drum boundary, surface water and stormwater runoff are directed via drainage ditches and outfalls into the Black River. The majority of stormwater runoff and surface drainage within the cantonment area and WSAAF at Fort Drum is directed through outfalls or via overland flow to numerous streams (e.g., West Creek, Pleasant Creek, Dam Creek, Fish Creek, Upper Airfield Creek, Sculpin Creek) and their tributaries to the northwest prior to exiting Fort Drum towards the Indian River. Surface water bodies at Fort Drum are not used as a source of potable water. However, the Black River is used as a source of potable water (via a surface water intake approximately 4 miles downstream of the southern boundary of Fort Drum) by the City of Watertown, New York.

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 Fort Drum.

2.9.1 Stormwater Management System Description

Stormwater at Fort Drum is conveyed via detention ponds (dry and wet detention ponds), catch basins, culverts, and manhole sumps to 58 drainage outfalls across Fort Drum. The municipal separate storm sewer system discharges stormwater directly to Pleasant Creek, West Creek, the Black River, and their tributaries (Fort Drum 2020).

The majority of surface water runoff generated at the WSAAF flows into the airfield stormwater collection system. Stormwater from the northern and western portions of the airfield is discharged through outfalls to a series of small creeks along the northwest side of the airfield, which flow to the northwest into Pleasant Creek (**Figure 2-2**). Stormwater flows from the southeastern portion of the airfield are discharged to several outfalls into the Black River.

2.9.2 Sewer System Description

Currently, sanitary wastes generated at Fort Drum are pumped off post to the City of Watertown / Development Authority of the North Country (DANC) for treatment and disposal. At the WSAAF, sanitary drains within the newer hangars are directed to the Building 2086 sewer oil water separator (OWS) for initial treatment before the wastes are then pumped to the City of Watertown / DANC for treatment and disposal. Sanitary drains within the older hangars (Hangar 2049 and Hangar 2050) are also directed to a

proximal contaminated sewer OWS for initial treatment before the wastes are pumped off post to the City of Watertown / DANC for treatment and disposal.

Historically, sanitary wastes generated at Fort Drum were conveyed to an on-post wastewater treatment plant (WWTP) for treatment. The former WWTP infrastructure and associated former sludge drying beds were located along the southern boundary of Fort Drum. Effluent waters from the former WWTP discharged to the Black River via an outfall. Dried sludges were transported from the sludge drying beds to either the Old Sanitary Landfill (OSL) or the Airfield Sanitary Landfill (ASL) for disposal. The former WWTP operated from 1941 to 1987, when the former WWTP ceased operation and sanitary wastes were subsequently sent to the City of Watertown for treatment and disposal.

2.10 Potable Water Supply and Drinking Water Receptors

There are a total of 18 on-post potable wells at Fort Drum. Presently, Fort Drum receives drinking water from a combination of active on-post potable wells north of WSAAF (Well 14, Well 15, Well 16, Well 17, and Well 18) (**Figure 2-2**) and the City of Watertown, New York potable water supply. Potable wells 1 through 13 are offline (i.e., not currently used to provide drinking water). A summary of offline/active potable wells at Fort Drum is provided in **Table 2-1**.

Table 2-1. Active, Offline, and Decommissioned Potable Wells at Fort Drum

Well Number	Active, Offline, or Decommissioned	Date and Reason for Offline Wells
Well 1	Decommissioned	Permanently decommissioned. Well 1 was abandoned in 1990s due to low yield and reportedly filled with grout.
Well 2 and 3	Offline	Last used in November and December 2010, respectively. Located proximal to multiple Installation Restoration Program (IRP) sites.
Well 4 and 5	Offline	Last used in the 1990s due to nitrate impacts and was not returned to service following a nearby jet-fuel spill.
Well 6	Offline	Last used prior to 2005 due to nitrate impacts and was not returned to service following a nearby jet-fuel spill.
Well 7	Offline	Taken offline in 2016 due to PFAS detections at the adjacent Fire Training Area (FTA).
Well 8	Offline	Reportedly taken offline in 2006 as a precaution due to the nearby jet-fuel spill.
Wells 9 and 10	Offline	Taken offline in April 2010 due to the presence of other constituents (i.e., non-PFAS).
Well 11	Offline	Last used in March 2016 due to PFAS detections at the adjacent FTA.

Well Number	Active, Offline, or Decommissioned	Date and Reason for Offline Wells
Well 12	Offline	Taken offline in 1998 due to the presence of other constituents (i.e., non-PFAS).
Well 13	Decommissioned	Permanently decommissioned. Originally installed as part of the new wellfield, however, the well never became operable.
Wells 14 to 18	Active	Not applicable, active since 2016

Active and offline Fort Drum potable water wells have historically been sampled for PFOS, PFOA, and PFBS.

The PFOS, PFOA, and PFBS results for the Fort Drum potable wells are described in **Section 2.12** and presented in **Table 2-2a**.

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 Fort Drum, which along with New York State water well data identified several off-post public and private wells within 5 miles of the installation boundary (**Figure 2-4**). The off-post potable wells across both the northern and southern installation boundaries may be downgradient of various AOPIs within WSAAF and the cantonment area at Fort Drum. The EDR report providing well search results is provided as **Appendix E**.

The City of Watertown, New York potable water supply is sourced from the Black River, and the surface water intake is located approximately 4 miles downstream from the Fort Drum southern boundary. There are other Class A streams (i.e., defined by the NYSDEC as a waterbody with the best uses of drinking water source, culinary/food processing, primary/secondary contact recreation, and fishing) located on the southwestern and northern installation boundaries (**Figure 2-4**).

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.

As of 2018, 1,020 plant species have been identified on Fort Drum. There are a total of 93 landcover/vegetation classifications on Fort Drum. The five most prevalent (i.e., most acreage) landcover/vegetation classifications are: forest upland, graminoid community upland, shrub upland, forest wetland, and shrub wetland (Fort Drum 2018).

Fort Drum also supports a large variety of wildlife, including 49 mammal, 252 bird, 45 fish, 12 reptile, and 18 amphibian species. Two federally-listed species are known to be present on Fort Drum: the endangered Indiana bat (Myotis sodalis) and the threatened northern long-eared bat (Myotis septentrionalis). Species that are petitioned to be federally-listed are also known to be present on Fort

Drum and include the yellow-banded bumblebee, golden-winged warbler, wood turtle, spotted turtle, and monarch butterfly (Fort Drum 2018).

2.12 Previous PFAS Investigations

Previous (i.e., pre-PA) and concurrent PFAS investigations relative to Fort Drum are summarized below to provide full context of available PFAS data for Fort Drum. Potable water, groundwater, surface water, and soils have historically been investigated at Fort Drum for PFAS, including PFOS, PFOA, and PFBS.

Potable Well Sampling

PFOS, PFOA, and PFBS have been detected in several potable water supply wells at Fort Drum (**Table 2-2a**). As stated in **Section 2.10**, potable wells 14 through 18 are actively used in combination with potable water from the City of Watertown to supply water to Fort Drum, and potable wells 1 through 13 are offline (i.e., not currently used to supply drinking water). The analytical method used in historical potable well sampling (as available in records reviewed) is USEPA Method 537.1. The location of the potable wells is shown on **Figure 2-2**.

The maximum PFOS, PFOA, and PFBS detections observed in potable water supply wells 1 through 18 are:

- PFOS - 28 ng/L in Well 7 (June 2017)
- PFOA – 120 ng/L in Well 7 (June 2017)
- PFBS – 23 ng/L in Well 5 (May 2017)

Offline potable wells Well 5, Well 7, Well 11 and Well 12 had the highest PFOS, PFOA, and PFBS detections of all the potable wells.

The active wells (14 through 18) and the entry point from the City of Watertown supply (i.e., referred to as DANC in lab reports) are sampled for PFOS, PFOA and PFBS on a quarterly basis. The maximum PFOS, PFOA, and PFBS detections observed in the active potable water supply wells and entry point from the DANC are:

- PFOS – 13 ng/L in Well 17 (May 2018)
- PFOA – 3.22 ng/L in Well 17 (August 2020)
- PFBS – 5.3 ng/L in Well 17 (November 2018)

2016- 2020 Historical Groundwater, Soil, Sediment and Surface Water Investigations

Previous sampling to address PFOS, PFOA, and PFBS has been performed at nine AOPIs: Fire Training Area, OSL, Route 26 Car Crash, ASL, Laundry Pad 1, Laundry Pad 2, Laundry Pad 3, Small Arms Range 7 Fire, and Former Airfield Fire Station (Building 2041). For reference, Former Airfield Fire Station (Building 2041) was incorrectly identified as Building 2061 in the 2019/2020 investigation (**Appendix F**). Please note, as stated in the Phase 2 QAPP Addendum (Arcadis 2021), existing groundwater data from the OSL as well as surface water (i.e., seeps) data collected during the SI was used to make recommendations for the Route 26 Car Crash AOPI. Additional SI sampling was conducted at the OSL, Route 26 Car Crash, and Former Airfield Fire Station (Building 2041) AOPIs as discussed in **Section 7.18**

and **Section 7.27**. The analytical results of these investigations, supplemented by comparison to OSD risk screening levels in this PA/SI Report, are considered sufficient to complete SI requirements under CERCLA and are described under their associated AOPI as appropriate. The following three investigations have been conducted:

- In 2016 and 2017, the USACE performed soil and groundwater PFOS, PFOA, and PFBS sampling at six AOPIs: FTA, OSL, ASL, Laundry Pad 1, Laundry Pad 2, and Laundry Pad 3. The analytical method used in the 2016 and 2017 sampling was USEPA Method 537 (USACE 2017).
- Additional PFOS, PFOA, and PFBS sampling was performed for soil and groundwater at the FTA in 2018. The analytical method used in the 2018 sampling was USEPA Method 537 (modified) (USACE 2018).
- Lastly, soil, groundwater, and/or surface water sampling was conducted at the FTA, ASL, Small Arms Range 7 Fire, and Former Airfield Fire Station (Building 2041) in 2019 and 2020 under a separate effort led by the USACE Baltimore District. The analytical method used in the 2019 and 2020 sampling was USEPA Method 537 (modified). Validation of this analytical data was completed in accordance with the Table B-15 of the DoD QSM Version 5.1.1. A copy of the 2019/2020 investigation is provided as **Appendix F**.

The following summarizes the historical sampling summarized by AOPI:

FTA

- FTA: Soil, groundwater, and surface water samples were collected from within and near the FTA in 2016, 2017, 2019 (**Table 2-2b** and **Table 2-2c**), and 2020 (**Appendix F**). Brief results summaries are presented below for each medium.
    - Overburden groundwater:
        - Groundwater samples were collected from overburden monitoring wells within the FTA in 2016 and 2017 (USACE 2017; USACE 2018). The maximum PFOS, PFOA, and PFBS concentrations in overburden groundwater samples were 14,000 ng/L, 2,100 ng/L, and 1,100 ng/L, respectively (**Table 2-2b**). These concentrations are greater than the OSD risk screening levels for PFOS and PFOA (40 ng/L) and PFBS (600 ng/L).
        - Groundwater samples were collected from overburden monitoring wells within the FTA in 2019 and 2020 (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections in overburden groundwater samples at the FTA in 2019/2020 were 15,000 ng/L, 2,000 ng/L, and 130 ng/L, respectively (Tables 3-2 and 3-3 in **Appendix F**). The maximum PFOS and PFOA detections in overburden groundwater at the FTA in 2019/2020 are greater than the OSD risk screening levels for PFOS and PFOA (40 ng/L). The maximum PFBS detections in overburden groundwater at the FTA in 2019/2020 were lower than the OSD risk screening levels for PFBS (600 ng/L).
    - Groundwater seeps:
        - Groundwater samples were collected from three seeps in 2018 (USACE 2018) and from six seeps in 2019 and 2020 downgradient of the FTA and just upgradient of the Black River (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections observed

in groundwater seeps downgradient of the FTA were 13,000 ng/L, 1,800 ng/L, and 430 ng/L, respectively (**Table 2-2b** and refer to Table 3-5 in **Appendix F**). The PFOS (13,000 ng/L) and PFOA (1,800 ng/L) maximum detections are greater than the OSD risk screening levels (40 ng/L). The PFBS (430 ng/L) maximum is less than the OSD risk screening level (600 ng/L).

- Bedrock groundwater:
  - Groundwater samples were collected from bedrock monitoring wells within the FTA in 2016 and 2017 (USACE 2017; USACE 2018). The maximum PFOS, PFOA, and PFBS detections observed in bedrock groundwater at the FTA were 150 ng/L, 190 ng/L, and 21 ng/L, respectively. The PFOS (150 ng/L) and PFOA (190 ng/L) maximum detections are greater than the OSD risk screening levels (40 ng/L). The PFBS (21 ng/L) maximum is less than the OSD risk screening level (600 ng/L).
  - Groundwater samples were collected from bedrock monitoring wells within the FTA in 2019 and 2020 (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections were 110 ng/L, 230 ng/L, and 22 ng/L, respectively (Tables 3-2 and 3-3 in **Appendix F**). The maximum PFOS and PFOA detections in bedrock groundwater at the FTA in 2019/2020 are greater than the OSD risk screening levels for PFOS and PFOA (40 ng/L). The maximum PFBS detections in bedrock groundwater at the FTA in 2019/2020 were lower than the OSD risk screening levels for PFBS (600 ng/L).
- Soil:
  - Soil samples were collected from the FTA in 2016 and 2017 (USACE 2017; USACE 2018). The maximum PFOS, PFOA, and PFBS detections observed in soil at the FTA were 11 mg/kg, 0.20 mg/kg, and 0.038 mg/kg, respectively (**Table 2-2c**). The PFOS (11 mg/kg) and PFOA (0.20 mg/kg) maximum detections are greater than the OSD risk screening levels (0.13 mg/kg). The PFBS (0.038 mg/kg) maximum is less than the OSD risk screening level (1.9 mg/kg).
  - Nine soil samples were collected at varying depths in the surrounding vicinity of the FTA in 2019 (Weston Solutions, Inc. 2021). PFOS, PFOA, and PFBS were not detected in soil samples collected in 2019 (Table 3-1 in **Appendix F**).
- Surface Water:
  - Twelve surface water samples were collected from the Black River in 2020 (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS results observed in surface water collected from the Black River in 2020 are 2.3 ng/L, 1.7 J ng/L, and 0.46 J ng/L, respectively (Table 3-6 of **Appendix F**), and are each below the OSD risk screening levels for tap water. Sample results for surface water collected from the Black River in 2020 were compared to the OSD risk screening levels for tap water because the associated surface water body (Black River) is used as a source of drinking water 4 miles downstream of Fort Drum (**Section 2.10**).

- <u>OSL and Route 26 Car Crash</u>:
  - Groundwater:

        - Three groundwater samples were collected from existing monitoring wells OSL-MW10, OSL-MW9A, and OSL-MW08, within and on the southeastern edge of the OSL, in 2016 (USACE 2017). These wells are downgradient of the OSL and the adjacent estimated location of the Route 26 Car Crash, and the groundwater analytical results are considered to represent potential PFAS impacts associated with both AOPIs. The maximum PFOS and PFOA detections in groundwater collected from the OSL in 2016 are 7.6 ng/L and 6.6 ng/L, respectively, which are both below the OSD risk screening level (40 ng/L). PFBS was not detected in monitoring wells sampled at the OSL in 2016 (**Table 2-2b**) (USACE 2017). These AOPIs are discussed further in **Section 5.2.20** and **Section 5.2.28**. Additional PFOS, PFOA, and PFBS sampling was conducted at the OSL and Route 26 Car Crash as part of this SI (**Section 7.18**)

- ASL:
    - Groundwater:
        - Three groundwater samples were collected from existing monitoring wells ASL-MW12A, ASL-MW961, and ASL-MW14, on the northern and southern edges of the ASL in 2016. The maximum PFOA detection observed in groundwater collected from the ASL in 2016 was 4.3 ng/L, below the OSD risk screening level (40 ng/L). PFOS and PFBS were not detected in monitoring wells sampled at the ASL in 2016 (**Table 2-2b**) (USACE 2017).
        - Eleven groundwater samples were collected from a combination of existing and new monitoring wells at the ASL in 2019 and 2020 (Figure 14 and 20 in **Appendix F**) (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections observed in groundwater at the ASL in 2019 and 2020 were 29 ng/L, 21 ng/L, and 8.4 ng/L, respectively (Table 3-2 and Table 3-3 in **Appendix F**). All groundwater sample results from the ASL in 2019/2020 were less than the OSD risk screening levels (40 ng/L for PFOS and PFOA, 600 ng/L for PFBS).
- Laundry Pad 1:
    - Soil
        - Two soil samples were collected at Laundry Pad 1 in 2016. PFOS, PFOA, and PFBS were not detected in either of the soil samples (**Table 2-2c**).
- Laundry Pad 2:
    - Soil
        - Two soil samples were collected at Laundry Pad 2 in 2016. PFOS, PFOA, and PFBS were not detected in either of the soil samples collected (**Table 2-2c**).
- Laundry Pad 3:
    - Soil
        - Three soil samples were collected at Laundry Pad 3 in 2016. PFOS was detected in one of the three soil samples at 0.0016 J mg/kg. PFOA and PFBS were not detected in any of the

soil samples collected (**Table 2-2c**). The observed PFOS result (0.0016 J [estimated] mg/kg) is less than the OSD risk screening level (0.13 mg/kg).

- Small Arms Range 7 Fire:
  - Soil:
    - Six soil samples were collected at varying depths at the Small Arms Range 7 Fire in 2019 (Weston Solutions, Inc. 2021). The maximum PFOS detection observed in soil was 0.00078 J mg/kg, which is less than the OSD risk screening level (0.13 mg/kg). PFOA and PFBS were not detected in any of the six soil samples collected in 2019 (Table 3-1 in **Appendix F**).
  - Groundwater:
    - Two groundwater samples were collected from new monitoring wells at the Small Arms Range 7 Fire (Figure 16 and 22 in **Appendix F**) in both 2019 and 2020 (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections observed in groundwater at the Small Arms Range 7 Fire were 100 ng/L, 6.5 ng/L, and 1.2 J ng/L, respectively (Table 3-2 and Table 3-3 in **Appendix F**). PFOS (100 ng/L) was detected above the OSD risk screening level (40 ng/L). PFOA (6.5 ng/L) and PFBS (1.2 J ng/L) were not detected above their OSD risk screening levels of 40 ng/L and 600 ng/L, respectively.
- Former Airfield Fire Station (Building 2041):
  - Soil:
    - Nine soil samples were collected at varying depths at the Former Airfield Fire Station (Building 2041) in 2019 (Weston Solutions, Inc. 2021). The maximum PFOS and PFOA detections observed in soil were 0.0095 mg/kg and 0.00027 J mg/kg, respectively. Both PFOS and PFOA detections in soil are below the OSD risk screening level (0.13 mg/kg). PFBS was not detected in any of the six soil samples collected in 2019 (Table 3-1 in **Appendix F**).
  - Groundwater:
    - Three groundwater samples were collected from monitoring wells at the Former Airfield Fire Station (Building 2041) (Figure 15 and 21 in **Appendix F**) in both 2019 and 2020 (Weston Solutions, Inc. 2021). The maximum PFOS, PFOA, and PFBS detections observed in groundwater at the Former Airfield Fire Station (Building 2041) were 21 ng/L, 7.2 ng/L, and 1.6 J ng/L, respectively (Table 3-2 and Table 3-3 in **Appendix F**). All groundwater sample results were less than the OSD risk screening levels (40 ng/L for PFOS and PFOA, 600 ng/L for PFBS). Additional PFOS, PFOA, and PFBS sampling was conducted at the Former Airfield Fire Station (Building 2041) as part of this SI (**Section 7.27**).

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 Fort Drum, data were collected from three principal sources of information:

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

These sources of data, along with their relative application to this PA, are discussed below. The specific findings of records review, personnel interviews, and site reconnaissance relevant to PFAS-containing materials at Fort Drum are described in **Section 4**.

3.1 Records Review

The records reviewed for this PA included, but were not limited to, various IRP administrative record documents, compliance documents, Fort Drum fire department documents, Fort Drum directorate of public works (DPW) documents, and GIS files. Internet searches were also conducted to identify publicly available and other relevant information. A list of the specific documents reviewed for Fort Drum is provided in **Appendix G**.

3.2 Personnel Interviews

Interviews were conducted during and after the site visit. The list of roles and/or affiliated installation department for the installation personnel interviewed during the PA process for Fort Drum is presented below (affiliation is with Fort Drum unless otherwise noted).

- Former Utilities and Roads and Grounds Chief (Retired)
- Former DPW Staff (Retired)
- Environmental Division Chief
- Petroleum, Oil & Lubricants Manager
- Public Works Director
- WSAAF Division Chief
- WSAAF Operations Officer
- Chief Water Operator
- Stormwater Manager
- Fire Chief
- Assistant Fire Chief
- Multiple Former Fort Drum Fire Chiefs (Retired)

- Forester
- Range Control Staff
- Natural Resources Branch Chief
- General Engineer/Master Planning
- Master Planning Division Chief
- Realty Specialist
- Engineering Division Chief
- Engineers
- DPW Staff
- Engineering, Plans, and Services Division Chief
- Aviation Field Maintenance Activities Chief
- Deputy Safety Director
- New York Army National Guard (NYARNG) Senior Environmental Analyst

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

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at Fort Drum 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 I**; photos were used to assist in verification of qualitative data collected in the field. The site reconnaissance logs are provided in **Appendix J**.

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.

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 Fort Drum 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**.

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

Fort Drum 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 at DoD facilities. Therefore, 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

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

Current and historical AFFF use, storage, and disposal at Fort Drum was documented and inferred at fire stations, fire training areas, fire response areas, AFFF suppression systems at WSAAF, and installation warehouses. A summary of each activity/category is below.

Fire Stations

Currently operational and former fire stations were identified at Fort Drum as part of the PA through records reviewed, personnel interviews, and site reconnaissance. Currently, there are three actively used fire stations at Fort Drum: Fire Station #1 (Building 10710), Fire Station #2 (Building 1585), and Fire Station #3 (Building 2065). Each of the three active fire stations is occupied by the Fort Drum Fire Department staff and associated equipment. Fire Station #1 (Building 10710) was built in the mid-1980s and is located in the western cantonment area of Fort Drum. Fire Station #2 (Building 1585) was built in 2011 and is located in the central portion of Fort Drum. Lastly, Fire Station #3 was built in 1993 and is located at WSAAF. During the PA site visit, the Fort Drum Fire Department stated AFFF is stored at Fire Station #3 within 55-gallon drums within AFFF-carrying fire trucks parked at the station. The Fort Drum Fire Department stated AFFF and AFFF-containing crash trucks are not currently stored at Fire Station #1 (Building 10710), and personnel did not recall any AFFF training (recent or historical) at these stations. Lastly, the Fort Drum Fire Department stated there is no bulk AFFF storage or AFFF training at Fire Station #2 (Building 1585), however, crash trucks from Fire Station #3 (i.e., likely carrying AFFF) are occasionally staged inside truck bays at this fire station.

There are six historical fire stations at Fort Drum that have been demolished or abandoned since their operational periods. Three of the six historical fire stations were operated by the Fort Drum Fire Department and three were operated by the Army personnel stationed at Fort Drum in between deployments.

Three of the six historical fire stations that were operated by the Fort Drum Fire Department include: Former Airfield Fire Station (Building 2041), Former Fire Station (Building T-2330), and Former Fire Station #3 (Building 181). The Former Airfield Fire Station (Building 2041), located in the southern portion of WSAAF, was built in 1942 and demolished in 2005. It was used by the Fort Drum Fire Department as the WSAAF fire station prior to the active Fire Station #3 (Building 2065). During its operational period, AFFF was present in crash trucks and storage containers at this station. A small burn pit was reportedly located to the west of the station and was used for fire training purposes prior to 1981. Fort Drum fire department personnel interviewed during the PA were unable to rule out AFFF use at this burn pit. Former Airfield Fire Station (Building 2041) was investigated for PFAS in a separate, concurrent, effort under contract with the USACE Baltimore District (Weston Solutions, Inc. 2021). Former Fire Station (Building T-2330) was built in 1941 in the eastern portion of the cantonment area and was demolished in 2011. The former building footprint is still unoccupied. Former Fire Station #3 (Building 181) was located in the central portion of the cantonment area and was built in 1941. It was demolished in 2012 and the former building footprint is still unoccupied.

The remaining three historical fire stations operated by the Army personnel stationed at Fort Drum in between deployments include: Former Army Fire Station (George & Cannon, Building 3828), Former Army Fire Station (Kennedy & Dunn, Building 2419), and Former Army Fire Station (Building 1860). During the PA site visit interviews, the Fort Drum Fire Department personnel noted the Army-operated fire departments at Fort Drum likely trained at the dedicated FTA on post. However, AFFF use and storage at the individual fire stations was also possible. There are no active Army-operated fire departments (or personnel) at Fort Drum to confirm PFAS-containing materials use, storage, or disposal. Former Army Fire Station (George & Cannon, Building 3828) was located in the eastern portion of the cantonment area and was built in 1969. It was demolished in 2013. The Former Army Fire Station (Kennedy & Dunn, Building 2419) was built in 1941 in the south-eastern portion of the cantonment area. It was demolished in the late 1990s (i.e., exact date unknown), and the former building footprint is still unoccupied. Lastly, the Former Army Fire Station (Building 1860) was built prior to the 1990s (i.e., the exact date of construction was not available) in the eastern portion of the cantonment area. It was demolished between 2006 and 2008, and the former building footprint is now partially paved for military vehicle parking and partially a grassy stormwater collection area.

The Fort Drum Fire Department personnel interviewed did not recall any AFFF storage or equipment testing or personnel training with AFFF at the historical fire stations (interview knowledge went back to 1980). However, full operational records for each of these areas are unavailable. Details regarding known or potential PFAS-containing materials use, storage, and disposal for each of the current and historical fire stations are provided in **Section 5**.

Fire Training Areas

One FTA was identified at Fort Drum during the records review portion of the PA. During the PA site visit, Fort Drum Fire Department personnel confirmed AFFF has been deployed as part of each Fort Drum Fire Department and/or Army-operated Fire Department training operation. Training operations consisted of

igniting fuel within the pit and using AFFF to extinguish the fire. From 1981 to 1987, the Fort Drum Fire Department utilized a lined basin and training pit adjacent to the Black River for training operations with AFFF. Use of the old training pit was discontinued in 1987 due to fuel-related contamination. In 1991, a new pit was constructed in the same general vicinity as the previously used pit and was used for similar training activities with AFFF. The newer pit consisted of a concrete basin which drained to an underground OWS and storage tank. In 2016, the fire training pit, associated OWS and storage tank were decommissioned and removed due to PFAS impacts to groundwater. Soils excavated during the decommissioning were stored on post at the Building 2018 – Soil Barn and were subsequently sent off post for landfill disposal. Soil, groundwater, and surface water associated with the FTA contained PFOS, PFOA, and PFBS (**Section 2.12**). The FTA and adjacent area are currently being investigated under a separate contract with the USACE Baltimore District (Weston Solutions, Inc. 2021).

A small burn pit was also reportedly located to the west of the Former Airfield Fire Station (Building 2041) that was used for fire training purposes prior to 1981. No additional information regarding this potential burn pit was available during the PA.

Fire Department Equipment Testing Areas

For emergency preparedness, personnel were trained to performed nozzle testing with AFFF to ensure optimal flow and use of the AFFF mixture. Nozzle testing involved spraying AFFF through fire equipment, which could discharge AFFF to the environment if the mixture was not fully contained. Fire equipment training also included arc training to maximize the arc, reach, and distance covered by AFFF in an emergency response. During the PA site visit interviews, the Fort Drum Fire Department personnel reported that equipment/nozzle testing using AFFF was conducted in two areas at WSAAF: Mountain Ramp Nozzle Testing Area and adjacent to Fire Station #3. The Fort Drum Fire Department noted nozzle testing with AFFF was conducted monthly at the Mountain Ramp Nozzle Testing Area from 2000 to 2016 and adjacent to Fire Station #3 from approximately 1993 to 2016.

Further details regarding these practices at each equipment testing area are detailed in the applicable **Section 5** subsections.

Fire Response Areas

According to the Fort Drum Fire Department, AFFF has been used on various occasions to extinguish fires and/or as a precautionary method to prevent fires on post. In response to a gasoline leak to the storm sewer in the cantonment area, the Fort Drum Fire Department deployed AFFF directly into the storm sewer system as a precautionary measure. The location of AFFF deployment into the storm sewer could not be pinpointed during interviews with active and retired Fort Drum Fire Department personnel.

The Fort Drum Fire Department deployed AFFF in response to a car crash on the shoulder of Route 26, however the specific location of the crash and AFFF use could not be determined with active or retired Fort Drum Fire Department personnel. AFFF was also deployed during a fire response at the former range building at Small Arms Range 7. The Fort Drum Fire Department was unable to estimate the volume of AFFF deployed during the response, however photos were provided to illustrate the widespread use of AFFF during the fire response. The Small Arms Range 7 Fire is being investigated for PFOS, PFOA, and PFBS under a separate contract with the USACE Baltimore District (Weston Solutions, Inc. 2021). Soil and groundwater samples collected at the Small Arms Range 7 Fire AOPI contained PFOS, PFOA, and/or PFBS (**Section 2.12**).

Further details regarding known AFFF use areas related to fire responses (i.e., except for Small Arms Range 7 Fire discussed above) are provided in the applicable **Section 5** subsections.

AFFF Suppression Systems

Eight fire suppression systems currently or historically containing AFFF were identified at Fort Drum, specifically at WSAAF, at the following facilities: Hangar 2049, Hangar 2050, Hangar 2060, Hangar 19710, Building 19855, Hangar 2070, Hangar 2072, and Hangar 2074. At the time of the PA site visit, six of these fire suppression systems had been switched from AFFF to a JET-X foam (i.e., non-PFAS), and as of September 2019, the AFFF suppression system was dismantled and removed from one hangar (Hangar 2072). The Fort Drum Fire Department plans to replace the one remaining AFFF suppression system, (Building 19855) with a non-PFAS system. AFFF was deployed from each suppression system during system testing (approximately every 5 years) and accidental releases could have occurred. Following testing or in the case of accidental releases, AFFF would have flowed into the sanitary sewer via internal floor drains but was also likely washed outside of the facilities onto the adjacent tarmac during cleanup. Photos of the AFFF suppression system within Hangar 2072 are included in **Appendix I**.

Further details regarding the locations with current and historical fire suppression systems using AFFF are presented in the applicable **Section 5** subsections.

Installation Storage Warehouses

During PA site visit interviews, Fort Drum personnel noted various areas where AFFF was historically stored, in addition to fire stations and AFFF suppression systems within WSAAF hangars. AFFF was historically stored in 55-gallon drums within Building 2725 and Former Building 1131. Rusty drums and/or AFFF spills were documented at both locations.

Further details regarding AFFF storage at Building 2725 and Former Building 1131 are provided in the applicable **Section 5** subsections.

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

Following document research, personnel interviews, and site reconnaissance at Fort Drum, WWTPs, landfills, stormwater/sanitary sewer components, remediated soil application areas, laundry facilities, photo-processing/X-ray areas, car washes, and vehicle maintenance areas were identified as preliminary locations of use, storage, and/or disposal of PFAS-containing materials. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion regarding areas not retained for further investigation is presented in **Section 5.1** and specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**.

Wastewater System Components and Associated Waste Disposal

During its period of operation (1941 to 1987), the Former WWTP received a variety of sanitary wastes generated at Fort Drum (**Section 2.9.2**). These included wastes from areas with documented PFAS-containing materials use, storage, and disposal; specifically, various fire stations and Hangar 2049. Retired Fort Drum DPW staff also recalled observing foam at the Former WWTP pump station. The Former WWTP is no longer operational, however, some of the abandoned infrastructure is still present. Also described in **Section 2.9.2**, the Former WWTP effluent discharged to the Black River, and sludges were placed in unlined sludge beds to dry. Sludges were then disposed in the OSL and ASL.

Groundwater samples collected from at the OSL and ASL in 2016 contained PFAS, PFOS, and/or PFBS (**Section 2.12**).

Various OWSs at Fort Drum received waste from fire department stations/operations and/or hangars with AFFF suppression systems. The OWS at Building 3829 and the former OWS (i.e., the OWS was later removed) at former Building 1943 both received wastes from the FTA pit infrastructure. Additionally, the OWS at Building 2086 within WSAAF receives all sanitary sewer wastes from the WSAAF hangars with current or historical AFFF fire suppression systems. Each OWS currently discharges to the City of Watertown publicly owned treatment works (POTW) (**Section 2.9.2**).

Soil Storage Areas

As mentioned in **Section 4.1**, PFAS-containing soils excavated from the FTA were temporarily stored in Building 2018- Soil Barn prior to off-site disposal. Additionally, soils and sediments removed during cleaning of smaller OWS units at individual buildings (including OWSs in hangars at WSAAF with AFFF suppression systems) were disposed in a sludge pile immediately adjacent to the OSL.

Laundry Areas

As indicated in records review during the PA, there were three laundry pads located in the operational areas of Fort Drum. The laundry pads consisted of a rimmed square concrete slab with one or two sumps. Wastewater from the laundering activities was directed into the sumps prior to draining to leachate fields. The laundry pads were used for temporary periods of time to support training exercises and provide clean laundry throughout the trainings. The laundry pads were capable of laundering 500 sets of laundry per day, and by the end of the training exercise approximately 1,500 gallons of wastewater were generated. This wastewater contained a combination of detergents, dirt, oils, as well as a Teflon-based additive to restore water repellency to Gore-Tex® material (USACE 2017). Teflon products likely contain PFAS-containing materials. Each of the laundry pads has been sampled for PFOS, PFOA, and PFBS, as described in **Section 2.12**.

Photo-Processing/X-ray Areas, Car Washes, and Vehicle Maintenance Areas

Several photo-processing/X-ray areas, car washes, and vehicle maintenance areas were evaluated as preliminary locations for use, storage, and disposal of PFAS-containing materials at Fort Drum. Following records review, personnel interviews, and site reconnaissance, PFAS-containing materials were not identified at any of these preliminary locations.

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 Fort Drum) 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.

During the PA site visit, the Fort Drum Fire Department recalled several instances where AFFF was deployed during off-post fire responses. The Fort Drum Fire Department noted AFFF usage was not tracked, therefore the exact volume of AFFF deployed at each location is unknown.

- AFFF deployed on Route 81. The exact location of the AFFF response is unknown, however Route 81 runs north to south approximately 5 miles from the eastern Fort Drum boundary.

- AFFF deployed at a fire resulting from a car and fuel tank collision at the intersection of Route 11 and Route 342 in Calcium, New York, approximately 0.3 mile from the eastern Fort Drum boundary. This AFFF response was part of a mutual aid response with other fire departments.
- AFFF deployed at a fire resulting from a fuel tank crash on Route 3 in Great Bend, New York. The exact location of the AFFF response is unknown, however, the town of Great Bend is located immediately across the south side of the Black River from Fort Drum.

The majority of land surrounding Fort Drum is agricultural, residential, and light commercial/industrial (**Figure 2-1**). The City of Watertown is the nearest small city to Fort Drum and is located just over 5 miles from the installation. There are no known major industrial/commercial operations suspected of PFAS use, storage, or disposal located within a 5-mile radius of Fort Drum.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage and/or disposal of PFAS-containing materials at Fort Drum 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, 36 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

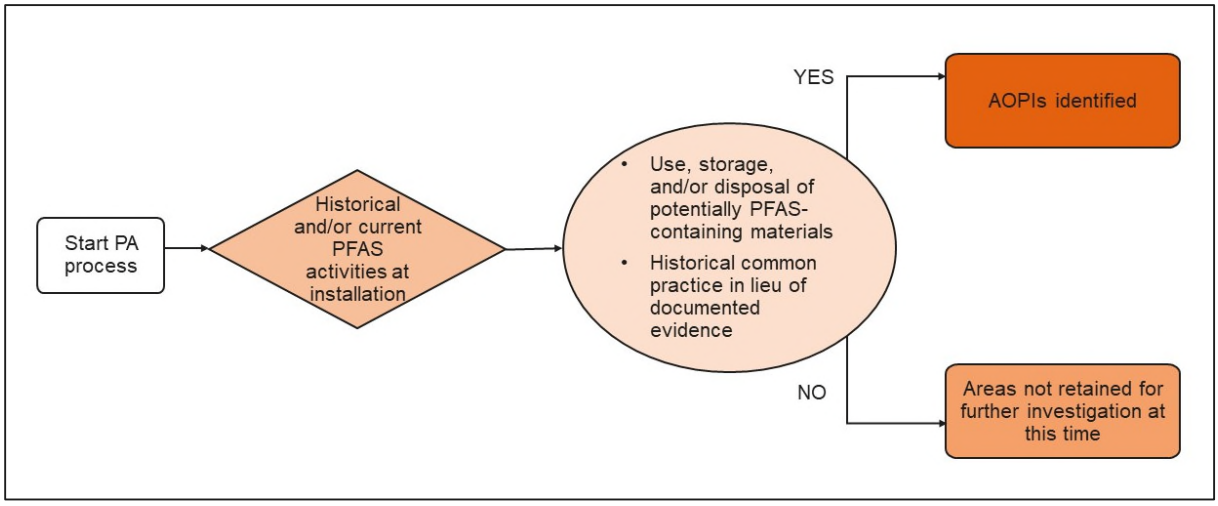

Figure 5-1: AOPI Decision Flowchart

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

Data limitations for this PA/SI at Fort Drum 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
Motor Pool OWS sludge drying beds	1995 to 1998	Noted as a sludge disposal area during the site visit. Sludges from various on-post motor pools were disposed here.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Crash truck maintenance areas (Building 91, Building 4530, and Building 20240)	Unknown	The buildings/areas were noted by the Fort Drum Fire Department as locations of fire truck maintenance. Manufacturer technicians came on post for major repairs. However, foam tanks and components would not have been disturbed during these truck maintenance activities.	Fire Department personnel did not indicate that foam components were serviced at these locations and therefore AFFF use, storage, or disposal is unlikely.
Photo processing and X-ray development areas (former photo development south of Building 1029, Building 1883 former photo processing lab, Building 11050 Medical and Dental Activity hospital X-ray, Building 10161 former Medical and Dental Activity hospital X-ray, and Building 30)	Unknown	The buildings/areas were noted during site visit interviews as locations of historical photo processing or X-ray operations. Any photo processing wastes would have been directed to the sanitary sewer system. The use of any PFAS-containing chemicals related to the photo processing operations could not be confirmed.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Tractor trailer fire response at the corner of Nash and 9th Street East	Unknown	During site visit interviews, the Fort Drum Fire Department noted this area as a potential on-post AFFF fire response. Current and retired fire chiefs were unable to identify the specific location of the event or to confirm that AFFF had been used in the response.	Inability to corroborate anecdotal evidence to confirm AFFF use, storage, or disposal at this location. As a result, the exact location of the potential incident could not be identified.

Area Description	Dates of Operation	Relevant Site History	Rationale
NYARNG Facilities at Fort Drum (Maneuver Area Training Equipment Site facility at Building 4900 and a readiness facility at Building 855)	2002 to present	NYARNG personnel confirmed their facilities utilize Fort Drum fire department, potable water, and sanitary services. NYARNG does not store AFFF or perform car wash operations with wax. The NYARNG presence at Fort Drum utilizes the Fort Drum wash rack nearby. A chemical inventory was obtained for the primary NYARNG facility at Fort Drum and reviewed for PFAS-containing chemicals.	PFAS-containing items were identified within the chemical inventory however, the items are not likely to have been used in large quantities and the wastes from these uses are containerized or would be conveyed to the Fort Drum utility infrastructure.
Vehicle maintenance facilities (leaking waste oil USTs)	Various	Documented leaking waste oil underground storage tanks (USTs) at many vehicles maintenance facilities on post. A chemical inventory of oils stored at these USTs was unable to be obtained.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 10700 Car Wash	1994 to present	Car wash located in cantonment area and operated by Morale, Welfare, and Recreation. Confirmed in interview to have used wax. Car wash drains lead to an OWS then the sanitary sewer system. The PA team received an SDS for type of wax currently used, which does not contain PFAS-containing materials. However, it was unable to be confirmed whether this was the only wax used since 1994.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Building 1185 Car Wash	1986 to present	Car wash located in cantonment area and operated by Morale, Welfare, and Recreation. Confirmed in interview to have used wax. Car wash drains lead to an OWS then the sanitary sewer system. Received an SDS for type of wax currently used, which does not contain PFAS-containing materials. However, unable to confirm whether this wax was used since 1986.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.
Army Air Force Exchange Service Car Wash	Approximately 2008 to 2017	Car wash located at WSAAF. Confirmed in interview to have used wax. Car wash drains lead to sanitary sewer system. The SDS for the wax historically used was not available.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Four of the AOPIs (OSL, ASL, Former WWTP, Fire Training Area) overlap with Fort Drum IRP sites and/or

Headquarters Army Environmental System (HQAES) sites **(Figure 5-2)**. The AOPI, overlapping IRP site identifier, HQAES number, and current site status are discussed within each AOPI subsection presented below. Additionally, various AOPIs are proximal to Fort Drum IRP sites and/or petroleum spill sites, but do not fully overlap with the AOPIs. Former Army Fire Station (George & Cannon, Building 3828), Former Army Fire Station (Building 1860), Historical Tank Repair/Vehicle Maintenance Shop, Building 3829 OWS, and Route 26 Car Crash are all proximal to the 3805/1995 site (i.e., non-PFAS IRP site). Storm Sewer AFFF Deployment is proximal to the 1795 site (i.e., non-PFAS IRP site). Hangar 2070, Hangar 2072, Hangar 2074, Fire Station #3 and Nozzle Testing Area, and Mountain Ramp Nozzle Testing Area are all proximal to the Oasis Fuel Point Site at WSAAF (a petroleum spill site regulated by the NYSDEC, outside of the IRP program). Sludge Pile Near OSL is proximal to the OSL IRP site. At the time of the PA, three of the Fort Drum IRP sites had historically been investigated or were currently being investigated for the possible presence of PFOS, PFOA, and PFBS (**Section 2.12**) and are identified as AOPIs in this report.

The AOPI locations are shown on **Figure 5-2**. Out of the 36 AOPIs identified at Fort Drum, nine AOPIs already have existing PFAS data (**Section 2.12**). Aerial photographs of the 33 AOPIs not shown within **Appendix F** and the approximate extent of PFOS, PFOA, and PFBS use, storage, and disposal (if applicable) are presented on **Figures 5-3** through **5-27** and include active monitoring wells in the vicinity of each AOPI. Aerial photographs for the three remaining AOPIs are included on Figure 2 (FTA), Figure 5 (Small Arms Range 7 Fire), and Figure 6 (ASL) in **Appendix F**.

5.2.1 Fire Station #3 and Nozzle Testing Area

The Fire Station #3 and Nozzle Testing Area was identified as an AOPI following personnel interviews and site reconnaissance due to documented AFFF use and storage. Fire Station #3 (Building 2065) was built in 1993 and is the only active fire station at WSAAF. Fire Station #3 is the primary storage location for AFFF-carrying crash trucks. AFFF is also stored at the station in 55-gallon drums. During PA site visit interviews, the Fort Drum Fire Department stated nozzle testing using AFFF was performed monthly for five crash trucks. The nozzle testing occurred on the concrete apron immediately southwest of Fire Station #3. An estimated 1 gallon maximum of AFFF concentrate was discharged from each crash truck per nozzle testing event. Nozzle testing with AFFF at Fire Station #3 ceased in 2016.

The Fire Station #3 and Nozzle Testing Area AOPI is located in the central portion of WSAAF (**Figure 5-2**). The AOPI consists of an active fire station, nozzle testing area, and associated pavement and drainage areas. The AOPI is surrounded by tarmac/roads to the west and south, a small grassy area to the east, and Building 2065 to the north (**Figure 5-3**).

5.2.2 Mountain Ramp Nozzle Testing Area

The Mountain Ramp Nozzle Testing Area was identified as an AOPI following personnel interviews and site reconnaissance due to AFFF use related to nozzle testing. During PA site visit interviews, the Fort Drum Fire Department noted nozzle testing with AFFF was performed here monthly for five crash trucks from 2000 to 2016. An estimated 1 gallon maximum of AFFF concentrate was discharged from each crash truck per nozzle testing event.

The Mountain Ramp Nozzle Testing Area AOPI is located in the northern portion of the WSAAF (**Figure 5-2**). The AOPI consists of the edges of a tarmac/paved area and the surrounding soils and drainage swales where AFFF was likely deployed and/or may have flowed. The AOPI is surrounded by tarmac to the west, and grassy areas with some small roads and driving paths to the north, east, and south (**Figure 5-4**).

5.2.3 Hangar 2070 Fire Suppression System

The Hangar 2070 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to testing of the AFFF fire suppression system and potential accidental system activation or spills. Hangar 2070 was built in 1993 and is located at WSAAF. The AFFF suppression system was replaced with a JET-X (i.e., non-PFAS) foam in 2014. During the PA site visit, the PA team confirmed Hangar 2070 historically utilized an AFFF suppression system with two 1,200-gallon AFFF tanks. PA site visit interviews and records reviewed confirmed AFFF was deployed from Hangar 2070 during system testing (approximately every 5 years) and if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains, which are conveyed to an OWS at Building 2086 prior to being pumped off post to the City of Watertown sanitary system. AFFF also likely washed outside of the Hangar 2070 building onto the tarmac during cleanup, where it likely entered surrounding soils and/or the WSAAF stormwater system that drains to Outfall OF-12 along Main Tank Trail.

The Hangar 2070 Fire Suppression System AOPI is located in the central portion of WSAAF (**Figure 5-2**). The AOPI consists of an actively used aircraft hangar and grassy and paved areas outside the main hangar door. The AOPI is surrounded by tarmac to the west, Hangar 2072 to the north, and grassy and paved areas to the south and east (**Figure 5-5**).

5.2.4 Hangar 2072 Fire Suppression System

The Hangar 2072 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to testing of the AFFF fire suppression system and potential accidental system activation or spills. Hangar 2072 was built in 1993 and is located at WSAAF. At the time of the PA site visit (May 2019), the AFFF suppression system was still in place at Hangar 2072 and a foam change-out to JET-X foam (i.e., non-PFAS) was pending. Additionally, the last documented suppression system testing event at Hangar 2072 occurred in 2016. During the PA site visit, the PA team confirmed Hangar 2072 had an AFFF suppression system with two 1,200- gallon AFFF tanks. PA site visit interviews and records reviewed confirmed AFFF was deployed from Hangar 2072 during system testing (approximately every 5 years) and if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains, which are conveyed to an OWS at Building 2086 prior to being pumped off post to the City of Watertown sanitary system. AFFF was also likely washed outside of the Hangar 2072 building onto the tarmac during cleanup, where it likely entered surrounding soils and/or the WSAAF stormwater system that drains to Outfall OF-12 along Main Tank Trail.

The Hangar 2072 Fire Suppression System AOPI is located in the central portion of WSAAF (**Figure 5-2**). The AOPI consists of an actively used aircraft hangar and grassy and paved areas outside the main

hangar door. The AOPI is surrounded by tarmac to the west, Hangar 2074 to the north, Hangar 2070 to the south, and small paved and grassy areas to the east (**Figure 5-5**).

5.2.5 Hangar 2074 Fire Suppression System

The Hangar 2074 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to testing of the AFFF fire suppression system and potential accidental system activation or spills. Hangar 2074 was built in 1993 and is located at WSAAF. The AFFF suppression system was replaced with a JET-X (i.e., non-PFAS) foam in 2011. During the PA site visit, the PA team confirmed Hangar 2074 historically utilized the AFFF suppression system with two 1,200- gallon AFFF tanks. PA site visit interviews and records reviewed confirmed AFFF was deployed from Hangar 2074 during system testing (approximately every 5 years) and if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains, which are conveyed to an OWS at Building 2086 prior to being pumped off post to the City of Watertown sanitary system. AFFF was also likely washed outside of the Hangar 2074 building onto the tarmac during cleanup, where it likely entered surrounding soils and/or the WSAAF stormwater system that drains to Outfall OF-12 along Main Tank Trail.

The Hangar 2074 Fire Suppression System AOPI is located in the central portion of WSAAF (**Figure 5-2**). The AOPI consists of an actively used aircraft hangar and grassy and paved areas outside the main hangar door. The AOPI is surrounded by tarmac to the west, a large, paved area/tarmac to the north, Hangar 2072 to the south, and paved and small grassy areas to the east (**Figure 5-5**).

5.2.6 Building 2725

Building 2725 was identified as an AOPI following personnel interviews and site reconnaissance due to documented AFFF storage. From an unknown date until 1995, Building 2725 was used for drum/material storage, including 55-gallon AFFF drums. Personnel interviewed during the PA site visit indicated AFFF drums stored at Building 2725 were stacked, rusty, and in poor condition. Therefore, AFFF leaks from the drums are likely due to the poor condition of the drums during the time of storage. AFFF is no longer stored in Building 2725.

Building 2725 is located east-southeast of the WSAAF (**Figure 5-2**) and consists of a metal building with two bay doors and concrete floors. A gravel driveway surrounds the building to the north, east, and west. A grassy area with a dumpster is located to the south of Building 2725. The AOPI is further surrounded by unoccupied forest land and the area is generally flat (**Figure 5-6**).

5.2.7 Former Army Fire Station (George & Cannon, Building 3828)

Former Army Fire Station (George & Cannon, Building 3828) was identified as an AOPI following personnel interviews and site reconnaissance due to documented AFFF storage in a crash truck stored there. From an unknown date to the 1990s, a U.S. Army fire company occupied a fire station building, which has been demolished, formerly located at the corner of George and Cannon streets. This fire station was the only U.S. Army Fire Station (operated by active Army personnel, not Fort Drum personnel) noted to have stored its crash truck, which contained AFFF. Interviews with PA site visit personnel indicated training with AFFF would have been conducted with the Fort Drum Fire Department at the

dedicated FTA. However, interview knowledge only goes back to 1980, leaving the potential for historical AFFF use and/or training.

The Former Army Fire Station (George & Cannon, Building 3828) is located in the eastern portion of cantonment area, on the west side of Dam Creek (**Figure 5-2**). The historical building footprint is located in a gravel vehicle parking lot. The AOPI is surrounded by George Avenue and forested vegetation to the west and south, Olsen Place to the east, and a grassy area to the north (**Figure 5-7**). The area surrounding the AOPI is generally flat.

5.2.8 Building 19855 Fire Suppression System

The Building 19855 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF use in the fire suppression system from 2006 to present. Fort Drum personnel noted Building 19855 contains the only in-service AFFF suppression system on Fort Drum currently. It has a 300-gallon stationary tank, and the internal building floor drains are directed to an underground storage tank that has no connection to the sanitary system. AFFF was discharged from the fire suppression system during post-installation commissioning testing on at least one occasion. Additional system testing/discharges and accidental releases are also likely during the period of AFFF use in the suppression system. Following releases, AFFF would have flowed into the internal floor drains but was also reportedly washed outside of the building onto the surrounding pavement, where it may have entered surrounding soils.

Building 19855 serves as a refueler storage facility and is located on the eastern side of WSAAF, immediately west of the ASL (**Figure 5-2**). Building 19855 is surrounded by pavement/tarmac, some grassy areas, and other WSAAF buildings/facilities (**Figure 5-8**).

5.2.9 Hangar 2060 Fire Suppression System

The Hangar 2060 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF use in the fire suppression system from 1993 to 2010. During the PA site visit, the PA team confirmed Hangar 2060 historically used an AFFF suppression system with two 1,200-gallon AFFF tanks. According to PA site visit interviews and records reviewed, AFFF was deployed from the hangar during system testing (approximately every 5 years), and possibly more frequently if an accidental activation occurred. Additionally, a fire suppression system leak was reported during PA site visit interviews. AFFF would have flowed into the sanitary sewer via internal floor drains but was also reportedly washed outside of the hangar building onto the tarmac during cleanup, where it may have entered surrounding soils and/or the stormwater system that drains to the Black River via outfall OF-01. Interviewees reported watching foam flow out of the back of Hangar 2060 and toward the stormwater drains behind the building, subsequently killing the surrounding grass in the early 2010s. PA site visit interviews confirmed the connection between Hangar 2060 and OF-01, and photos indicate a high expansion foam (i.e., not AFFF) that originated from Hangar 2060 led to visible foaming at OF-01. Therefore, it is also likely OF-01 received discharges from the AFFF fire suppression systems at WSAAF before the AFFF fire suppression system was replaced.

Hangar 2060 is located in the southern-central portion of WSAAF (**Figure 5-2**). The AOPI is surrounded by pavement/tarmac to the west and south, and roads as well as some grassy areas to the north and

east. Stormwater in the vicinity of the AOPI is eventually discharged to the Black River via OF-01 and WSAAF stormwater infrastructure (**Figure 5-9**).

5.2.10 Hangar 19710 Fire Suppression System

The Hangar 19710 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF use in the fire suppression system from 2006 to 2012. During the PA site visit, the PA team confirmed Hangar 19710 historically utilized an AFFF suppression system with two 1,200-gallon AFFF tanks. PA site visit interviews and records reviewed indicated AFFF was deployed from the hangar during system testing (approximately every 5 years) and possibly more if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains but was also reportedly washed outside of the hangar building onto the tarmac during cleanup, where it may have entered surrounding soils and/or the stormwater system that drains to the Black River via outfall OF-01.

Hangar 19710 is located in the southern-central portion of WSAAF (**Figure 5-2**). The AOPI is surrounded by pavement/tarmac and a grassy area to the west, Munns Corner Road and forest vegetation to the south, and roads and some grassy areas to the north and east. Stormwater in the vicinity of the AOPI is eventually discharged to the Black River via OF-01 and WSAAF stormwater infrastructure (**Figure 5-9**).

5.2.11 Hangar 2049 Fire Suppression System

The Hangar 2049 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF use in the fire suppression system. Hangar 2049 was constructed in the 1970s and had an AFFF suppression system until 2011. During the PA site visit, the PA team confirmed Hangar 2049 historically utilized an AFFF suppression system with two 1,200-gallon AFFF tanks. PA site visit interviews and records reviewed indicated AFFF was deployed from the hangar during system testing (approximately every 5 years) and possibly more if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains (currently to an OWS and then to the City of Watertown POTW, but to the Former WWTP until 1987). However, AFFF was also reportedly washed outside of the building onto the tarmac during cleanup, where it may have entered surrounding soils and/or the stormwater system that discharges to Dam Creek via OF-06.

Hangar 2049 is part of the original WSAAF and is located on the western side of WSAAF, where the cantonment area ends and WSAAF begins (**Figure 5-2**). The AOPI is surrounded by tarmac/pavement to the north and south, Hangar 2050 to the east, and some pavement and grassy areas to the west. Stormwater in the vicinity of the AOPI is eventually discharged to Dam Creek via OF-06 and WSAAF stormwater infrastructure (**Figure 5-10**)

5.2.12 Hangar 2050 Fire Suppression System

The Hangar 2050 Fire Suppression System was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF use in the fire suppression system. Hangar 2050 was constructed in 1989 and had an AFFF suppression system until 2012. During the PA site visit, the PA team confirmed Hangar 2050 historically utilized an AFFF suppression system with two 1,200-gallon AFFF tanks. PA site visit interviews and records reviewed indicated AFFF was deployed from the

hangar during system testing (approximately every 5 years) and possibly more if accidental releases occurred. AFFF would have flowed into the sanitary sewer via internal floor drains but was also reportedly washed outside of hangar building onto the tarmac during cleanup where it would have entered soil and/or the stormwater system that drains to Dam Creek via OF-06.

Hangar 2050 is part of the original WSAAF and is located on the western side of WSAAF, where the cantonment area ends and WSAAF begins (**Figure 5-2**). The AOPI is surrounded by tarmac/pavement to the north and south, Hangar 2049 to the west, and some pavement and grassy areas to the east. Stormwater in the vicinity of the AOPI is eventually discharged to Dam Creek via OF-06 and WSAAF stormwater infrastructure (**Figure 5-10**).

5.2.13 Former WWTP (FTD-003, 36205.1003)

The Former WWTP was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to likely receipt of AFFF releases from Hangar 2049. The Fort Drum sanitary sewer flows were treated by the on-post WWTP for several decades until the sewers were connected to the Watertown POTW in the late 1980s. Effluent from the Former WWTP was discharged to the Black River. AFFF entering the internal drains at Hangar 2049 (the only active Hangar at the time of Former WWTP operation) from fire suppression system testing was conveyed via subsurface pipe to the Former WWTP while it was operating (pre-1987). Additionally, retired DPW staff interviewed during the site visit recalled observing foam at the Former WWTP pump station. The Former WWTP is no longer in operation; however, some of the abandoned infrastructure is still present (**Appendix I**).

The Former WWTP is located in the cantonment area, along the southern installation boundary near the Black River to the southeast, and just south of the Former WWTP Sludge Drying Beds location (**Figure 5-2**). The AOPI is surrounded by forest vegetation and the installation boundary to the south, east, and west. An open grassy area is located north of the AOPI (**Figure 5-11**).

As part of the IRP at Fort Drum, the Former WWTP was addressed as site FTD-003. FTD-003 was categorized for no further action (for non-PFAS constituents) in October 1994 (Fort Drum 2017).

5.2.14 Former WWTP Sludge Drying Beds

The Former WWTP Sludge Drying Beds were identified as an AOPI following records review, personnel interviews, and site reconnaissance due to likely receipt of AFFF wastes from the Former WWTP and Hangar 2049 where AFFF fire suppression testing was performed. During the Former WWTP operational period, sludges were placed in unlined sludge drying beds on the east side of the Former WWTP. Sludges may have contained PFOS, PFOA, and/or PFBS associated with AFFF in wastewater from Hangar 2049 that entered the sanitary sewer system and was conveyed the Former WWTP before it was decommissioned in 1987. The sludge was excavated and disposed of in the ASL in 1994.

The Former WWTP Sludge Drying Beds are located in the cantonment area, along the southern installation boundary near the Black River to the southeast, and just north of the Former WWTP location (**Figure 5-2**). The AOPI is surrounded by forest vegetation and the installation boundary to the south, 2nd Street East to the west, and open grassy areas to the north and east (**Figure 5-11**).

5.2.15 Former Army Fire Station (Building 1860)

The Former Army Fire Station (Building 1860) was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its potential for AFFF use, storage, and/or disposal. Building 1860 was used by the U.S. Army Fire Brigade during the 1990s into the 2000s. Interviewees stated AFFF training would have been conducted with the Fort Drum Fire Department at their training location (FTA). However, small quantities of AFFF may have been stored at Building 1860 in 5-gallon pails. AFFF-containing crash trucks were not likely staged here, and no AFFF spills or disposal were reported. However, there is a knowledge gap in the operational record at this Former Army Fire Station (PA team could not confirm with the Former Army Fire Department personnel back to the beginning use of Former Army Fire Station Building 1860).

The Former Army Fire Station (Building 1860) is located in the eastern portion of the cantonment area (**Figure 5-2**). The AOPI currently is located within a large military vehicle parking area. A limited grassy area is located to the north of the AOPI between the parking area and Ontario Ave. The large military vehicle parking area surrounds the AOPI to the east, south, and west (**Figure 5-12**).

5.2.16 Fire Station #1 (Building 10710)

Fire Station #1 (Building 10710) was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to its historical and current use as a fire station. Therefore, there is a potential for historical AFFF use, storage, or disposal. Fire Station #1 (Building 10710) has been utilized as a fire station since the mid-1980s until present. The Fort Drum Fire Department currently does not store AFFF or AFFF-containing crash trucks and does not perform AFFF training at this station. Additionally, no AFFF spills were reported. However, there is potential for historical AFFF use, storage, or disposal during the full operational history due to known Fort Drum Fire Department AFFF use.

Fire Station #1 (Building 10710) is located in the western portion of the cantonment area (**Figure 5-2**). The AOPI consists of an active fire station building and paved driveway. Fire Station #1 (Building 10710) is surrounded by South Riva Ridge Loop to the south, a grassy area with sparse trees to the west and north, and small buildings and parking lot to the west (**Figure 5-13**).

5.2.17 Former Army Fire Station (Kennedy & Dunn, Building 2419)

The Former Army Fire Station (Kennedy & Dunn, Building 2419) was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical use as a fire station and therefore potential AFFF use, storage, or disposal. The Former Army Fire Station (Kennedy & Dunn, Building 2419) AOPI was used by the U.S. Army Fire Brigade to provide firefighting capability during deployments in the 1990s and 2000s. The Fort Drum Fire Department personnel were interviewed during the PA site visit and noted AFFF training would have been conducted with Fort Drum Fire Department at their FTAs. However, small quantities of AFFF may have been stored at this Fire Station in 5-gallon pails. It is believed that crash trucks were not staged here, and no AFFF spills were reported. However, there is an existing knowledge gap in the operational record at this Fire Station (PA team could not confirm this with Fire Department personnel back to the beginning use of Former Army Fire Station [Kennedy & Dunn, Building 2419]).

The Former Army Fire Station (Kennedy & Dunn, Building 2419) is located in the cantonment area, along the southern installation boundary near the Black River (**Figure 5-2**). The AOPI is surrounded by forest vegetation to the south, an open grassy area and large building to the west, Kennedy Ave to the east, and small structures to the north (**Figure 5-14**).

5.2.18 Building 2018 Soil Barn

The Building 2018 Soil Barn was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to AFFF-containing soils storage. Building 2018 is currently used to store non-hazardous soils/materials prior to off-site disposal. Approximately 400 tons of PFAS-impacted soil from the FTA pit excavation were temporarily stored at Building 2018 prior to off-site disposal. Material (dry sweep) used to clean up an AFFF spill at the former Building 1131 was also temporarily stored here. During site reconnaissance, stored soils in Building 2018 were observed to be tracked onto the ground surface outside the building bay doors. Therefore, PFAS-containing soil from the FTA excavation and AFFF-containing spill cleanup material may have been spilled and/or tracked on the ground surface outside of Building 2018 during placement within or removal from the building.

The Building 2018 Soil Barn is located in the easternmost portion of the cantonment area, just west of Dam Creek (**Figure 5-2**). Outside of Building 2018, there is a paved area for vehicles to drive in front of the bay doors. The AOPI is located southeast of the intersection between Route 26 and Main Tank Trial. Cleared grassy areas surround the AOPI to the east, Route 26 to the east and south, and Main Tank Trail to the north (**Figure 5-15**).

5.2.19 Former Building 1131 AFFF Storage and Spill

The Former Building 1131 AFFF Storage and Spill was identified as an AOPI following personnel interviews and site reconnaissance due to a documented AFFF spill and AFFF storage. During PA site visit interviews, Fort Drum personnel recalled Building 1131 as a former AFFF storage location and reported an AFFF spill (approximately 25 to 30 gallons) within Building 1131, which has since been demolished. Fort Drum personnel indicated dry sweep was used to clean up the AFFF spill. The used dry sweep was subsequently transported to Building 2018 for storage prior to off-site disposal. The condition of the floor in Former Building 1131 at the time of the spill is unknown, and for PFAS migration to underlying soils through cracks/drains in the floor if they were present. This AFFF-containing cleanup material may also have been spilled and/or tracked on the ground surface outside the building during cleanup. Building 1131 was demolished between 2016 and 2019 and the location is currently vacant.

Former Building 1131 AFFF Storage and Spill is located in the central portion of the cantonment area (**Figure 5-2**). The AOPI is located north of the intersection between Restore Hope Avenue and 1st Street West to the west, south, and east. Three buildings and associated parking areas are located to the north of the AOPI (**Figure 5-16**).

5.2.20 OSL (FTD-007, 36205.1007)

The OSL was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to historical data indicating PFAS presence in groundwater (**Section 2.12**) and the operational history of receiving potentially PFAS-containing wastes from the Former WWTP and

associated sludge drying beds (**Section 5.2.13**). Other wastes disposed of at the OSL during its period of operation (1940 to 1973), included general refuse, containers with residual pesticides/herbicides, unused ammunition, chlorinated solvents, and industrial wastes. Groundwater seeps are present at the base of the northeastern OSL cell along Dam Creek and one of its tributaries are sampled routinely as part of a groundwater monitoring program, but they have not been sampled for PFAS.

The OSL is located in the eastern portion of the cantonment area, immediately west of Dam Creek (**Figure 5-2**). The OSL consists of two waste cells, divided by a tributary to Dam Creek. The OSL is bounded by Route 26 to the south and southwest, wooded vegetation to the west, Main Tank Trail to the east, and Dam Creek to the north (**Figure 5-17**). The Route 26 Car Crash location is immediately southwest of the northwest OSL cell.

As part of IRP actions for non-PFAS contaminants, a corrective measures study for the OSL was finalized in 2006. A full-scale phytoremediation system was installed to attenuate seep constituents from the OSL, and cap improvements were made (e.g., adding new fill, new geomembrane, new cover, topsoil, and addition of a 4% slope) in 2008. In 2014, Fort Drum initiated long-term operation and maintenance actions at the OSL, including annual groundwater and surface water monitoring (Fort Drum 2017).

5.2.21 Storm Sewer AFFF Deployment

The Storm Sewer AFFF Deployment was identified as an AOPI following personnel interviews and site reconnaissance due to a known AFFF release. During PA site visit interviews, Fort Drum Fire Department personnel stated that up to 20 gallons of AFFF were deployed to the storm sewer system to prevent ignition of spilled fuel in the late 1980s to early 1990s. The retired fire chief stated the AFFF was deployed near one of the motor pool areas in the vicinity of Buildings 1700 through1800 along Ontario Avenue but could not provide an exact location. The exact AFFF deployment location is still unknown. Stormwater from this area flows west, discharging into a small creek that flows northwest under Oneida Avenue and discharges into a tributary of Upper Pleasant Creek.

The Storm Sewer AFFF Deployment is located in the eastern portion of the cantonment area and encompasses the extent of the storm sewer system within which the retired fire chief stated that the AFFF deployment point is located. The AOPI is surrounded by wooded vegetation to the west, Oneida Avenue to the north, 8th Street East to the west, and Restore Hope Avenue to the south (**Figure 5-18**).

5.2.22 Sludge Pile Near OSL

The Sludge Pile Near OSL was identified as an AOPI following personnel interviews and site reconnaissance because Fort Drum personnel reported placing potentially PFAS-impacted sediment/sludge from OWS units and storm sewers across Fort Drum (including WSAAF) at this location. These materials may contain residual PFAS associated with AFFF discharges at WSAAF hangars and nozzle testing areas. The sludge pile is located next to a drainage swale that runs along Main Tank Trail and eventually discharges into Dam Creek.

The Sludge Pile Near OSL is located in the easternmost portion of the cantonment area, just west of Dam Creek (**Figure 5-2**). The AOPI is bounded by Main Tank Trail to the south, cleared/grassy areas to the east and west, and the OSL to the north (**Figure 5-19**).

5.2.23 Former Fire Station #3 (Building 181)

The Former Fire Station #3 (Building 181) was identified as an AOPI following personnel interviews and site reconnaissance due to likely AFFF use, storage, and/or disposal. The Former Fire Station #3 (Building 181) was built in 1941 and was demolished in 2012. The Former Fire Station #3 (Building 181) was historically used by the Fort Drum Fire Department and personnel stated that AFFF-containing crash trucks could not have been stored there due to the small size of the vehicle bays. The Fort Drum Fire Department personnel did not recollect AFFF storage or training with AFFF at this fire station (interview knowledge went back to 1980). However, there is an information gap for the operational record at the Former Fire Station #3 (no information regarding historical [pre-1980] AFFF use, storage, and disposal.

The Former Fire Station #3 (Building 181) is located in the central portion of the cantonment area (**Figure 5-2**). The AOPI is bounded by Euphrates River Valley Road to the east, Oswego Avenue to the south, 1st Street East to the west, and Restore Hope Avenue to the north. The AOPI currently consists of an open grassy area and two paved areas that were used as driveways for the Former Fire Station #3 (Building 181). The historical building footprint is located in the southern portion of the grassy area (**Figure 5-20**).

5.2.24 Former Fire Station (Building T-2330)

The Former Fire Station (Building T-2330) was identified as an AOPI following personnel interviews and site reconnaissance due to likely AFFF use, storage, and/or disposal. The building was constructed in 1941 and demolished in 2011. Interviewees stated that the fire station was too small for storage of AFFF-containing crash trucks. Fort Drum Fire Department personnel did not recollect any AFFF storage or equipment testing/personnel training with AFFF at this fire station. However, there is an information gap for the operational record at the Former Fire Station (Building T-2330) (no information regarding historical [pre-1980] AFFF use, storage, and disposal at Former Fire Station [Building T-2330]).

Former Fire Station (Building T-2330) is located in the eastern portion of the cantonment area (**Figure 5-2**). The AOPI is situated in a grassy area immediately south of the intersection of Eighth Street West and Nash Boulevard. The AOPI is bounded by similar grassy areas to the west, south, and east, and Nash Boulevard to the north (**Figure 5-21**).

5.2.25 Building 3829 OWS

The Building 3829 OWS was identified as an AOPI following personnel interviews and site reconnaissance due to receipt of AFFF wastes from the FTA. Fort Drum personnel reported emptying unused AFFF from the FTA UST into the OWS at Building 3829 regularly between 1992, when the UST was installed, and 2016, when it was removed. Additionally, Fort Drum personnel noted on occasion, the AFFF was deployed into a manhole adjacent to the OWS. This OWS discharges to the sanitary sewer, which flows to the City of Watertown POTW.

The Building 3829 OWS is located in the eastern portion of the cantonment area, just west of Route 26 (**Figure 5-2**). The AOPI is bounded by an open grassy area and Route 26 to the north and east, Building 3829 and gravel lot to the south, and roads and grassy areas to the west (**Figure 5-22**).

5.2.26 Former Building 1943 OWS

The Former Building 1943 OWS was identified as an AOPI following personnel interviews and site reconnaissance due to receipt of AFFF wastes from the FTA. Fort Drum personnel reported the contents of the FTA UST were occasionally discharged into the OWS at Former Building 1943 instead of the Building 3829 OWS. The OWS discharged to the sanitary sewer, which flows to the City of Watertown POTW. Building 1943 has since been demolished and the OWS removed.

The Former Building 1943 OWS is located in the eastern portion of the cantonment area (**Figure 5-2**), adjacent to the Storm Sewer AFFF Deployment AOPI. The AOPI currently consists of a large, paved area where Conex boxes and military vehicles are stored. The AOPI is bounded by 8th Street East to the west, a grassy area to the north, and Conex box and military vehicle storage to the west and south (**Figure 5-23**).

5.2.27 Fire Station #2 (Building 1585)

The Fire Station #2 (Building 1585) was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to possible storage of AFFF. Fire Station #2 (Building 1585) was built in 2011 and is currently active. During PA site visit interviews, Fort Drum Fire Department personnel stated AFFF is not currently stored within this building and is unlikely to have been stored here historically. However, crash trucks from Fire Station 3 (i.e., likely carrying AFFF) are occasionally staged inside truck bays at this fire station. A 2016 aerial of Fire Station 2 illustrates Fire Department hoses laid out on the driveway/grassy area south of Fire Station #2 (Building 1585), however, it is unknown if the hoses contained AFFF or AFFF residuals, and if this practice was performed historically with AFFF or AFFF residuals. Due to common use and storage of AFFF by the Fort Drum Fire Department related to training activities on post, it is possible that containers of AFFF were stored at this fire station in the past.

The Fire Station #2 (Building 1585) AOPI is located in the central portion of the cantonment area (**Figure 5-2**). The AOPI currently consists of an active fire station building/vehicle bay, various paved areas where vehicles and crash trucks are parked, and several grassy areas with stormwater drainage swales. The AOPI is bounded by 5th Street West to the west, Ontario Ave to the north, a grassy/wooded area to the south, and 5th Street M to the east (**Figure 5-24**).

5.2.28 Historical Tank Repair/Vehicle Maintenance Shop

The Historical Tank Repair/Vehicle Maintenance Shop was identified as an AOPI following records review/reconciliation and following clarification from Fort Drum Real Property staff. As described in **Section 6.3.3**, it was determined that the location previously marked as ‘Former Army Fire Station (Building 1884)’ was incorrect, and that the correct historical location is Former Army Fire Station (Building 1860). Upon records review, it was determined the incorrect location for ‘Former Army Fire Station (Building 1884)’ was a Historical Tank Repair/Vehicle Maintenance Shop. Due to the presence of PFOS, PFOA, and PFBS in groundwater at the location (see **Section 7.26**), the Historical Tank Repair/Vehicle Maintenance Shop was also retained as an AOPI. The Historical Tank Repair/Vehicle Maintenance Shop occupied Building 1800, which was built in 1964. According to Fort Drum Real Property staff, former Building 1800 was used as a tank repair shop and then a vehicle maintenance shop, although the specific timeframes for each use are unknown. Former Building 1800 was later

demolished in 2008. There is no confirmed use, storage, or disposal of PFAS-containing materials at Building 1800.

The Historical Tank Repair/Vehicle Maintenance Shop AOPI is located in the central portion of the cantonment area (**Figure 5-2**). The AOPI currently is located mostly in a cleared grassy field, and a portion of the AOPI overlays a small building to the south. Grassy areas are located to the north and east of the AOPI, 8th Street West to the west of the AOPI, and a large military vehicle parking area to the south (**Figure 5-12**).

5.2.29 AOPIs With Existing PFOS, PFOA, PFBS Data and Under Separate PFAS Investigation

The summaries below present brief site histories and descriptions for the AOPIs sampled in previous investigations. **Section 2.12** present comparisons of the associated analytical results to OSD risk screening levels which was used to formulate appropriate recommendations for further investigations or no further action at this time. These AOPI locations are included on **Figure 5-2**.

The following four AOPIs were identified in the PA as having existing PFOS, PFOA, and PFBS data and were investigated for PFOS, PFOA, and PFBS under a USACE 2016 investigation (USACE 2017).

- Route 26 Car Crash: The Route 26 Car Crash, in the eastern portion of the cantonment area, (**Figure 5-2**), was identified as an AOPI following personnel interviews due to AFFF use. During the PA site visit interviews, the Fort Drum retired Fire Department personnel stated in the 1990s, the Fort Drum Fire Department deployed AFFF in response to a car crash on the pavement shoulder of Route 26 that is adjacent to Engineering Buildings at Nininger Street. The retired fire chief recalled using less than 10 gallons of AFFF during this response but could not recollect the exact location of the response. An estimate of the location based on the information gathered during the PA is provided on **Figure 5-2**. The estimated location of the Route 26 Car Crash is immediately southwest and upgradient of the OSL (**Figure 5-17**). Groundwater samples collected in 2016 from wells downgradient of the estimated Route 26 Car Crash location and the OSL in 2016 contained PFOS and PFOA (**Section 2.12**). Additional downgradient groundwater samples were collected as part of the OSL SI (**Section 7.18**).
- Laundry Pad 1: The Laundry Pad 1 (**Figure 5-25**) was identified as an AOPI following records review and personnel interviews. It was investigated in the USACE 2016 investigation due to use of a potentially PFAS-containing chemical (i.e., Teflon-containing additive) during laundering activities. PFOS, PFOA, and PFBS were not detected in soil samples from Laundry Pad 1 (**Section 2.12**).
- Laundry Pad 2: The Laundry Pad 2 (**Figure 5-26**) was identified as an AOPI following records review and personnel interviews. It was investigated in the USACE 2016 investigation due to use of a potentially PFAS-containing chemical (i.e., Teflon-containing additive) during laundering activities. PFOS, PFOA, and PFBS were not detected in soil samples from Laundry Pad 2 (**Section 2.12**).
- Laundry Pad 3: The Laundry Pad 3 (**Figure 5-27**) was identified as an AOPI following records review and personnel interviews. It was investigated in the USACE 2016 investigation due to use of a potentially PFAS-containing chemical (i.e., Teflon-containing additive) during laundering activities.

PFOS was detected less than the OSD risk screening level in a soil sample from Laundry Pad 3 (**Section 2.12**).

The following four AOPIs were also identified in the PA as having existing PFOS, PFOA, and PFBS data and have been investigated for PFOS, PFOA, and PFBS under a separate contract with the USACE Baltimore District (Weston Solutions, Inc. 2021).

- FTA (Site FTD-028, HQAES 36205.1020): The FTA (**Figure 5-2**) was identified as an AOPI following records review, personnel interviews, and site reconnaissance due to documented AFFF use. The FTA is located in the southern portion of WSAAF and is approximately 0.15 mile from the Black River (Figure 2 in **Appendix F**). During the PA site visit, personnel confirmed AFFF was deployed following each Fort Drum Fire Department and/or Army-operated Fire Department training operation. Training operations consisted of igniting fuel within the pit and using AFFF to extinguish the fire. From 1981 to 1987, the Fort Drum Fire Department utilized a lined basin and training pit for training operations with AFFF. Use of the old training pit was discontinued in 1987 due to fuel-related contamination. In 1991, a new pit was constructed in the same general vicinity as the previously used pit and was used for similar training activities with AFFF. The newer pit consisted of a concrete basin which drained to an underground OWS and storage tank. In 2016, the fire training pit and associated OWS and storage tank were decommissioned and removed due to the discovery of PFAS constituents in the surrounding groundwater. Soils excavated during the decommissioning were stored on post at the Building 2018 – Soil Barn and were subsequently sent off post for landfill disposal. Previous PFOS, PFOA, and PFBS data for the FTA are summarized in **Section 2.12**.
- ASL (Site FTD-008, HQAES 36205.1008): The ASL was identified as an AOPI following records review and personnel interviews due to receipt of potentially PFAS-containing wastes and historical detections of PFOA in groundwater samples collected during 2016 (USACE 2017). The ASL is located within the central portion of WSAAF (Figure 6 in **Appendix F**). The Airfield Sanitary Landfill operated from 1973 through 1987 and received solid waste (e.g., dried sludges from the Former WWTP [**Section 5.2.13**], paint wastes, solvent containers, oil, petroleum). Groundwater samples were collected from three existing monitoring wells during the 2016 USACE investigation (USACE 2017) and additional groundwater sampling was conducted as part of a separate contract with the USACE Baltimore District (Weston Solutions, Inc. 2021). Previous PFOS, PFOA, and PFBS data for the ASL are summarized in **Section 2.12**.
- Small Arms Range 7 Fire: The Small Arms Range 7 Fire was identified as an AOPI following records review, personnel interviews, and site reconnaissance. The Small Arms Range 7 Fire AOPI is located south of WSAAF and is approximately 300 feet from the Black River (Figure 5 in **Appendix F**). The Fort Drum Fire Department confirmed AFFF was deployed during a fire response at the former range building at Small Arms Range 7 in November 2002. The Small Arms Range 7 Fire AOPI is located on the WSAAF portion of Fort Drum, proximal to the Black River (**Figure 5-2**). The Fort Drum Fire Department was unable to estimate the volume of AFFF deployed, however photos were provided to illustrate the widespread use of AFFF during the fire response. Additionally, site reconnaissance at this location identified a proximal creek and drainage swale that discharge to the Black River and may have received AFFF runoff from the fire response. Groundwater samples were collected from two monitoring wells as part of a separate contract with the USACE Baltimore District (Weston Solutions,

Inc. 2021). Previous PFOS, PFOA, and PFBS data for the Small Arms Range 7 Fire are summarized in **Section 2.12**.

- Former Airfield Fire Station (Building 2041): The Former Airfield Fire Station (Building 2041) was identified as an AOPI following records review, personnel interviews, and site reconnaissance. Located in the southwestern portion of the WSAAF, adjacent to Hangar 2049 and Hangar 2050 (**Figure 5-10**), this fire station was built in 1942 and was demolished in 2005. According to Fort Drum Fire Department interviews and records reviewed, AFFF was stored in crash trucks and other storage containers at this fire station during the time of operation. A small burn pit used for fire training purposes prior to 1981 was reportedly located to the west of the building. Fort Drum Fire Department personnel were unable to rule out AFFF use at this burn pit. Interviewees did not report AFFF use, or nozzle testing performed at this fire station, however crash trucks with AFFF were staged here. Additionally, the FTA is located proximal to this former fire station. Results for previously collected groundwater samples from four monitoring wells are summarized in **Section 2.12**. One additional shallow groundwater sample was collected as part of the SI (**Section 7.27**).

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at Fort Drum, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling at Fort Drum was completed at 30 of the 36 AOPIs to evaluate whether PFOS, PFOA, and PFBS are present at concentrations that exceed the OSD risk screening levels. Previous sampling to address PFOS, PFOA, and PFBS has been performed for the remaining six AOPIs (USACE 2017; USACE 2018; Weston Solutions, Inc. 2021). The analytical results of these investigations, supplemented by comparison to OSD risk screening levels in this PA/SI Report, are considered sufficient to complete SI requirements under CERCLA (**Section 7**).

As such, two separate installation-specific QAPP Addenda (Arcadis 2019b; Arcadis 2021) and FCRs were developed to supplement the general information provided in the PQAPP (Arcadis 2019a) and to detail the site-specific proposed scopes of work for each phase of the SI. A preliminary CSM was prepared for 30 of the 36 AOPIs identified in the PA in accordance with the USACE Engineer Manual on Conceptual Site Models, EM 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, groundwater, surface water, and sediment pathways as potentially complete which guided the SI sampling. The Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019a; Arcadis 2021) and subsequent FCRs detail the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed through the collection of field data and analytical samples.

The SI sampling performed to date was completed in three mobilizations. During the first mobilization, Phase 1 SI sampling was completed from December 2019 through January 2020 at five AOPIs that were prioritized due to their proximity to the current Fort Drum potable well field and potential risk to drinking water sources. During the second mobilization, Phase 2, SI sampling was completed from October 2020 through December 2020 at 22 AOPIs, and the third mobilization was completed from September 2021 through November 2021 at 3 AOPIs.

The SI field work was completed in accordance with the standard operating procedures (SOPs), technical guidance instructions (TGIs), sampling design, and QA/QC requirements presented in the QAPP Addenda (Arcadis 2019b; Arcadis 2021) and PQAPP (Arcadis 2019a). The subsections below summarize the DQOs, sampling design and rationale, sampling activities and methods, and data analyses procedures for the SI phase at Fort Drum. Non-conformances to the prescribed procedures in the PQAPP and QAPP Addenda 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 Addenda (Arcadis 2019b; Arcadis 2021), the objective of the SI was to identify whether there has been a release to the environment at the AOPIs identified in the PA and to determine if further investigation is warranted. This SI evaluated groundwater, soil, surface water, and sediment for PFOS, PFOA, and PFBS presence or absence at each of the sampled AOPIs.

6.2 Sampling Design and Rationale

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

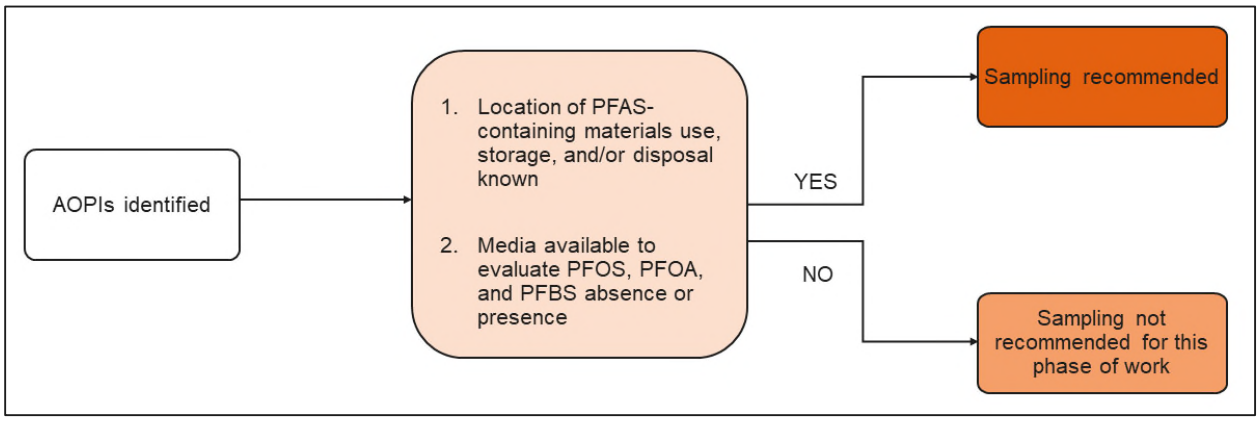

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at Fort Drum is detailed in Worksheet #17 of the QAPP Addenda (Arcadis 2019b; Arcadis 2021) and subsequent FCRs. A brief summary of the sampling design is provided below. The areas of focus for this SI included 30 AOPIs. The sampling design consisted of a combination of soil sampling using hand augers and various drilling methods (e.g., sonic, direct-push technology [DPT], hollow-stem auger [HSA]), groundwater sampling (e.g., grab sampling and low-flow sampling from temporary wells and monitoring wells), surface water sampling, and sediment sampling. For each of the 30 sampled AOPIs, samples were collected at locations of known or suspected use, storage, or disposal of PFAS-containing materials; surface runoff collection points, and locations downgradient of known or suspected PFOS, PFOA, and/or PFBS source areas. Sample locations were selected based on site-specific historical evidence, suspected groundwater flow conditions, as well as surface runoff/surface slope conditions observed in the field at each sampled AOPI. Environmental media (e.g., soil, groundwater, surface water, sediment) sampled for each AOPI were selected based on the which media was most likely to have been impacted by PFOS, PFOA, and/or PFBS, if present, given AOPI history and the CSM developed for each AOPI.

The sampling depths at temporary wells and installed monitoring wells were at approximately the center of the saturated screened interval. **Table 6-1** includes the monitoring well construction details related to the groundwater samples collected during the SI as available.

6.3 Sampling Methods and Procedures

Environmental data were collected and analyzed in accordance with the PQAPP (Arcadis 2019a), 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 Addenda (Arcadis 2019b; Arcadis 2021), and the safety procedures specified in the Accident Prevention Plan (Arcadis 2018) and SSHPs (Arcadis 2019c; 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, procedures for storing samples to

ensure that sample contamination does not occur during collection, and transport. In general, sampling techniques used for in the SI were consistent with conventional sampling techniques used in the environmental industry, but special considerations were made regarding PFAS-containing materials, equipment, and cross-contamination potential.

The sampling methods employed during the SI are detailed in the PQAPP (Arcadis 2019a) and QAPP Addenda (Arcadis 2019b; Arcadis 2021). The subsections below provide a summary of the field methods and procedures utilized to complete the SI scope of work. Field notes and field forms (i.e., soil boring logs, groundwater purging logs, equipment calibration forms, tailgate health and safety forms, and sample collection logs) documenting the SI sampling activities are included in **Appendices K** and **L**, respectively. Photographs of the sampling activities are included in **Appendix M**.

6.3.1 Field Methods

During the SI field events, surface soil samples were collected using a stainless-steel hand auger. At each surface soil sampling location, a soil sample was generally collected within the 0.5 to 2 feet below ground surface (bgs) interval; specific sample intervals are indicated in each relevant figure. Only two of the soil samples collected during the Fort Drum SI were collected at depths greater than 2 feet bgs (FTD-BLDG2086-1-SO and FTD-B3829-1-SO). Subsurface soil samples were collected from both FTD-BLDG2086-1-SO and FTD-B3829-1-SO at 20 feet bgs to capture potential PFOS, PFOA, and PFBS presence at the depth of the adjacent OWS. Coordinates for each soil sampling location were recorded using a handheld global positioning system capable of achieving 0.1 foot vertical and horizontal accuracy.

Surface water samples were collected as part of the SI using direct-fill methods just below the water surface. At locations where surface water samples were co-located with sediment samples, the surface water samples were collected before sediment samples to reduce siltation. Field parameters (e.g., temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured at the time of surface water sampling. Coordinates for each surface water sampling location were recorded using a handheld global positioning system capable of achieving 0.1 foot vertical and horizontal accuracy. The field instrument used to document sample locations during the Phase 1 mobilization was a Leica GS15 rover with a Leica CS20 controller, a Leica GS15 GPS rover with a Leica CS15 controller during the Phase 2 mobilization, and a Leica GS18 GPS rover with a Leica CS20 controller during the third mobilization.

Sediment samples were collected from the upper 10 centimeters using a decontaminated Lexan tube and stainless-steel trowel. Sediment samples were decanted before bottling for laboratory analysis. Coordinates for each sediment sampling location were recorded using a handheld global positioning system capable of achieving 0.1 foot vertical and horizontal accuracy.

During the first SI mobilization (December 2019 to January 2020), groundwater samples were collected following the installation and development of monitoring wells via sonic drilling. During the second (October 2020 to December 2020) and third (September 2021 to October 2021) SI mobilizations, groundwater samples were collected following the installation of temporary monitoring wells via DPT drilling, or HSA drilling if refusal was encountered during DPT drilling. Monitoring well screens were placed within the first-encountered water-bearing zone.

All groundwater samples were collected using low-flow purging methods from approximately the center of the saturated screened intervals. Sampling depths for each of the groundwater samples collected during the SI are listed in **Table 6-1** and on each applicable figure. Well construction details (e.g., screen length, screen slot size, depth, filter pack material) are included in **Appendix L**. Field parameters (e.g., temperature, pH, specific conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential) were measured during well purging and allowed to stabilize prior to sampling to allow for collection of a representative sample. Coordinates for each new groundwater monitoring well were surveyed by a New York State licensed surveyor.

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 Phase 1 and Phase 2 QAPP Addenda provide QA/QC requirements for field duplicates, matrix spike/matrix spike duplicates, equipment blanks (EBs), source blanks (SBs) for water used in the initial decontamination step for drill tooling, and field blanks (FBs) for laboratory-supplied water used in the final decontamination step.

QA/QC samples were collected at the frequencies specified in the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) and subsequent FCRs, 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. EBs were collected for media sampled for PFOS, PFOA, and PFBS, at a frequency of one per piece of relevant equipment for each sampling event, as specified in the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) and subsequent FCRs. The decontaminated reusable equipment from which EBs were collected include sample tubing, drill tooling, sample liners, stainless-steel trowel, hand augers, bladder pump, and water-level meters as applicable to the sampled media. SBs were collected from the water used to pressure-wash drill tooling as well as from the water used as the initial step of equipment decontamination. Analytical results for blank samples are discussed in **Section 7.29**.

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) occurred during the Fort Drum SI field work.

In some cases, clarifications to the established scope of work were needed but do not necessarily constitute a non-conformance from the sampling plans described in the Phase 1 and Phase 2 QAPP Addenda. Minor modifications from and clarifications for the procedures and scope of work detailed in the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) and PQAPP (Arcadis 2019a) and that did not affect DQOs are documented in FCRs included as **Appendix N** and are summarized below:

- FCR-FTD-01: The drilling subcontractors used water from the Fort Drum Central Wash Rack, which is a closed loop system supplied by recycled water from the facility and associated holding ponds. Occasionally, the Fort Drum Central Wash Rack water supply is supplemented by the Fort Drum water treatment plant during the winter months. However, at the time of the Phase 1 QAPP

Addendum planning it was thought that the sole source of the Fort Drum Central Wash Rack was the Fort Drum water treatment plant, which was historically documented to contain low estimated concentrations of PFAS constituents (PFOS, PFOA and PFBS were detected at laboratory estimated concentrations of 0.5 ng/L, 0.6 ng/L, and 0.9 ng/L, respectively, during an August 2019 sampling event). As agreed upon with the Army PA team, field event samples were collected for trihalomethanes (THM), so the results could be used as a tracer to evaluate whether any low-level PFOS, PFOA, and PFBS detections in groundwater samples collected during the investigation might be attributable to drilling water and not formation groundwater. The Phase 1 drilling was completed via rotosonic method, which can require large volumes of drilling water. The SI project team determined the Central Wash rack water to be an acceptable source of drilling water since locating and transporting water in from another off-post source was not practical given schedule restrictions at the time of the investigation but wanted to gather another line of evidence that PFOS, PFOA and PFBS detections in the groundwater samples would not be due to detections in the source water. Another SB sample was collected from the equipment wash rack during the Phase 1 SI which had similar, low level PFOS, PFOA, and PFBS detections (PFOS, PFOA and PFBS were detected at laboratory estimated concentrations of 1.1 ng/L, 1.3 ng/L, and 1.2 ng/L, respectively). The SB sample was also analyzed for THMs: bromodichloromethane, bromoform, chlorodibromomethane and chloroform, which are common byproducts produced during the potable water disinfection process. The ratio of PFOS, PFOA, and PFBS concentrations to THM concentrations detected in the SB was compared to the ratios detected in groundwater samples collected during the SI, to evaluate whether PFOS, PFOA, or PFBS detections in environmental samples might have originated in the source water. Groundwater samples collected from seven monitoring wells located closest to the Fort Drum potable wellfield were analyzed for THMs; but the PFOS, PFOA and PFBS concentrations detected in the groundwater samples were uniformly higher than those detected in the SB samples from the wash rack. Therefore, the PFOS, PFOA and PFBS detections in the groundwater samples collected as part of Phase 1 were not partly due to detections in the source water and the DQOs were not affected. Groundwater samples collected during the Phase 2 SI were not analyzed for THMs since Phase 2 drilling was performed using DPT and HSA methods, which require limited drilling water use.

- FCR-FTD-02: Existing monitoring well 1795-MWS10 was sampled instead of planned monitoring well WWII-002 for PFOS, PFOA, and PFBS at the Storm Sewer Deployment AOPI. The Army decommissioned monitoring well WWII-002 just before the planned sampling. Monitoring well 1795-MWS10 is located proximal to and downgradient to the Storm Sewer Deployment AOPI, therefore the DQOs were not affected.
- FCR-FTD-03: The planned drilling method (DPT) was unsuccessful at three groundwater sampling locations due to refusal. Instead, HSA drilling was utilized to advance borings to first-encountered groundwater at three groundwater sampling locations (i.e., FTD-SludgePile-1-GW, FTD-FS1-1-GW, and FTD-19710/2060-1-GW). This change did not impact DQOs.
- FCR-FTD-04: There were two changes in QA/QC sample collection from the Phase 2 Fort Drum QAPP Addendum. A second SB (FTD-SB-2) was not collected because a second source of water for field activities was not used. A fourth FB (FTD-FB-4) was collected because of the field sample counts requirements (i.e., one per every 20 parent samples). This change did not impact DQOs.

- FCR-FTD-05: Following Phase 2, USAEC directed additional SI sampling at Fort Drum to bolster rationale for an RI or no further action at this time at select AOPIs (Fire Station #2 – Building 1585, Former Airfield Fire Station [Building 2041], Former Army Fire Station [Building 1860], Hangar 2060 Fire Suppression System, and Fire Station #1 [Building 10710]. A follow-on sampling event was conducted in September to October 2021 and the FCR detailing the sampling scope is included in **Appendix N**.
- FCR-FTD-06: During the Draft PA/SI report review, Fort Drum Real Property staff noted the location of the Former Army Fire Station (Building 1884) was incorrect and is the location of a Historical Tank Repair/Vehicle Maintenance Shop. The incorrect location (Former Army Fire Station [Building 1884]) had been provided to the PA/SI team in the records review process. The correct historical location for the Former Army Fire Station was identified as former Building 1860 by Fort Drum Real Property staff and is located less than 300 feet east of the incorrect location. As a result:
    - The SI team collected two groundwater samples from existing monitoring wells at the correct AOPI location (Former Army Fire Station [Building 1860]), 3805-001 and PCERI-MW-10I, during the October 2021 mobilization. Monitoring wells 3805-001 and PCERI-MW-10I are located adjacent to the correct location of the AOPI and will be sampled via low-flow purging and sampling procedures.
    - Due to the presence of PFOS, PFOA, and PFBS in groundwater at the Historical Tank Repair/Vehicle Maintenance Shop (Fall 2020 and 2021 SI sampling), the Historical Tank Repair/Vehicle Maintenance Shop is also retained as an AOPI. As a result, the sample ID for the groundwater sample collected adjacent to the Historical Tank Repair/Vehicle Maintenance Shop in Fall 2021 was revised to FTD-TR&VMS-1-GW.
- FCR-FTD-07: As described in FCR-05, three groundwater samples (FTD-FS1-2-GW, FTD-FS1-3-GW, FTD-FS1-4-GW) were proposed for collection at Fire Station #1 (Building 10710) via HSA drilling methods at suspected downgradient locations (i.e., exact groundwater flow is unknown). Due to geologic/hydrogeologic conditions, none of the three proposed groundwater samples were collected. Field teams mobilized to Fire Station #1 (Building 10710) in October 2021 and advanced each of the three borings to bedrock before installing a temporary monitoring well/piezometer at each location. Bedrock was encountered at 11.5 feet bgs at FTD-FS1-2-GW, at 10 feet bgs at FTD-FS1-3-GW, and 8.5 feet bgs at FTD-FS1-4-GW. However, all three borings encountered bedrock before first groundwater was reached and groundwater did not recharge in any of the three temporary wells over a four-week waiting period. Therefore, groundwater was not collected from any of the new borings. All three of the dry temporary wells will be abandoned consistent with procedures outlined in the Fort Drum Phase 2 QAPP Addendum. The available groundwater data collected at Fire Station #1 (Building 10710) during the SI exceeds OSD risk screening levels. Therefore, the recommendation for further study in a remedial investigation (RI) was not affected by the inability to collect the three groundwater samples discussed above. Based on the lack of groundwater in the overburden in the vicinity of Fire Station #1 (Building 10710), overburden migration is very unlikely.

6.3.4 Decontamination

Non-dedicated reusable sampling equipment (e.g., drill tooling, stainless-steel trowel, hand auger, bladder pump, water-level meters) that came into direct contact with sampling media were decontaminated before first use, between sampling locations/intervals, and before demobilization in accordance with P-09, TGI - Groundwater and Soil Sampling Equipment Decontamination (Arcadis 2019, **Appendix A**).

6.3.5 Investigation-Derived Waste

IDW, including soil cuttings and decontamination water, were segregated by medium and placed in Department of Transportation approved 55-gallon drums, labeled as non-hazardous, and staged at a temporary staging area and transported to Ecoflo in Greensboro, North Carolina for final disposal. Excess sediment, surface water, and purged groundwater were disposed back to ground surface at the point of collection. Disposable equipment IDW was collected in trash bags and disposed in municipal waste receptacles on post. Equipment IDW includes personal protective equipment and other disposal materials (e.g., gloves, plastic sheeting, tubing) that may have come in contact with sampled media.

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 events were submitted to Eurofins Lancaster Laboratories Environmental, 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 2019a). Eighteen PFAS-related compounds, including PFOS, PFOA, and PFBS, were analyzed for in groundwater, soil, surface water, and sediment samples using an analytical method that is ELAP-accredited and compliant with QSM 5.1.1, Table B-15.

Additionally, the following general chemistry and physical characteristic analyses were completed for select blank, groundwater, soil, and sediment samples in accordance with Worksheet #18 of the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) by the analytical methods noted:

- Total organic carbon (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.

As discussed in **Section 6.3.3** above, a subset of the groundwater samples collected during the Phase I SI were also analyzed for THMs by USEPA 524.2, to provide a means to quantify potential PFOS, PFOA, and PFBS contributions from residual drilling water in environmental samples.

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

6.4.2 Data Validation

All analytical data generated during the SI, except grain size and THMs, were verified and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019a). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.1.1 (DoD 2018) and 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 O**. The Level IV analytical reports are included within **Appendix O** in the final electronic deliverable only.

6.4.3 Data Usability Assessment and Summary

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

Based on the final data usability assessment, the environmental data collected at Fort Drum during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUSR and its associated data validation reports (**Appendix O**), and as indicated in the full analytical tables (**Appendix P**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019a), Fort Drum Phase 1 QAPP Addendum (Arcadis 2019b), and Fort Drum Phase 2 QAPP Addendum (Arcadis 2021). Data qualifiers applied to laboratory analytical results for samples collected during the SI at Fort Drum 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 figure notes.

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, PFBS in Tap Water and Soil Using USEPA's Regional Screening Level Calculator

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

Notes:

1. Risk screening levels for tap water and soil provided by the OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15 (**Appendix A**).
2. All soil and/or sediment data will be screened against both the Residential Scenario and Industrial/Commercial risk screening levels (if collected from less than 2 feet bgs), regardless of the current and projected land use of the AOPI. Soil samples collected from greater than 2 feet but less than 15 feet bgs will be compared to the Industrial/Commercial risk screening levels only, and soil samples collected from greater than 15 feet bgs will not be compared to either risk screening level.

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

The OSD residential tap water risk screening levels will be used to compare all groundwater and select surface water data (i.e., only if surface water is a direct expression of groundwater and/or used as a source of drinking water) for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at Fort Drum are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil data. Sediment data collected as part of the SI were not compared to the OSD risk screening levels for soil since the sediment sample collection areas were not representative of soil exposures. The data from the SI sampling events are compared to the OSD risk screening levels (**Table 6-2**) in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than the applicable OSD risk screening levels, further study in an RI 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 Fort Drum (field duplicate results are provided in the associated tables) for 30 of the 36 AOPIs. Sampled media and QA/QC samples were analyzed for the constituents prescribed per Worksheet #18 of the Phase I and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021). The sample results discussion below focuses on the PFOS, PFOA, and PFBS analytical results because they have OSD risk screening levels. The Army will make subsequent investigation decisions based on these constituents' concentrations relative to the OSD risk screening levels.

Tables 7-1 through **7-4** provide a summary of the groundwater, soil, surface water, and sediment analytical results for PFOS, PFOA, and PFBS. **Table 7-5** summarizes AOPIs sampled as part of this SI only (and the Route 26 Car Crash because data collected during the SI from the OSL was used to make recommendations for the Route 26 Car Crash AOPI) and whether their SI results exceed the OSD risk screening levels. As stated in **Section 6.5**. the OSD residential tap water risk screening levels will be used to compare select surface water data (i.e., only if surface water is a direct expression of groundwater and/or used as a source of drinking water) for this Army PFAS PA/SI. None of the surface water at Fort Drum is currently used as a source of drinking water. However, some surface water samples at Fort Drum represent a direct expression of groundwater (e.g., seeps) and are therefore compared to the OSD risk screening levels for tap water in subsections below. The subsections below include rationale for whether the referenced surface water sample is comparable to the OSD risk screening levels. **Appendix P** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at Fort Drum with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-23** show the PFOS, PFOA, and PFBS analytical results in groundwater, soil, and surface water and sediment for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and 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 6.4.2**) are defined and presented on the analytical tables. Groundwater and surface water data collected during the SI are reported in ng/L, or parts per trillion, and soil and sediment data are reported in mg/kg, or parts per million.

Field parameters measured for groundwater during low-flow purging and sample collection and for surface water during sample collection are provided on the field forms in **Appendix L**. Soil and sediment descriptions are provided on the field forms in **Appendix L**. The results of the SI are grouped by AOPI and discussed for each medium as applicable.

Table 7-5 AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Fire Station #3 and Nozzle Testing Area	Yes
Mountain Ramp Nozzle Testing Area	Yes
Hangar 2070 Fire Suppression System	Yes
Hangar 2072 Fire Suppression System	Yes

AOPI Name	OSD Exceedances (Yes/No)
Hangar 2074 Fire Suppression System	Yes
Building 2725	No
Former Army Fire Station (George & Cannon, Building 3828)	No
Building 19855 Fire Suppression System	Yes
Hangar 19710 Fire Suppression System	No
Hangar 2060 Fire Suppression System	Yes
Hangar 2049 Fire Suppression System	Yes
Hangar 2050 Fire Suppression System	Yes
Former WWTP	No
Former WWTP Sludge Beds	No
Former Army Fire Station (Building 1860)	Yes
Fire Station #1 (Building 10710)	Yes
Former Army Fire Station (Kennedy & Dunn, Building 2419)	Yes
Building 2018 Soil Barn	No
Former Building 1131 AFFF Storage and Spill	Yes
Old Sanitary Landfill (OSL)	No
Route 26 Car Crash	No
Storm Sewer AFFF Deployment	No
Sludge Pile Near OSL	Yes
Former Fire Station 3 (Building 181)	No
Former Fire Station (Building T-2330)	Yes
Building 3829 Oil Water Separator (OWS)	No
Former Building 1943 OWS	No
Fire Station #2 (Building 1585)	Yes
Historical Tank Repair/ Vehicle Maintenance Shop	No
Former Airfield Fire Station (Building 2041)	No

7.1 Fire Station #3 and Nozzle Testing Area

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Fire Station #3 and Nozzle Testing Area.

7.1.1 Groundwater

Three groundwater monitoring wells were installed south of Fire Station #3 and Nozzle Testing Area AOPI where AFFF was sprayed on soil and where AFFF runoff from pavement accumulated (**Figure 7-2**).

PFOA (14 ng/L) and PFBS (2.8 J+ [the result is an estimated quantity; the result may be biased high] ng/L) were detected in groundwater sample FTD-FS3/NOZZLE-1-GW, below the OSD risk screening levels. PFOS was not detected in groundwater sample FTD-FS3/NOZZLE-1-GW (**Table 7-1**).

PFOA (15 ng/L) and PFBS (3.4 ng/L) were detected in groundwater sample FTD-FS3/NOZZLE-2-GW, below the OSD risk screening levels. PFOS was not detected in groundwater sample FTD-FS3/NOZZLE-2-GW (**Table 7-1**).

PFOS (2,400 J [the result is an estimated quantity] ng/L) and PFOA (45 ng/L) were detected above the OSD risk screening level (40 ng/L) in groundwater sample FTD-FS3/NOZZLE-3-GW. PFBS (7.2 ng/L) was detected below the OSD risk screening level (600 ng/L) in FTD-FS3/NOZZLE-3-GW (**Table 7-1**).

7.1.2 Soil

A total of seven surface soil samples were collected via hand auger to the south, southwest, and west of Fire Station #3 and Nozzle Testing Area, where AFFF was directly sprayed on soil and where AFFF runoff from pavement accumulated (**Figure 7-2**).

None of the surface soil samples collected at the AOPI contained PFOS, PFOA, or PFBS concentrations that exceeded the OSD residential risk screening levels for soil (0.13 mg/kg). The maximum PFOS concentration (0.021 mg/kg) was detected in FTD-FS3/NOZZLE-1-SS and the maximum PFOA concentration (0.0012 mg/kg) was detected in FTD-FS3/NOZZLE-6-SS. PFBS was not detected in any of the surface soil samples collected at the AOPI. (**Table 7-2**).

7.2 Mountain Ramp Nozzle Testing Area

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

7.2.1 Groundwater

Three new groundwater monitoring wells and one pre-existing monitoring well within the AOPI were sampled. The wells are located on the north and eastern sides of the pavement, where AFFF was sprayed on soil and where AFFF runoff from pavement accumulated (**Figure 7-3**).

PFOS (71 ng/L) and PFOA (40 ng/L) were detected at or above the OSD risk screening level (40 ng/L) in groundwater sample FTD-OBS-05. PFBS (11 ng/L) was detected in groundwater sample FTD-OBS-05 at a concentration less than the OSD risk screening level (600 ng/L) (**Table 7-1**).

PFOS (170 J ng/L) was detected above the OSD risk screening level (40 ng/L) in groundwater sample FTD-MTNRAMP-1-GW. PFOA (28 ng/L) and PFBS (2.4) were detected in groundwater sample FTD-MTNRAMP-1-GW at concentrations less than their OSD risk screening levels (40 ng/L and 600 ng/L, respectively) (**Table 7-1**).

PFOS (3.9 ng/L), PFOA (31 ng/L), and PFBS (25 ng/L) were detected in groundwater sample FTD-MTNRAMP-2-GW at concentrations below the OSD risk screening levels (**Table 7-1**).

PFBS (4.5 ng/L) was detected in groundwater sample FTD-MTNRAMP-3-GW, below the OSD risk screening level (600 ng/L). PFOS and PFOA were not detected in groundwater sample FTD-MTNRAMP-3-GW (**Table 7-1**).

7.2.2 Soil

A total of six surface soil samples were collected via hand auger to the north and east of the pavement, where AFFF was sprayed on soil and where AFFF runoff from pavement accumulated (**Figure 7-3**).

The maximum PFOS detection (0.019 J mg/kg) was observed in FTD-MTNRAMP-6-SS, less than the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected in any of the six surface soil samples (**Table 7-2**).

7.3 Hangar 2070, Hangar 2072, and Hangar 2074

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Hangar 2070, Hangar 2072, and Hangar 2074. As described in **Section 5**, sanitary sewer drains within Hangar 2070, Hangar 2072, and Hangar 2074, which likely received AFFF during fire suppression system testing events, lead to the Building 2086 OWS. Additionally, stormwater drains proximal to Hangar 2070, Hangar 2072, and Hangar 2074 discharge to the WSAAF stormwater detention/infiltration basin and Culvert 42, where AFFF runoff from fire suppression system testing at these hangars would be conveyed. Subsurface soil and groundwater at Building 2086 OWS were evaluated for PFOS, PFOA, and PFBS presence or absence related to the Hangar 2070, Hangar 2072, and Hangar 2074 AOPIs (**Figure 7-4**). Surface soil was not sampled at Building 2086 OWS because the OWS and associated infrastructure (i.e., where PFOS, PFOA, PFBS wastes were potentially transported) are located approximately 20 feet below grade.

7.3.1 Groundwater

A total of four monitoring wells were installed to investigate the presence or absence of PFOS, PFOA, and PFBS from the fire suppression systems in Hangar 2070, Hangar 2072, and Hangar 2074. One new monitoring well is near Culvert 42 (FTD-HNG-3-GW); two new monitoring wells are in the vicinity of the WSAAF stormwater detention/infiltration basin (FTD-HNG-1-GW and FTD-HNG-2-GW); and one new monitoring well is at Building 2086 OWS (FTD-BLDG2086-1-GW) (**Figure 7-4**).

PFOS (44 ng/L) was detected above the OSD risk screening level (40 ng/L) in one of the four groundwater samples (FTD-HNG-2-GW) and below the OSD risk screening level in the remaining three groundwater samples (16 ng/L at FTD-HNG-1-GW, 2.4 ng/L at FTD-HNG-3-GW, and 30 ng/L at FTD-BLDG2086-1-GW) (**Table 7-1**). PFOA was detected below the OSD risk screening level (40 ng/L) in all four groundwater samples (11 ng/L at FTD-HNG-1-GW, 8.2 ng/L at FTD-HNG-2-GW, 2.4 ng/L at FTD-HNG-3-GW, and 6.0 ng/L FTD-BLDG2086-1-GW) (**Table 7-1**). PFBS was detected below the OSD risk screening level (600 ng/L) in three of the four groundwater samples (1.1 J ng/L at FTD-HNG-1-GW, 4.0 ng/L at FTD-HNG-2-GW, and 3.0 ng/L at FTD-BLDG2086-1-GW). PFBS was not detected in groundwater sample FTD-HNG-3-GW (**Table 7-1**).

7.3.2 Soil

One soil sample (FTD-BLDG2086-1-SO) was collected at an interval of 20 feet to 21.3 feet bgs, the same depth of the adjacent OWS at Building 2086, where sanitary wastes including AFFF deployed within the hangars, were directed (**Figure 7-4**).

PFOS, PFOA, and PFBS were not detected in soil sample FTD-BLDG2086-1-SO (**Table 7-2**).

7.3.3 Surface Water

One surface water sample (FTD-HNGCLVRT42-1-SW), collocated with sediment sample FTD-HNGCLVRT42-1-SE, was collected near Culvert 42 on the Lower Airfield Creek, where stormwater flows from Hangar 2070, Hangar 2072, and Hangar 2074, eventually discharge (**Figure 7-4**). Sample results for surface water sample FTD-HNGCLVRT42-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample is not a direct expression of groundwater at the related AOPIs, and the associated surface water body (Lower Airfield Creek) is not used as a source of drinking water.

PFOS (0.98 J ng/L) was detected in surface water sample FTD-HNGCLVRT42-1-SW. PFOA and PFBS were not detected in surface water sample FTD-HNGCLVRT42-1-SW (**Table 7-3**).

7.3.4 Sediment

One sediment sample (FTD-HNGCLVRT42-1-SE), collocated with surface water sample FTD-HNGCLVRT42-1-SW, was collected from near Culvert 42 on the Lower Airfield Creek, where stormwater flows from Hangar 2070, Hangar 2072, and Hangar 2074, eventually discharge (**Figure 7-4**).

PFOS, PFOA, and PFBS were not detected in sediment sample FTD-HNGCLVRT42-1-SE (**Table 7-4**).

7.4 Building 2725

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 2725.

7.4.1 Groundwater

One grab groundwater sample, FTD-B2725-1-GW, was collected from a soil boring located outside the door on the downgradient side of Building 2725 (**Figure 7-5**).

PFOS, PFOA, and PFBS were not detected in groundwater sample FTD-B2725-1-GW (**Table 7-1**).

7.4.2 Soil

Two surface soil samples (FTD-B2725-1-SO and FTD-B2725-2-SO) were collected from outside Building 2725 doors to assess potential impacts of AFFF that may have spilled during loading and unloading of AFFF containers, or from potential indoor leaks AFFF within the building that may have flowed out through the doors (**Figure 7-5**).

PFOS, PFOA, and PFBS were not detected in either soil sample collected at the AOPI (**Table 7-2**).

7.5 Former Army Fire Station (George & Cannon, Building 3828)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Army Fire Station (George & Cannon, Building 3828).

7.5.1 Groundwater

One grab groundwater sample (FTD-FAFS [G+C]-1-GW) was collected from a soil boring located downgradient of the historical building footprint to capture potential AFFF impacts associated with potential AFFF use, storage, and/or disposal during the former fire station's operational period (**Figure 7-6**).

PFOS (17 ng/L) and PFOA (2.2 ng/L) were detected in groundwater sample FTD-FAFS [G+C]-1-GW at concentrations below the OSD risk screening level (40 ng/L) (**Table 7-1**). PFBS (1.6 J ng/L) was detected in groundwater sample FTD-FAFS [G+C]-1-GW at a concentration below the OSD risk screening level (600 ng/L) (**Table 7-1**).

7.5.2 Soil

Three surface soil samples (FTD-FAFS [G+C]-1-SO, FTD-FAFS [G+C]-2-SO, and FTD-FAFS [G+C]-3-SO) were collected via hand auger from the west, south, and east sides of the historical building footprint to capture potential AFFF impacts associated with filling AFFF tanks on fire trucks and from fire truck washing (**Figure 7-6**).

PFOS (0.00083 mg/kg) was detected in surface soil sample FTD-FAFS [G+C]-1-SO, less than the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected in sample FTD-FAFS [G+C]-1-SO. PFOA, PFOS, and PFOA were not detected in the other two soil samples. (**Table 7-2**).

7.6 Building 19855 Fire Suppression System

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 19855 Fire Suppression System.

7.6.1 Groundwater

One groundwater sample (FTD-ASL-MW943) was collected from existing monitoring well ASL- MW943, which is located downgradient of Building 19855 (**Figure 7-7**).

PFOS (65 J- [the result is an estimated quantity; the result may be biased low] ng/L) was detected in groundwater sample FTD-ASL-MW943 at a concentration above the OSD risk screening level (40 ng/L). PFOA (32 ng/L) and PFBS (7.1 ng/L) were detected at concentrations below the OSD risk screening level (**Table 7-1**).

7.6.2 Soil

Four surface soil samples (FTD-19855-1-SO, FTD-19855-2-SO, FTD-19855-3-SO, and FTD-19855-4-SO) were collected via hand auger. The four surface soil samples were collected from the grassy area

surrounding the pavement at Building 19855 to capture potential releases of AFFF that were not conveyed to the sanitary sewer system within the building (**Figure 7-7**).

PFOS was detected in one surface soil sample (0.00062 mg/kg) at concentrations below the OSD risk screening level (0.13 mg/kg) at FTD-19855-2-SO. Additionally, PFOA was detected (0.00084 mg/kg) in surface soil sample FTD-19855-3-SO below the OSD residential risk screening level (0.13 mg/kg). PFOA, PFOS and PFBS were not detected in the remaining surface soil samples at the AOPI (**Table 7-2**).

7.7 Hangar 19710 Fire Suppression System

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Hangar 19710 Fire Suppression System.

7.7.1 Groundwater

One grab groundwater sample (FTD-19710/2060-1-GW) was collected following HSA drilling. The grab groundwater sample was collected immediately downgradient of Hangar 2060 and Hangar 19710 to assess potential releases from the AFFF suppression systems at Hangar 2060 and Hangar 19710 (**Figure 7-8**).

PFOS (3.2 ng/L) and PFOA (3.2 ng/L) were detected in groundwater sample FTD-19710/2060-1-GW at concentrations less than the OSD risk screening level (40 ng/L). PFBS (2.3 ng/L) was detected in groundwater sample FTD-19710/2060-1-GW at a concentration less than the OSD risk screening level (600 ng/L) (**Table 7-1**).

7.7.2 Soil

Two surface soil samples (FTD-19710-1-SO and FTD-19710-2-SO) were collected via hand auger near to the edge of the tarmac at Hangar 19710 to capture potential impacts of AFFF that did not enter the sanitary sewer system within the building (**Figure 7-8**).

PFOS, PFOA, and PFBS were not detected in surface soil samples FTD-19710-1-SO and FTD-19710-2-SO (**Table 7-2**).

7.7.3 Surface Water

One grab surface water sample (FTD-OF01-1-SW) was collected from the discharge channel between stormwater outfall OF-01 and the Black River (**Figure 7-8**). Outfall OF-01 receives stormwater flow from the area of WSAAF that includes Hangars 19710 and 2060, including any potential AFFF releases to stormwater from the fire suppression systems at these two AOPIs. Sample results for surface water sample FTD-OF01-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample is not a direct expression of groundwater at the related AOPIs, and the associated surface water body (stormwater discharge channel) is not used as a source of drinking water

PFOS (2.9 ng/L) and PFOA (1.2 J ng/L) were detected in surface water sample FTD-OF01-1-SW. PFBS was not detected (**Table 7-3**).

7.7.4 Sediment

Two sediment samples (FTD-OF01-1-SE and FTD-OF01-2-SE) were collected to assess potential AFFF releases from both Hangar 2060 and Hangar 19710 fire suppression systems. One sediment sample was collected from the settling basin at outfall OF-01 (FTD-OF01-2-SE). The second sediment sample was collected from the discharge channel immediately downstream of OF-01 and was co-located with surface water sample FTD-OF01-1-SW (**Figure 7-8**).

PFOS, PFOA, and PFBS were not detected in sediment samples FTD-OF01-1-SE and FTD-OF01-2-SE (**Table 7-4**).

7.8 Hangar 2060 Fire Suppression System

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Hangar 2060 Fire Suppression System.

7.8.1 Groundwater

One grab groundwater sample (FTD-2060-1-GW) was collected following HSA drilling. The grab groundwater sample was collected immediately behind Hangar 2060, near the stormwater collection drain where foam was observed by site personnel in the 2010s (**Figure 7-8**).

PFOA (61 ng/L) was detected in groundwater sample FTD-2060-1-GW at a concentration above the OSD risk screening level (40 ng/L). PFOS (25 ng/L) and PFBS (4.5 ng/L) were detected in groundwater sample FTD-2060-1-GW at concentrations less than their OSD risk screening levels (40 ng/L and 600 ng/L, respectively) (**Table 7-1**).

Please see **Section 7.7.1** for groundwater data collected downgradient of the Hangar 2060 Fire Suppression System AOPI.

7.8.2 Soil

One surface soil sample (FTD-2060-1-SO) was collected via hand auger. The surface soil sample was collected adjacent to the tarmac behind Hangar 2060, where stormwater runoff is directed, to capture potential releases of AFFF that were not conveyed to the sanitary sewer system within the building or captured in the stormwater drains on the tarmac (**Figure 7-8**). As noted in **Section 5.2.9**, personnel on post recalled watching foam flow out of the back of Hangar 2060 and toward the stormwater drains behind the building.

PFOS (0.00081 mg/kg) and PFOA (0.0062 mg/kg) were detected in surface soil sample FTD-2060-1-SO at concentrations below the OSD residential risk screening level (0.13 mg/kg). PFBS was not detected.

7.8.3 Surface Water

Please see **Section 7.3.3**. As described in the Phase 2 QAPP Addendum (Arcadis 2021), surface water data from surface water sample FTD-OF01-1-SW will be used to evaluate PFOS, PFOA, and PFBS in surface water at Hangar 2060.

7.8.4 Sediment

Please see **Section 7.7.4**. As described in the Phase 2 QAPP Addendum (Arcadis 2021), sediment data from sediment samples FTD-OF01-1-SE and FTD-OF01-2-SE will be used to evaluate PFOS, PFOA, and PFBS in sediment at Hangar 2060.

7.9 Hangar 2049 Fire Suppression System

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Hangar 2049 Fire Suppression System.

7.9.1 Groundwater

As described in the Phase 2 QAPP Addendum (Arcadis 2021), existing groundwater data from shallow monitoring well MW-5 was used to evaluate PFOS, PFOA, and PFBS presence in groundwater at Hangar 2049 and Hangar 2050 AOPIs. Please see **Section 2.12** and **Figure 7-9** for historical data.

7.9.2 Soil

One surface soil sample (FTD-2049-1-SO) was collected via hand auger on the tarmac edge at Hangar 2049 to capture potential releases of AFFF that were not conveyed to the sanitary sewer system within the building or to the stormwater drains on the tarmac (**Figure 7-9**).

PFOS, PFOA, and PFBS were not detected in surface soil sample FTD-2049-1-SO (**Table 7-2**).

7.9.3 Surface Water

One surface water sample (FTD-OF06-1-SW) was collected at stormwater outfall OF-06 (**Figure 7-9**). Stormwater from the vicinity of Hangar 2049 discharges to OF-06, and thus, AFFF released from the fire suppression system that was not conveyed to the sanitary sewer system would have discharged to this outfall as well. Sample results for surface water sample FTD-OF06-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample is not a direct expression of groundwater at the related AOPIs, and the associated surface water body (Dam Creek) is not used as a source of drinking water.

PFOS (120 ng/L), PFOA (27 ng/L) and PFBS (3.6 ng/L) were detected in surface water sample FTD-OF06-1-SW) (**Table 7-3**).

7.9.4 Sediment

One sediment sample (FTD-OF06-1-SE) was collected at outfall OF-06, co-located with surface water sample FTD-OF06-1-SW (**Figure 7-9**).

PFOS, PFOA, and PFBS were not detected in sediment sample FTD-OF06-1-SE (**Table 7-4**).

7.10 Hangar 2050 Fire Suppression System

The subsections below summarize the groundwater, soil, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with Hangar 2050 Fire Suppression System.

7.10.1 Groundwater

As described in the Phase 2 QAPP Addendum (Arcadis 2021), existing groundwater data from shallow monitoring well MW-5 was used to evaluate PFOS, PFOA, and PFBS presence in groundwater at Hangar 2049 and Hangar 2050 AOPIs. Please see **Section 2.12** and **Figure 7-9** for historical data.

7.10.2 Soil

Two surface soil samples (FTD-2050-1-SO and FTD-2050-2-SO) were collected via hand auger on the tarmac edges at Hangar 2050 to capture potential releases of AFFF that were not conveyed to the sanitary sewer system within the building or to the stormwater drains on the tarmac (**Figure 7-9**).

PFOS was detected (0.0021 mg/kg) in surface soil sample FTD-2050-1-SO below the OSD risk screening level (0.13 mg/kg). PFOA and PFBS were not detected. PFOS (0.00067 mg/kg) was detected in surface soil sample FTD-2050-2-SO below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

7.10.3 Surface Water

Please see **Section 7.9.3**. As described in the Phase 2 QAPP Addendum (Arcadis 2021), surface water data from sample FTD-OF06-1-SW will be used to evaluate PFOS, PFOA, and PFBS in surface water resulting from potential fire suppression system discharges at Hangar 2050.

7.10.4 Sediment

Please see **Section 7.9.4**. As described in the Phase 2 QAPP Addendum (Arcadis 2021), sediment data from FTD-OF06-1-SE will be used to evaluate PFOS, PFOA, and PFBS in sediment resulting from potential fire suppression system discharges at Hangar 2050.

7.11 Former WWTP

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former WWTP. Soil surrounding the Former WWTP was not sampled since the suspected release and disposal of PFAS-containing materials was to the Former WWTP infrastructure, not the surrounding soils. Since the exact potential release area is unknown and likely in the subsurface soil underlying the existing infrastructure, subsurface soil was also not sampled during the SI.

7.11.1 Groundwater

One grab groundwater sample (FTD-WWTP-1-GW) was collected following DPT drilling. The exact area of potential release is unknown but would likely have occurred as AFFF entrained in wastewater discharged to the subsurface soil from leaks in the WWTP process vessels and/or piping. Therefore, the

groundwater sample was collected immediately downgradient of the Former WWTP to capture AFFF that might have been released via leaks in the Former WWTP infrastructure (**Figure 7-10**).

PFOA (2.2 ng/L) was detected in groundwater sample FTD-WWTP-1-GW below the OSD risk screening level (40 ng/L). PFOS and PFBS were not detected (**Table 7-1**).

7.12 Former WWTP Sludge Beds

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former WWTP Sludge Beds. As described in **Section 5.2.14**, the sludge beds were excavated from this area in the early-mid 1990s. Due to the sludge bed excavation and unknown area/depths of possible release, neither surface nor subsurface soil were sampled in the SI.

7.12.1 Groundwater

One grab groundwater sample (FTD-WWTPSB-1-GW) was collected following DPT drilling. The groundwater sample was collected immediately downgradient of the Former WWTP Sludge Drying Beds to capture PFOS, PFOA, and PFBS releases from sludges before they were excavated (**Figure 7-10**).

PFOS (3.6 ng/L) and PFOA (1.4 J ng/L) were detected in groundwater sample FTD-WWTPSB-1-GW below the OSD risk screening level (40 ng/L). PFBS was not detected (**Table 7-1**).

7.13 Former Army Fire Station (Building 1860)

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former Army Fire Station (Building 1860). As shown in **Figure 5-12**, Building 1860 has since been demolished and soil associated with potential PFOS, PFOA, and PFBS releases at the AOPI was likely removed/disturbed when the building was demolished, and surrounding area regraded. Therefore, soil was not sampled during the SI.

7.13.1 Groundwater

Two groundwater samples (FTD-3805-001 and FTD-PCERI-MW-10I) were collected from downgradient existing monitoring wells via low-flow sampling procedures. The downgradient wells were sampled to evaluate potential historical releases of AFFF during the operational period of the fire station (**Figure 7-11**).

PFOA (93 ng/L) was detected in groundwater sample FTD-3805-001 above the OSD risk screening level (40 ng/L). PFOS (8.2 ng/L) and PFBS (100 ng/L) were detected in groundwater sample FTD-3805-001 below their OSD risk screening levels of 40 ng/L and 600 ng/L, respectively (**Table 7-1**).

PFOA (74 ng/L) was detected in groundwater sample FTD-PCERI-MW10I above the OSD risk screening level (40 ng/L). PFOS (36 ng/L) and PFBS (7.5 ng/L) were detected in groundwater sample FTD-PCERI-MW10I below their OSD risk screening levels of 40 ng/L and 600 ng/L, respectively (**Table 7-1**).

7.14 Fire Station #1 (Building 10710)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Fire Station #1 (Building 10710). As described in **Section 6.3.3**, three additional groundwater samples were proposed for collection at Fire Station #1 (Building 10710) via HSA drilling methods, however, due to geologic/hydrogeologic conditions, none of the three proposed groundwater samples were collected.

7.14.1 Groundwater

One grab groundwater sample (FTD-FS1-1-GW) was collected following HSA drilling. The exact area of potential AFFF release is unknown, therefore the groundwater sample was collected from a stormwater drainage swale downgradient from the station driveway to assess AFFF releases from fire truck washing/storage, and transfers into fire truck tanks (**Figure 7-12**).

PFOS (2,700 ng/L) and PFOA (870 ng/L) were detected in groundwater sample FTD-FS1-1-GW at concentrations greater than the OSD risk screening levels (40 ng/L). PFBS was not detected in groundwater sample FTD-FS1-1-GW (**Table 7-1**).

7.14.2 Soil

Two surface soil samples (FTD-FS1-1-SO and FTD-FS1-2-SO) were collected via hand auger within the stormwater drainage swale that potentially received runoff from AFFF releases from the fire station and parking lot/driveway during the operational period. Surface soil sample FTD-FS1-1-SO was co-located with groundwater sample FTD-FS1-1-GW (**Figure 7-12**).

PFOS (0.041 mg/kg) and PFOA (0.0018 mg/kg) were detected in surface soil sample FTD-FS1-1-SO at concentrations below the OSD residential risk screening level (0.13 mg/kg). PFOS (0.033 mg/kg) and PFOA (0.0017 mg/kg) were detected in surface soil sample FTD-FS1-2-SO at concentrations below the OSD residential risk screening level (0.13 mg/kg). PFBS was not detected in either surface soil sample (**Table 7-2**).

7.15 Former Army Fire Station (Kennedy & Dunn, Building 2419)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Army Fire Station (Kennedy & Dunn, Building 2419).

7.15.1 Groundwater

One grab groundwater sample (FTD-FAFS[K+D]-1-GW) was collected following DPT drilling. The potential AFFF release area at the AOPI is unknown. Therefore, the groundwater sample was located downgradient of the historical building footprint to capture historical AFFF releases during the operational period of the fire station (**Figure 7-13**).

PFOS (9.8 ng/L) and PFOA (2.2 ng/L) were detected in groundwater sample FTD-FAFS[K+D]-1-GW at concentrations below the OSD risk screening level (40 ng/L). PFBS was not detected in groundwater sample FTD-FAFS[K+D]-1-GW (**Table 7-1**).

7.15.2 Soil

Two surface soil samples (FTD-FAFS[K+D]-1-SO and FTD-FAFS[K+D]-2-SO) were collected via hand auger. The potential AFFF release area at the AOPI is unknown. Therefore, surface soil sample FTD-FAFS[K+D]-2-SO was collected adjacent to former building where the vehicle bays were located and surface soil sample FTD-FAFS[K+D]-1-SO was collected at the edge of the paved driveway to assess potential AFFF runoff from the fire station driveway. Surface soil sample FTD-FAFS[K+D]-1-SO was co-located with groundwater sample FTD-FAFS[K+D]-1-GW (**Figure 7-13**).

PFOS (0.28 J+ mg/kg) was detected in surface soil sample FTD-FAFS[K+D]-2-SO at a concentration greater than the OSD residential risk screening level (0.13 mg/kg). PFOA (0.0017 J+ mg/kg) was detected lower than the OSD residential risk screening level, and PFBS was not detected (**Table 7-2**).

PFOS (0.048 mg/kg) was detected in surface soil sample FTD-FAFS[K+D]-1-SO lower than the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

7.16 Building 2018 Soil Barn

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 2018 Soil Barn.

7.16.1 Groundwater

As described in the Phase 2 QAPP Addendum (Arcadis 2021), existing groundwater data from downgradient monitoring well OSL-MW-8 was used to evaluate PFOS, PFOA, and PFBS presence in groundwater at Building 2018 Soil Barn. Please see **Section 2.12** and **Figure 7-14** for historical data.

7.16.2 Soil

Two surface soil samples (FTD-B2018-1-SO and FTD-B2018-2-SO) were collected via hand auger. Both surface soil samples were located outside of the loading/paved area where PFAS-containing soils may have been tracked outside of the building (**Figure 7-14**).

PFOS (0.0022 mg/kg) was detected in surface soil sample FTD-B2018-1-SO below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

PFOS (0.00047 J mg/kg) was detected in surface soil sample FTD-B2018-2-SO below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

7.17 Former Building 1131 AFFF Storage and Spill

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Building 1131 AFFF Storage and Spill.

7.17.1 Groundwater

One grab groundwater sample was collected following DPT drilling. The groundwater sample was collected within the Former Building 1131 footprint to capture potential AFFF releases through cracks or floor drains of Former Building 1131 when the AFFF spill occurred (**Figure 7-15**).

PFOS (150 ng/L) was detected in groundwater sample FTD-B1131-1-GW at a concentration greater than the OSD risk screening level (40 ng/L). PFOA (13 ng/L) and PFBS (1.3 J ng/L) were detected in groundwater sample FTD-B1131-1-GW at concentrations below the OSD risk screening level (**Table 7-1**).

7.17.2 Soil

Three surface soil samples (FTD-B1131-1-SO, FTD-B1131-2-SO, and FTD-B1131-3-SO) were collected via hand auger. Each surface soil sample was collected within the historical building footprint to capture potential AFFF releases through cracks or floor drains when the AFFF spill occurred (**Figure 7-15**).

PFOS, PFOA, and PFBS were not detected in surface soil samples FTD-B1131-1-SO, FTD-B1131-2-SO, and FTD-B1131-3-SO (**Table 7-2**).

7.18 Old Sanitary Landfill and Route 26 Car Crash

The subsections below summarize the SI groundwater and surface water PFOS, PFOA, and PFBS analytical results associated with Old Sanitary Landfill. As described in the Phase 2 QAPP Addendum (Arcadis 2021), existing groundwater data from the OSL (**Section 2.12**) as well as surface water (i.e., seeps) data collected during the SI will be used to make recommendations for the Route 26 Car Crash AOPI.

7.18.1 Groundwater

Groundwater monitoring wells within the OSL were sampled for PFOS, PFOA, and PFBS in 2016. Please see **Section 2.12** and **Figure 7-16** for historical data.

7.18.2 Surface Water

Two surface water seep samples (FTD-OSL-LS31 & FTD-OSL-SP03) were collected from existing seep sampling locations related to OSL monitoring to capture groundwater from the OSL prior to discharging to Dam Creek (**Figure 7-16**). Sample results for surface water samples FTD-OSL-LS31 & FTD-OSL-SP03 were compared to the OSD risk screening levels for tap water because the surface water sample is a direct expression of groundwater at the related AOPIs (i.e., seep). The associated surface water body (Dam Creek) is not used as a source of drinking water.

PFOS (14 J ng/L) was detected in surface water seep sample FTD-OSL-LS31 below the OSD risk screening level (40 ng/L). PFOA and PFBS were not detected (**Table 7-3**).

PFOS (31 ng/L) was detected in surface water seep sample FTD-OSL-SP03 below the OSD risk screening level (40 ng/L). PFOA and PFBS were not detected (**Table 7-3**).

Additionally, one co-located surface water sample (FTD-OSL-1-SW) and one sediment sample (FTD-OSL-1-SE) were collected downstream of the OSL and various proximal AOPIs to assess PFOS, PFOA, and PFBS discharges to Dam Creek from surface water and groundwater at proximal AOPIs. PFOS (55 ng/L), PFOA (13 ng/L) and PFBS (3.2 ng/L) were detected in surface water sample FTD-OSL-1-SW. Sample results for surface water sample FTD-OSL-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample source is not a direct expression of groundwater and the associated surface water bodies are not used as a source of drinking water.

7.18.3 Sediment

As described above, one sediment sample (FTD-OSL-1-SE) was collected downstream of the OSL and various proximal AOPIs to assess PFOS, PFOA, and PFBS discharges to Dam Creek from surface water and groundwater. PFOS, PFOA and PFBS were not detected in sediment sample FTD-OSL-1-SE.

7.19 Storm Sewer AFFF Deployment

The subsections below summarize the groundwater, surface water, and sediment PFOS, PFOA, and PFBS analytical results associated with the Storm Sewer Deployment AOPI. Soil in the vicinity of the Storm Sewer Deployment AOPI was not sampled since the potential release/disposal area of PFAS-containing materials is large, mostly paved/developed, and the exact release area is unknown. Additionally, the storm sewer wastes were likely conveyed to the storm sewer infrastructure or prior to discharging to a tributary to Upper Pleasant Creek.

7.19.1 Groundwater

One groundwater sample (FTD-1795-MWS10) was collected from existing downgradient monitoring well 1795-MWS10 via low-flow sampling procedures (**Figure 7-17**).

PFBS (0.84 J ng/L) was detected in groundwater sample FTD-1795-MWS10, below the OSD risk screening level (600 ng/L). PFOA and PFBS were not detected (**Table 7-1**).

7.19.2 Surface Water

One surface water sample (FTD-SSAD-1-SW) was collected from a tributary to Upper Pleasant Creek, where stormwater from the AFFF release area likely entered the tributary (**Figure 7-17**). Sample results for surface water sample FTD-SSAD-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample is not a direct expression of groundwater at the related AOPIs, and the associated surface water body (tributary to Upper Pleasant Creek) is not used as a source of drinking water.

PFOS (13 ng/L), PFOA (4.7 ng/L), and PFBS (1.4 J ng/L) were detected in surface water sample FTD-SSAD-1-SW (**Table 7-3**).

7.19.3 Sediment

Two sediment samples (FTD-SSAD-1-SE and FTD-SSAD-2-SE) were collected from a tributary to Upper Pleasant Creek, where stormwater containing AFFF that was deployed to the storm sewer system would

have likely entered the tributary. Sediment sample FTD-SSAD-2-SE was collected upstream of Oneida Avenue. Sediment sample FTD-SSAD-1-SE was collected downstream of Oneida Avenue and was co-located with surface water sample FTD-SSAD-1-SW (**Figure 7-17**).

PFOS, PFOA, and PFBS were not detected in sediment samples (**Table 7-4**).

7.20 Sludge Pile Near OSL

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Sludge Pile Near OSL.

7.20.1 Groundwater

One grab groundwater sample (FTD-SludgePile-1GW) was collected following HSA drilling. The groundwater sample was collected on the southeastern edge of the Sludge Pile, where surface runoff is directed (**Figure 7-18**).

PFOS (43 ng/L) was detected in groundwater sample FTD-SludgePile-1GW, above the OSD risk screening level (40 ng/L). PFOA (6.0 ng/L) and PFBS (0.86 J ng/L) were detected below the OSD risk screening level (**Table 7-1**).

7.20.2 Soil

Three surface soil samples (FTD-SludgePile-1-SO, FTD-SludgePile-2-SO, and FTD-SludgePile-3-SO) were collected via hand auger. Surface soil samples FTD-SludgePile-1-SO and FTD-SludgePile-2-SO were collected within the AOPI. FTD-SludgePile-3-SO was collected at the edge of the AOPI, where runoff from the pile would have collected during precipitation events (**Figure 7-18**).

PFOS (0.0057 mg/kg) was detected in surface soil sample FTD-SludgePile-1-SO, below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

PFOS (0.0045 mg/kg) was detected in surface soil sample FTD-SludgePile-2-SO, below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

PFOS (0.00042 J mg/kg) was detected in surface soil sample FTD-SludgePile-3-SO, below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

7.21 Former Fire Station #3 (Building 181)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Fire Station #3 (Building 181).

7.21.1 Groundwater

One grab groundwater sample (FTD-FFS3-1-GW) was collected following DPT drilling. The exact area of AFFF release is unknown. Therefore, the groundwater sample was located at the edge of driveway pavement, where AFFF potentially released from the building would likely have flowed via runoff (**Figure 7-19**).

PFOS (15 ng/L) and PFOA (0.98 J ng/L) were detected in groundwater sample FTD-FFS3-1-GW, below the OSD risk screening level (40 ng/L). PFBS was not detected (**Table 7-1**).

7.21.2 Soil

Three surface soil samples (FTD-FFS3-1-SO, FTD-FFS3-2-SO, and FTD-FFS3-3-SO) were collected via hand auger. The exact area of AFFF release is unknown. Therefore, the surface soil samples were collected along the edges of pavement, where historical AFFF releases may have occurred from fire truck washing or parking. Surface soil sample FTD-FFS3-1-SO was co-located with groundwater sample FTD-FFS3-1-GW (**Figure 7-19**).

PFOS (0.0022 mg/kg) was detected in surface soil sample FTD-FFS3-3-SO, below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

PFOS, PFOA, and PFBS were not detected in surface soil samples FTD-FFS3-1-SO and FTD-FFS3-2-SO (**Table 7-2**).

7.22 Former Fire Station (Building T-2330)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Former Fire Station (Building T-2330).

7.22.1 Groundwater

One grab groundwater sample (FTD-FFS2330-1-GW) was collected following DPT drilling. The exact area of AFFF release is unknown. Therefore, the groundwater sample was located where the historical building bay doors were located to capture historical AFFF releases during the operational period of the fire station (**Figure 7-20**).

PFOS (6,600 ng/L) and PFOA (160 ng/L) were detected in groundwater sample FTD-FFS2330-1-GW at concentrations above the OSD risk screening level (40 ng/L). PFBS (4.0 ng/L) was detected in groundwater sample FTD-FFS2330-1-GW at a concentration below the OSD risk screening level (600 ng/L) (**Table 7-1**).

7.22.2 Soil

Two surface soil samples (FTD-FFS2330-1-SO and FTD-FFS2330-2-SO) were collected via hand auger on the edge of the former station driveway pavement, where AFFF releases may have occurred during fire truck washing or parking (**Figure 7-20**).

PFOS (0.00047 J mg/kg) was detected in surface soil sample FTD-FFS2330-1-SO, below the OSD residential risk screening level (0.13 mg/kg). PFOA and PFBS were not detected (**Table 7-2**).

PFOS (0.0097 mg/kg) and PFOA (0.0006 J mg/kg) were detected in surface soil sample FTD-FFS2330-2-SO, below the OSD residential risk screening level (0.13 mg/kg). PFBS was not detected (**Table 7-2**).

7.23 Building 3829 OWS

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Building 3829 OWS.

7.23.1 Groundwater

One grab groundwater sample (FTD-3829OWS-1-GW) was collected following DPT drilling. The groundwater sample was located immediately adjacent to the Building 3829 OWS to capture potential releases from the OWS infrastructure following AFFF transfers (**Figure 7-21**).

PFOS (3.3 ng/L) was detected in groundwater sample FTD-3829OWS-1-GW, below the OSD risk screening level (40 ng/L). PFOA and PFBS were not detected.

7.23.2 Soil

A subsurface soil sample (FTD-B3829-1-SO) was collected via DPT drilling at the equivalent approximate depth of the bottom of the OWS (~20 ft bgs) to capture potential releases of AFFF from spills that may have occurred during discharges of water from the holding tank at the FTA to the OWS, or from leaks in the OWS or connected piping. Subsurface soil sample FTD-B3829-1-SO was co-located with groundwater sample FTD-3829OWS-1-GW (**Figure 7-21**).

PFOS, PFOA, and PFBS were not detected in subsurface soil sample FTD-B3829-1-SO (**Table 7-2**).

7.24 Former Building 1943

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former Building 1943. A subsurface soil sample was not collected at Former Building 1943 because the OWS had since been removed and the exact location/depth of the former OWS is unknown.

7.24.1 Groundwater

One grab groundwater sample (FTD-1943OWS-1-GW) was collected following DPT drilling. The groundwater sample was located immediately downgradient of the Former Building 1943 OWS to capture potential releases of AFFF from spills that may have occurred during discharges of water from the holding tank at the FTA to the OWS, or from leaks in the OWS or connected piping (**Figure 7-22**).

PFOS (11 ng/L), PFOA (2.4 ng/L), and PFBS (2.4 ng/L) were detected in groundwater sample FTD-1943OWS-1-GW at concentrations less than the OSD risk screening levels.

7.25 Fire Station #2 (Building 1585)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with Fire Station #2 (Building 1585).

7.25.1 Groundwater

A total of three grab groundwater samples (FTD-FS2-1-GW, FTD-FS2-2-GW, and FTD-FS2-3-GW) were collected via DPT drilling methods in the central portion of the AOPI near the pavement edges as well as the downgradient edges of the AOPI since the points of potential use, storage, and disposal of PFAS-containing materials are unknown (**Figure 7-23**).

PFOS (4.4 ng/L) and PFOA (3.0 ng/L) were detected in groundwater sample FTD-FS2-1-GW at concentrations less than the OSD risk screening levels. PFBS was not detected in groundwater sample FTD-FS2-1-GW (**Table 7-1**).

PFOS (280 ng/L) and PFOA (66 ng/L) were detected in groundwater sample FTD-FS2-2-GW at concentrations above the OSD risk screening levels. PFBS (1.4 J ng/L) was detected in groundwater sample FTD-FS2-2-GW below the OSD risk screening levels (**Table 7-1**).

PFOS (59 ng/L) was detected in groundwater sample FTD-FS2-3-GW at concentrations above the OSD risk screening levels. PFOA (22 ng/L) and PFBS (1.4 J ng/L) were detected in groundwater sample FTD-FS2-2-GW below the OSD risk screening levels (**Table 7-1**).

7.25.2 Soil

A total of four surface soil samples (FTD-FS2-1-SO, FTD-FS2-2-SO, FTD-FS2-3-SO, and FTD-FS2-4 SO) were collected via hand auger from areas where surface runoff potentially drained and/or where Fort Drum Fire Department nozzles were rinsed at the AOPI (**Figure 7-23**).

PFOS and PFBS were not detected in soil sample FTD-FS2-1-SO. During validation, the PFOA result in FTD-FS2-1-SI was qualified as “X”, indicating serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. Therefore, with approval by a USACE chemist, the analytical result has been deemed unusable and rejected.

PFOS (0.0012 mg/kg) and PFOA (0.00056 J mg/kg) were detected in soil sample FTD-FS2-2-SO below the OSD risk screening levels. PFBS was not detected in soil sample FTD-FS2-2-SO (**Table 7-2**).

PFOS (0.003 mg/kg) was detected in soil sample FTD-FS2-3-SO below the OSD risk screening level. PFOA and PFBS were not detected in soil sample FTD-FS2-3-SO (**Table 7-2**).

PFOS (0.0011 J mg/kg) was detected in soil sample FTD-FS2-4-SO below the OSD risk screening level. PFOA and PFBS were not detected in soil sample FTD-FS2-4-SO (**Table 7-2**).

7.26 Historical Tank Repair/Vehicle Maintenance Shop

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Historical Tank Repair/Vehicle Maintenance Shop. As shown in **Figure 5-12**, Building 1800 has since been demolished and soil associated with potential PFOS, PFOA, and PFBS releases at the AOPI was likely removed/disturbed when the building was demolished, and surrounding area regraded. Therefore, soil was not sampled during the SI.

7.26.1 Groundwater

A total of three groundwater samples were collected adjacent to and downgradient of the Historical Tank Repair/Vehicle Maintenance Shop AOPI. Two groundwater samples were collected from existing monitoring wells FTD-PCERI-MW-19S and FTD-PCERI-MW-18I via low-flow sampling procedures. Additionally, one groundwater sample (FTD-TR&VMS-1-GW) was collected following DPT-drilling adjacent to the AOPI (**Figure 7-11**). The downgradient wells were sampled to evaluate potential historical releases of PFAS-containing materials.

PFOS (20 ng/L), PFOA (6.4 ng/L), and PFBS (3.2 ng/L) were detected in groundwater sample FTD-PCERI-MW-19S at concentrations below the OSD risk screening levels (**Table 7-1**).

PFOS (2.5 ng/L), PFOA (3.1 ng/L), and PFBS (3.7 ng/L) were detected in groundwater sample FTD-PCERI-MW-18I at concentrations below the OSD risk screening levels (**Table 7-1**).

PFOS (6.4 ng/L), PFOA (7.0 ng/L), and PFBS (4.3 ng/L) were detected in groundwater sample FTD-TR&VMS-1-GW at concentrations below the OSD risk screening levels (**Table 7-1**).

7.27 Former Airfield Fire Station (Building 2041)

The subsections below summarize the groundwater PFOS, PFOA, and PFBS analytical results associated with Former Airfield Fire Station (Building 2041). Results for previously collected groundwater samples from four monitoring wells are summarized in **Section 2.12**.

7.27.1 Groundwater

One grab groundwater sample (FTD-FAFS2041-1-GW) was collected on the downgradient edge of the AOPI via DPT drilling methods to evaluate potential historical releases of AFFF during the operational period of the fire station (**Figure 7-9**).

PFOS (17 ng/L), PFOA (12 ng/L), and PFBS (3.1 ng/L) were detected in groundwater sample FTD-FAFS2041-1-GW at concentrations below the OSD risk screening level (40 ng/L) (**Table 7-1**).

7.28 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI (i.e., where soil was sampled at the AOPI) was analyzed for TOC, pH, moisture content, and grain size data as theses data may be useful in future fate and transport studies. The TOC in the soil samples ranged from 352 to 22,100 mg/kg. The TOC at this installation was within range of that found in topsoil (5,000 to 30,000 mg/kg). The combined percentage of fines (i.e., silt and clay) in soils at Fort Drum ranged from 1% to 19.6% with an average of 7.6%. 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 (7.3%) was typical for sandy soil. The average pH of the soil (8.0) was slightly alkaline. Based on these geochemical and physical soil characteristics (i.e., low percentage of fines and TOC) observed underlying the installation during the SI, PFAS constituents are expected to be relatively more mobile at Fort Drum than in soils with greater percentages of fines and TOC.

7.29 Blank Samples

Detections of PFOS, PFOA, and PFBS are summarized below for blank samples collected during both phases of SI field work.

- First Mobilization, Phase 1 SI Field Work:
  - EBs: PFOS, PFOA, and PFBS were not detected in any of the EB samples collected during the Phase 1 SI.
  - FBs: PFOS (240 ng/L), PFOA (34 ng/L), and PFBS (25 ng/L) were detected in FTD-FB-1 during the Phase 1 SI. PFOS, PFOA, and PFBS were not detected in FTD-FB-2 during the Phase 1 SI. It was noted that FB FTD-FB-1 had significant PFOS, PFOA, and PFBS detections. As a result, the laboratory re-extracted the FB, and the results were non-detect. A review of the associated samples from Fort Drum indicated that the FB was not inadvertently switched in the field since the field samples were soil matrix. Review of the laboratory sample preparation log for the FB indicates it was extracted with a batch of groundwater samples that required a 10-fold dilution that were not associated with field samples from Fort Drum. A theory is that the sample extract for the FB was inadvertently switched with a groundwater sample in the associated preparation batch at the laboratory. The initial analysis of the FB is reported since the re-extraction is over hold time. The detections in the FB did not result in qualification of the associated samples from Fort Drum.
  - SBs: PFOS (1.1 J ng/L). PFOA (1.3 J ng/L), and PFBS (1.2 J ng/L) were detected in FTD-SB-1 during the Phase 1 SI. This SB was collected from the Fort Drum Central wash rack at Fort Drum that was used by the drillers in the first step of decontamination of drilling equipment between drilling locations. PFOA (2.2 ng/L) and PFBS (5.3 ng/L) were detected and PFOS was not detected in FTD-SB-2-120619 which was also collected from the initial decontamination of soil sampling (hand auger) equipment during the Phase 1 SI. The second step of decontamination included a rinse of lab provided water (FTD-SB-2-120619 and FTD-SB-2-011020). PFOS, PFOA, and PFBS were not detected in FTD-SB-2-011020 during the Phase 1 SI.
- Second Mobilization, Phase 2 SI Field Work:
  - EBs: PFOS, PFOA, and PFBS were not detected in any of the EB samples collected during the Phase 2 SI.
  - FBs: PFOS, PFOA, and PFBS were not detected in any of the FB samples collected during the Phase 2 SI.
  - SBs: PFOS (1.9 ng/L), PFOA (1.1 J ng/L), and PFBS (0.97 J ng/L) were detected in the SB collected during the Phase 2 SI. The SB was collected from the on-post water supply and the water used in the first step of decontamination of the drilling equipment.
- Third Mobilization:
  - EBs: PFOS, PFOA, and PFBS were not detected in any of the EB samples collected during the third mobilization.
  - FBs: PFOS, PFOA, and PFBS were not detected in any of the FB samples collected during the third mobilization.

- SBs: PFOS (1.1 J ng/L) and PFOA (2.1 ng/L) were detected in the SB collected during the third mobilization. The SB was collected from the on-post water supply and the water used in the first step of decontamination of the drilling equipment.

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

7.30 Conceptual Site Models

The preliminary CSMs presented in the Phase 1 and Phase 2 QAPP Addenda (Arcadis 2019b; Arcadis 2021) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-24** through **7-33** 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 and previous PFOS, PFOA, and PFBS detections at the AOPIs, affected media are likely to consist of soil, groundwater, surface water, and sediment. Release and transport mechanisms include dissolution/desorption from soil to groundwater, transport via sediment carried in and dissolution to stormwater and surface water, discharge/recharge between groundwater and surface water, and adsorption/desorption between surface water and sediment. Generic categories of potential human receptors and their associated exposure scenarios that are typically evaluated in a CERCLA human health risk assessment were considered and include on-installation site workers (e.g., industrial/commercial workers, utility workers, or future construction workers who could be exposed to chemicals in soil at an AOPI or to chemicals in tap water in an industrial/commercial building), on-installation residents (e.g., adults and children who could be exposed to chemicals in tap water in a residence), and on-installation recreational users (e.g., hikers or hunters who could be exposed to chemicals in waterways at an installation). Off-installation receptor types could include drinking water receptors (i.e., commercial/industrial workers or residents) and recreational users.

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

CSMs were developed for each individual AOPI and were combined where source media, potential migration pathways and exposure media, and human exposure pathway determinations are congruent. The following exposure pathway determinations apply to all CSMs:

- The AOPIs are not residential or recreational sites and are wholly located within the installation boundaries. Therefore, the soil exposure pathways for on-installation residents and recreational users and for off-installation receptors are incomplete.
- 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 7-24 shows the CSM for AOPIs Hangar 2049 AFFF Suppression System and Hangar 19710 AFFF Suppression System. Historical releases during testing or accidental releases from AFFF fire suppression systems could have impacted surrounding soils and migrated to groundwater and/or to the Fort Drum stormwater system that drains to various surface water bodies via outfalls.

- PFOS, PFOA, and/or PFBS were not detected in soil at these AOPIs, therefore the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are downgradient or outside the vicinity of the active on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows off post through the installation's southern boundary. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water which receives runoff from the AOPIs (i.e., at outfalls and/or downstream tributary creeks). On-installation site workers and recreational users could contact constituents in the outfalls and their tributaries on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for these receptors are potentially complete. On-installation residents are not likely to contact sediment in the on-post surface water bodies, therefore this exposure pathway is incomplete.
- Surface water bodies flow off post through both the southern and northern installation boundaries. Pleasant Creek (northern boundary) does not have any known potable purposes. However, Fort Drum receives drinking water from a combination of on-post potable wells and the City of Watertown, New York potable water supply. The City of Watertown potable water supply is sourced from the Black River (southern boundary), and the surface water intake is located approximately four miles downstream from Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete.

- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-25 shows the CSM for AOPI Building 2725. Building 2725 was identified as an AOPI due to the possibility of leaks of AFFF to soil and/or paved surfaces from AFFF drums historically stored at the building.

- PFOS, PFOA, and/or PFBS were not detected in soil at the AOPI, therefore the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were not detected in groundwater at the AOPI, therefore the groundwater exposure pathways for all on-installation and off-installation receptors are incomplete.
- Based on the non-detect results in soil and groundwater samples, it is inferred there is no source of constituents at the AOPI. Therefore, the surface water and sediment exposure pathways for all receptors are incomplete.

Figure 7-26 shows the CSM for AOPI Former Building 1131. Historical releases of AFFF stored inside the building could have migrated to soil and groundwater and possibly to surface water and sediment via shallow groundwater discharge.

- PFOS, PFOA, and/or PFBS were not detected in soil at the AOPI, therefore the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPI. The AOPI is outside the vicinity of the active on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at this AOPI flows off post through the installation's southern or northern boundary (i.e., AOPI is located within a groundwater divide and exact localized flow direction is unknown). Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater originating at this AOPI likely does not discharge to surface water bodies on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation recreational users are incomplete.
- Groundwater originating at this AOPI likely discharges through the southern or northern boundary and potentially discharges to surface water bodies off post. Pleasant Creek (northern boundary) does not have any known potable purposes. The Black River (southern boundary) is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete. The sediment exposure pathways for on-installation site workers and residents are incomplete.

- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-27 shows the CSM for AOPIs Former Army Fire Station (Kennedy & Dunn, Building 2419), Former Fire Station #3 (Building 181), and Former Fire Station (Building T-2330). Historical releases of AFFF to soil and/or paved surfaces from fire department activities (e.g., AFFF equipment/nozzle testing, AFFF-carrying fire truck washing, AFFF filling in truck tanks) could have migrated to groundwater and possibly to surface water and sediment via shallow groundwater discharge.

- PFOS, PFOA, and/or PFBS were detected in soil at the AOPIs. Site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are outside the vicinity of the active on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows off post through the installation's southern or northern boundaries. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater originating at these AOPIs likely does not discharge to surface water bodies on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation recreational users are incomplete.
- Groundwater originating at these AOPIs likely discharges through the southern or northern boundary and potentially discharges to surface water bodies off post. Pleasant Creek (northern boundary) does not have any known potable purposes. The Black River (southern boundary) is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete. The sediment exposure pathways for on-installation site workers and residents are incomplete.
- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-28 shows the CSM for AOPIs Hangar 2050 AFFF Suppression System and Hangar 2060 AFFF Suppression System. Historical releases during testing or accidental releases from AFFF fire suppression systems could have impacted surrounding soils and migrated to groundwater and/or to the Fort Drum stormwater system that drains to various surface water bodies via outfalls.

- PFOS, PFOA, and/or PFBS were detected in soil at the AOPIs. Site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.

- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are outside the vicinity of the on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at the AOPIs flows off post through the installation's southern boundary. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water which receives runoff from the AOPIs (i.e., at outfalls and their tributaries). On-installation site workers and recreational users could contact constituents in the outfalls and their tributaries on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for these receptors are potentially complete. On-installation residents are not likely to contact sediment in the on-post surface water bodies, therefore this exposure pathway is incomplete.
- Surface water bodies flow off post through both the southern and northern installation boundaries. Pleasant Creek (northern boundary) does not have any known potable purposes. The Black River (southern boundary) is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete.
- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-29 shows the CSM for AOPIs Former WWTP and Former WWTP Sludge Drying Beds. Releases of AFFF from WSAAF fire suppression systems likely passed through the Former WWTP and were potentially within sludges/wastes generated in Former WWTP Sludge Drying Beds. Soil surrounding the Former WWTP was not sampled since the suspected release and disposal of PFAS-containing materials was to the Former WWTP infrastructure, not the surrounding soils. Since the exact potential release area is unknown and likely in the subsurface soil underlying the existing infrastructure, subsurface soil was also not sampled during the SI. The Former WWTP Sludge Drying Beds were excavated but not sampled for PFOS, PFOA, and PFBS to confirm they are not within underlying soils. Potential AFFF in the subsurface soil could migrate to groundwater and possibly to surface water and sediment via shallow groundwater discharge.

- If PFOS, PFOA, and/or PFBS are present in subsurface soil at the AOPIs, site workers (e.g., future construction workers) could contact constituents in subsurface soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are downgradient of the active on-post drinking water wells, and it is unlikely the downgradient on-post groundwater will be used as a source of drinking water in the future due to the proximity of the AOPIs

to the installation boundary. Therefore, the groundwater exposure pathways for on-installation site workers and residents are incomplete.

- Groundwater originating at these AOPIs flows off post through the installation's southern boundary directly into the Black River. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater originating at these AOPIs does not discharge to surface water bodies on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for on-installation recreational users are incomplete.
- The Black River is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete. The sediment exposure pathways for on-installation site workers and residents are incomplete.
- Recreational users off post could contact constituents in the Black River through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-30 shows the CSM for AOPIs Building 19855 Fire Suppression System, Fire Station #1 (Building 10710), Former Army Fire Station (George & Cannon, Building 3828), Sludge Pile Near OSL, Building 2018 Soil Barn, Fire Station #3 and Nozzle Testing Area, Mountain Ramp Nozzle Testing Area, and Fire Station #2 (Building 1585). Releases of AFFF to soil and/or paved surfaces from fire department activities (e.g., AFFF response areas, AFFF equipment/nozzle testing, AFFF-carrying fire truck washing, AFFF filling in truck tanks) and potentially PFOS, PFOA, and PFBS-containing soil storage areas could migrate to groundwater and possibly to surface water and sediment via shallow groundwater discharge.

- PFOS, PFOA, and/or PFBS were detected in soil at the AOPIs. Site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The Mountain Ramp Nozzle Testing Area AOPI is proximal to or potentially within the groundwater capture zone of active potable wells at Fort Drum. Therefore, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete. The other AOPIs are downgradient or outside the vicinity of the on-post drinking water wells. However, the groundwater exposure pathways 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 these AOPIs flows off post through the installation's southern or northern boundaries. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater originating at these AOPIs potentially discharges to various to surface water bodies on post. Recreational users could contact constituents in on-post surface water bodies through incidental

ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete.

- Surface water bodies flow off post through both the southern and northern installation boundaries. Pleasant Creek (northern boundary) does not have any known potable purposes. The Black River (southern boundary) is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete. The sediment exposure pathways for on-installation site workers and residents are incomplete.
- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-31 shows the CSM for AOPIs Former Army Fire Station (Building 1860), Hangar 2070 Fire Suppression System, Hangar 2072 Fire Suppression System, Hangar 2074 Fire Suppression System, and Historical Tank Repair/Vehicle Maintenance Shop. Releases of AFFF to soil and/or paved surfaces from AFFF suppression systems and fire department activities (e.g., AFFF equipment/nozzle testing, AFFF-carrying fire truck washing, AFFF filling in truck tanks) could migrate to groundwater and/or to the Fort Drum stormwater system that drains to various surface water bodies via outfalls.

- Site workers (i.e., installation personnel or future construction workers) could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The Hangar 2070 Fire Suppression System, Hangar 2072 Fire Suppression System, and Hangar 2074 AOPIs are proximal to or potentially within the groundwater capture zone of active potable wells at Fort Drum. Therefore, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete. The Former Army Fire Station (Building 1860) and Historical Tank Repair/Vehicle Maintenance Shop AOPIs are downgradient or outside the vicinity of the on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows off post through the installation's northern boundary. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater originating at these AOPIs potentially discharges to various surface water bodies on post. Additionally, the Fort Drum stormwater system drains to various surface water bodies via outfalls. On-installation site workers and recreational users could contact constituents in the outfalls and their tributaries on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for these receptors are potentially complete. On-installation residents are not likely to contact surface water and sediment in the on-post surface water bodies, therefore these exposure pathways are incomplete.

- Surface water bodies flow off post through the northern installation boundary. Recreational users off post could contact constituents in Pleasant Creek through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-32 shows the CSM for Storm Sewer AFFF Deployment, OSL, Building 3829 OWS, and Former Building 1943 OWS. Releases of AFFF to stormwater/OWS infrastructure or PFOS, PFOA, and/or PFBS containing materials (i.e., landfill contents that yielded PFOS, PFOA, and PFBS detections in previous investigations at the OSL) to subsurface soil could migrate to groundwater and possibly to surface water and sediment via shallow groundwater discharge.

- Site workers (e.g., utility workers and future construction workers) could contact constituents in subsurface soil via incidental ingestion, dermal contact and inhalation of dust if working on or in the vicinity of the stormwater system, former OWS, or landfill. Therefore, the subsurface soil exposure pathway for on-installation site workers is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are downgradient or outside the vicinity of the on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at these AOPIs flows off post through the installation's northern boundary. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- Groundwater from the OSL discharges via seeps to Dam Creek. Groundwater originating at the other AOPIs potentially discharges to various to surface water bodies on post. Recreational users could contact constituents in on-post surface water bodies through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for on-installation recreational users are potentially complete. On-installation site workers and residents are not likely to contact surface water and sediment in the on-post surface water bodies, therefore these exposure pathways are incomplete.
- Surface water bodies flow off post through the northern installation boundary. Recreational users off post could contact constituents in Pleasant Creek through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Figure 7-33 shows the CSM for AOPI Former Airfield Fire Station (Building 2041) and Route 26 Car Crash. Potential historical AFFF releases from Fort Drum Fire Department AFFF-related activities could have impacted surrounding soils and migrated to groundwater and/or to the Fort Drum stormwater system that drains to various surface water bodies via outfalls.

- Soil was not sampled at the AOPIs during the SI. 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 potentially complete.

- PFOS, PFOA, and/or PFBS were detected in groundwater at the AOPIs. The AOPIs are outside the vicinity of the on-post drinking water wells. However, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents are potentially complete to account for potential future use of the downgradient on-post groundwater.
- Groundwater originating at the AOPIs flows off post through the installation's northern or southern boundary. Due to the absence of land use controls preventing potable use of groundwater off post, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for off-installation receptors is potentially complete.
- PFOS, PFOA, and/or PFBS were detected in surface water which receives runoff from the AOPIs (i.e., at outfalls and their tributaries or groundwater discharge to surface water). On-installation site workers and recreational users could contact constituents in the surface water on post. Therefore, the surface water and sediment exposure pathways (via incidental ingestion and dermal contact) for these receptors are potentially complete. On-installation residents are not likely to contact sediment in the on-post surface water bodies, therefore this exposure pathway is incomplete.
- Surface water bodies flow off post through both the southern and northern installation boundaries. Pleasant Creek (northern boundary) does not have any known potable purposes. The Black River (southern boundary) is used for drinking water by the City of Watertown approximately 4 miles downstream of Fort Drum. Therefore, the surface water exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers and residents and for off-installation drinking water receptors are potentially complete.
- Recreational users off post could contact constituents in the Black River or Pleasant Creek through incidental ingestion and dermal contact. Therefore, the surface water and sediment exposure pathways for off-installation recreational users are potentially complete.

Following the SI sampling, 29 out of the 30 sampled 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 RI 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 Fort Drum 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 evaluate whether or not 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 records 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 Fort Drum. Following the evaluation, 36 AOPIs were identified.

Fort Drum currently receives drinking water from a combination of on-post potable wells north of WSAAF (**Figure 2-2**) and the City of Watertown, New York potable water supply. The City of Watertown, New York potable water supply is sourced from the Black River, and the surface water intake is located approximately 4 miles downstream from the southern boundary of Fort Drum. Active and offline Fort Drum potable water wells have been sampled for PFOS, PFOA, and PFBS historically (**Section 2.12**). The EDR report and the New York State Water Well database identified multiple off-post potable wells (**Figure 2-4**) across both the northern and southern installation boundaries that may potentially be downgradient of various AOPIs within WSAAF and the cantonment area at Fort Drum (**Figure 5-2**). The EDR report providing well search results is provided as **Appendix E** (provided in the Final deliverable only).

Thirty out of the 36 AOPIs at Fort Drum were sampled during this SI effort to identify presence or absence of PFOS, PFOA, and PFBS. The SI scope of work was completed in accordance with the Final PQAPP (Arcadis 2019a), the Fort Drum Phase 1 QAPP Addendum (Arcadis 2019b), the Fort Drum Phase 2 QAPP Addendum (Arcadis 2021), and subsequent FCRs. PFOS, PFOA, and/or PFBS were detected above the laboratory limits of detection at 29 of the 30 sampled AOPIs (i.e., all except Building 2725). PFOS, PFOA, and PFBS detections and maximum concentrations in each sampled medium during the SI are summarized below, data that was not collected as part of the SI is not included:

- Thirty-five out of 36 groundwater samples had PFOS, PFOA, and/or PFBS detections. The maximum groundwater detection was observed at Former Fire Station (Building T-2330) AOPI (6,600 ng/L for PFOS).
- Thirty-three out of 51 soil samples had PFOS, PFOA, and/or PFBS detections. The maximum soil detection was observed at Former Army Fire Station (Kennedy & Dunn, Building 2419) AOPI (0.28 mg/kg for PFOS).
- All seven surface water samples had PFOS, PFOA, and/or PFBS detections. The maximum surface water detection was observed in a sample collected during the investigation of the Hanger 2049/Hanger 2050 Fire Suppression System AOPIs (120 ng/L for PFOS).
- None of the seven sediment samples collected had PFOS, PFOA, or PFBS detections.

Following the SI sampling, 29 out of the 30 sampled AOPIs were considered to have complete or potentially complete exposure pathways. Soil exposure pathways for on-installation site workers are complete at 13 AOPIs where PFOS, PFOA, and/or PFBS were detected in soil, and potentially complete at an additional 12 AOPIs. There are 26 AOPIs where the groundwater exposure pathways for on-installation drinking water receptors are potentially complete. Based on their location, these AOPIs likely do not impact the current on-post drinking water wells; however, the groundwater exposure pathways are potentially complete to account for potential future potable use of groundwater. Due to a lack of land use controls off-installation and downgradient of Fort Drum, the groundwater exposure pathways for off-installation drinking water receptors are also potentially complete for 28 AOPIs. Surface water bodies may be impacted by migration of constituents via shallow groundwater discharge and/or through the Fort Drum stormwater system that drains to various surface water bodies via outfalls. Because the City of Watertown, New York potable water supply is sourced from the Black River and Fort Drum receives drinking water from a combination of on-post potable wells and the City of Watertown, the surface water exposure pathways for on-installation and off-installation drinking water receptors are potentially complete at 20 AOPIs. Additionally, recreational users could have incidental contact with constituents in waterbodies. Therefore, the surface water and sediment exposure pathways are potentially complete for on-installation recreational users at 22 AOPIs and for off-installation recreational users at 28 AOPIs**.**

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for future study in an RI or no action at this time is based on the comparison of the SI analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the AOPIs identified at Fort Drum, PFOS, PFOA, and PFBS sampling and recommendations for each AOPI. Further investigation is warranted at Fort Drum. 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 PFOS, PFOA, and PFBS Sampling at Fort Drum and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels (Yes/No/NA/ND/NS)?				Recommendation
	GW	SO	SW	SE	
Fire Station 3 and Nozzle Testing Area	Yes	No	NS	NS	Further study in an RI
Mountain Ramp Nozzle Testing Area	Yes	No	NS	NS	Further study in an RI
Hangar 2070 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Hangar 2072 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Hangar 2074 Fire Suppression System	Yes	NS	NA	ND	Further study in an RI
Building 2725	ND	ND	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels (Yes/No/NA/ND/NS)?				Recommendation
	GW	SO	SW	SE	
Former Army Fire Station (George & Cannon, Building 3828)	No	No	NS	NS	No action at this time
Building 19855 Fire Suppression System	Yes	No	NS	NS	Further study in an RI
Hangar 2060 Fire Suppression System	Yes	No	NA	NA	Further study in an RI
Hangar 19710 Fire Suppression System	No	No	NA	ND	No action at this time
Hangar 2049 Fire Suppression System	Yes	ND	NA	NA	Further study in an RI
Hangar 2050 Fire Suppression System	Yes	No	NA	NA	Further study in an RI
Former WWTP	No	NS	NS	NS	No action at this time
Former WWTP Sludge Beds	No	NS	NS	NS	No action at this time
Former Army Fire Station (Building 1860)	Yes	NS	NS	NS	Further study in an RI
Fire Station #1 (Building 10710)	Yes	No	NS	NS	Further study in an RI
Former Army Fire Station (Kennedy & Dunn, Building 2419)	No	Yes	NS	NS	Further study in an RI
Building 2018 Soil Barn	No	No	NS	NS	No action at this time
Former Building 1131 AFFF Storage and Spill	Yes	ND	NS	NS	Further study in an RI
Old Sanitary Landfill	No	NS	No	NS	No action at this time
Storm Sewer AFFF Deployment	No	NS	NA	NA	No action at this time
Sludge Pile Near OSL	Yes	No	NS	NS	Further study in an RI
Former Fire Station 3 (Building 181)	No	No	NS	NS	No action at this time
Former Fire Station (Building T-2330)	Yes	No	NS	NS	Further study in an RI
Building 3829 Oil Water Separator (OWS)	No	ND	NS	NS	No action at this time
Former Building 1943 OWS	No	NS	NS	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels (Yes/No/NA/ND/NS)?				Recommendation
	GW	SO	SW	SE	
Fire Station #2 (Building 1585)	Yes	No	NS	NS	Further study in an RI
Historical Tank Repair/ Vehicle Maintenance Shop	No	NS	NS	NS	No action at this time
Route 26 Car Crash	No	NS	No	NS	No action at this time
Laundry Pad 1	NS	No	NS	NS	No action at this time*,[1]
Laundry Pad 2	NS	No	NS	NS	No action at this time*,[1]
Laundry Pad 3	NS	No	NS	NS	No action at this time*,[1]
Fire Training Area	Yes	Yes	No	NS	Further study in an RI*,[1,2,3]
Airfield Sanitary Landfill	No	NS	NS	NS	No action at this time*,[1,3]
Small Arms Range 7 Fire	Yes	No	NS	NS	Further study in an RI*,[3]
Former Airfield Fire Station (Building 2041)	No	NS	NS	NS	No action at this time

Notes:

Light gray shading – detection above the OSD risk screening level

* - Recommendations are based solely on data not collected as part of the SI[1,2,3]. The analytical results of these investigations supplemented by comparison to OSD risk screening levels in this PA/SI Report, are considered sufficient to complete SI requirements under CERCLA.

GW – groundwater

NA – not applicable (PFOS, PFOA, and/or PFBS was detected, however, comparison to OSD risk screening levels is not applicable for this AOPI since surface water is not an expression of groundwater and is not used as a source of drinking water).

ND – PFOS, PFOA, and PFBS not detected

NS – not sampled

SE – sediment

SO – soil

SW – surface water

Data collected during the PA (**Section 3**, **Section 4**, and **Section 5**) and SI (**Section 6** and **Section 7**) were sufficient to draw the conclusions summarized in this section. The data limitations relevant to the development of this PA/SI for PFOS, PFOA, and PFBS at Fort Drum are discussed below.

[1] USACE. 2017. Draft Final Project Report. Site Wide PFC Screening Level Investigation. Fort Drum, New York. May

[2] USACE. 2018. PFC Site Characterization Investigation Summary Report – Old Fire Training Pit, Fort Drum, New York. January.

[3] Weston Solutions, Inc. 2021. Final Subsurface Investigation Report. Investigation of Pathways Relating to Fate and Transport of

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. As described in **Section 4.3**, AFFF was deployed on various occasions off post by the Fort Drum Fire Department, however, the exact location and volume of AFFF deployed could not be recalled.

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 EDR well search results and the NYSDEC water well database (**Appendix E**, provided in the Final deliverable only).

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.

The available PFOS, PFOA, and PFBS analytical data is limited to a combination of historical drinking water, groundwater, soil, sediment, and surface water data (**Section 2.12**), as well as the recently collected SI data. Available data, including PFOS, PFOA, and PFBS, is listed in **Appendix P**, which were analyzed per the selected analytical method.

Results from this PA/SI indicate further study in an RI is warranted at Fort Drum in accordance with the guidance provided by the OSD.

Per- and Polyfluoroalkyl Substances (PFAS) For Protection of Locally Utilized Water Supplies. U.S. Army Fort Drum. Jefferson County, New York. June.

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10 ACRONYMS

%	percent
AFFF	aqueous film-forming foam
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
ASL	Airfield Sanitary Landfill
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DANC	Development Authority of the North Country
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
DUSR	Data Usability Summary Report
EB	equipment blank
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FB	field blank
FCR	Field Change Report
FTA	fire training area
GIS	geographic information system
GW	groundwater
HSA	hollow stem auger
HQAES	Headquarters Army Environmental System
IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
LOD	limit of detection
LOQ	limit of quantitation

mg/kg	milligrams per kilogram (parts per million)
NA	not applicable
ng/L	nanograms per liter (parts per trillion)
NS	not sampled
NYARNG	New York Army National Guard
NYSDEC	New York State Department of Environmental Conservation
OSD	Office of the Secretary of Defense
OSL	Old Sanitary Landfill
OWS	oil water separator
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
POTW	publicly owned treatment works
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
RI	remedial investigation
RSL	Regional Screening Level
SB	source blank
SE	sediment
SI	site inspection
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan

SW	surface water
TGI	technical guidance instruction
THM	trihalomethanes
TOC	total organic carbon
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
UST	underground storage tank
WSAAF	Wheeler Sack Army Airfield
WWTP	wastewater treatment plant

TABLES

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	WW002	WW003	WW007	WW009	WW010	WW011	WW012	WW014	WW015	WW016	WW017	WW018
		Sample Date	4/13/2016	4/13/2016	6/2/2016	4/13/2016	4/13/2016	6/2/2016	7/21/2016	4/12/2016	4/13/2016	4/13/2016	4/13/2016	4/12/2016
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	**2.4**	2 U	**90**	< 2	< 2	**4.9**	**50**	< 2	< 2	< 2	< 2	< 2
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	< 9	9 U	9 U	< 9	< 9	**10**	9 U	< 9	< 9	< 9	< 9	< 9
Perfluorooctane sulfonate (PFOS)	40	ng/L	< 4	4 U	**11**	< 4	< 4	4 U	4 U	< 4	< 4	< 4	< 4	< 4

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 5	Well 7	Well 11	Well 12	WTP01	WTP01	WTP01	WTP01	WTP01
		Sample Date	5/31/2017	6/1/2017	6/1/2017	6/1/2017	5/16/2018	7/10/2018	8/21/2018	11/27/2018	2/5/2019
Chemical name	**OSD risk screening level - tap water**	**Units**									
Perfluorooctanoic acid (PFOA)	40	ng/L	**14**	**120**	**6**	**7.9**	**0.54**	**0.42**	**0.48**	**1.1**	**1.5**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**23**	NA	**11**	**4.4**	**1.6**	**1.0**	**1.4**	**2.6**	**2.5**
Perfluorooctane sulfonate (PFOS)	40	ng/L	NA	**28**	NA	NA	**0.48**	**0.45**	NA	**0.89**	**0.89**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 14	Well 14	Well 14	Well 14	Well 14	Well 14	Well 15	Well 15	Well 15	Well 15
		Sample Date	3/19/2018	5/16/2018	7/10/2018	8/21/2018	11/27/2018	2/5/2019	3/19/2018	5/16/2018	7/10/2018	8/21/2018
Chemical name	**OSD risk screening level - tap water**	**Units**										
Perfluorooctanoic acid (PFOA)	40	ng/L	**0.40**	NA	NA	**0.43**	NA	**0.39**	**0.50**	**0.37**	NA	**0.44**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**0.50**	**0.44**	**0.29**	**0.46**	**0.36**	**0.42**	**0.90**	**0.95**	**0.73**	**0.94**
Perfluorooctane sulfonate (PFOS)	40	ng/L	NA	NA	NA	**0.50**	NA	NA	**0.70**	NA	NA	**0.42**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 15	Well 15	Well 16	Well 16	Well 16	Well 16	Well 16	Well 16	Well 17	Well 17	Well 17	Well 17
		Sample Date	11/27/2018	2/5/2019	3/19/2018	5/16/2018	7/10/2018	8/21/2018	11/27/2018	2/5/2019	3/19/2018	5/16/2018	7/10/2018	8/21/2018
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	**0.59**	**0.77**	**0.60**	**0.87**	**0.61**	**1.0**	**1.8**	**0.95**	**0.5**	**1.6**	**0.63**	**1.2**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**1.2**	**1.1**	**2.0**	**3.1**	**2.3**	**3.2**	**4.2**	**1.5**	**2.0**	**4.8**	**2.5**	**4.2**
Perfluorooctane sulfonate (PFOS)	40	ng/L	**0.44**	**0.40**	**0.50**	**0.79**	**0.66**	**0.92**	**1.4**	**0.68**	**0.4**	**13**	**0.56**	**1.1**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 17	Well 17	Well 18	Well 18	Well 18	Well 18	Well 18	Well 18	WTP01 EP	Well 14	Well 14 (FB)	Well 15
		Sample Date	11/27/2018	2/5/2019	3/19/2018	5/16/2018	7/10/2018	8/21/2018	11/27/2018	2/5/2019	2/12/2020	2/12/2020	2/12/2020	2/12/2020
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	**2.2**	**2.5**	NA	NA	NA	NA	NA	NA	**1.03 J**	**0.322 J**	ND	**0.826 J**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**5.3**	**4.1**	NA	NA	NA	NA	NA	NA	**0.946 J**	**0.496 J**	ND	**1.02 J**
Perfluorooctane sulfonate (PFOS)	40	ng/L	**1.8**	**1.9**	NA	NA	NA	NA	NA	NA	**0.636 J**	ND	ND	**0.566 J**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 15 (FB)	Well 16	Well 16 (FB)	Well 17	Well 17 (FB)	Well 18	Well 18 (FB)	DANC EP	DANC EP (FB)	WTP01 EP	WTP01 EP (FB)	Well 14
		Sample Date	2/12/2020	2/12/2020	2/12/2020	2/12/2020	2/12/2020	2/12/2020	2/12/2020	2/12/2020	2/12/2020	5/13/2020	5/13/2020	5/13/2020
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	**1.98**	ND	**2.10**	ND	ND	ND	**0.428 J**	ND	**0.638 J**	ND	**0.324 J**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	**1.50 J**	ND	**1.63 J**	ND	ND	ND	**0.288 J**	ND	**0.782 J**	ND	**0.246 J**
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	**1.45 J**	ND	**1.45 J**	ND	ND	ND	**0.752 J**	ND	**0.564 J**	ND	ND

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 14 (FB)	Well 15	Well 15 (FB)	Well 16	Well 16 (FB)	Well 17	Well 17 (FB)	Well 18	Well 18 (FB)	DANC EP	DANC EP (FB)	WTP01 EP
		Sample Date	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	5/13/2020	8/4/2020
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	**0.658 J**	ND	**1.67 J**	ND	**2.06**	ND	ND	ND	**0.414 J**	ND	**1.36 J**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	**0.800 J**	ND	**1.50 J**	ND	**1.48 J**	ND	ND	ND	ND	ND	**0.978 J**
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	**0.571 J**	ND	**1.51 J**	ND	**1.59 J**	ND	ND	ND	**0.669 J**	ND	**0.898 J**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	WTP01 EP (FB)	Well 14	Well 14 (FB)	Well 15	Well 15 (FB)	Well 16	Well 16 (FB)	Well 17	Well 17 (FB)	Well 18	Well 18 (FB)	DANC EP
		Sample Date	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	ND	ND	**0.891 J**	ND	**2.44**	ND	**3.22**	ND	**0.220 J**	**0.262 J**	**0.873 J**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	**0.371 J**	ND	**0.830 J**	ND	**1.33 J**	ND	**1.69 J**	ND	ND	ND	ND
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	ND	ND	**0.533 J**	ND	**1.54 J**	ND	**2.74**	ND	ND	ND	**1.07 J**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media			DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Sample ID			DANC EP (FB)	WTP01 EP	WTP01 EP (FB)	Well 14	Well 14 (FB)	Well 15	Well 15 (FB)	Well 16	Well 16 (FB)	Well 17	Well 17 (FB)	Well 18
Sample Date			8/4/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	**0.968 J**	ND	ND	ND	**0.658 J**	ND	**2.05**	ND	**1.67 J**	ND	ND
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	**0.864 J**	ND	**0.350 J**	ND	**0.831 J**	ND	**1.44 J**	ND	**1.35 J**	ND	ND
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	**0.899 J**	ND	ND	ND	**0.658 J**	ND	**1.65 J**	ND	**1.64 J**	ND	ND

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
		Sample ID	Well 18 (FB)	DANC EP	DANC EP (ND)	WTP01 EP	WTP01 EP (FB)	Well 14	Well 14 (FB)	Well 15	Well 15 (FB)	Well 16	Well 16 (FB)	Well 17
		Sample Date	10/6/2020	10/6/2020	10/6/2020	1/27/2021	1/27/2021	1/28/2021	1/28/2021	1/28/2021	1/28/2021	1/28/2021	1/28/2021	1/28/2021
Chemical name	**OSD risk screening level - tap water**	**Units**												
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	**0.837 J**	ND	**1.36 J**	ND	ND	ND	**0.674 J**	ND	**2.34**	ND	**2.54**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	ND	ND	**1.25 J**	ND	**0.432 J**	ND	**0.922 J**	ND	**1.46 J**	ND	**1.92**
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	**0.946 J**	ND	**0.963 J**	ND	ND	ND	ND	ND	**1.70 J**	ND	**1.92**

Table 2-2a. Historical PFOS, PFOA, and PFBS Analytical Results - Potable Water Supply
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	DW	DW	DW	DW	DW
		Sample ID	Well 17 (FB)	Well 18	Well 18 (FB)	DANC EP	DANC EP (FB)
		Sample Date	1/28/2021	1/28/2021	1/27/2021	1/27/2021	1/27/2021
Chemical name	**OSD risk screening level - tap water**	**Units**					
Perfluorooctanoic acid (PFOA)	40	ng/L	ND	ND	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	ND	ND	ND	ND	ND
Perfluorooctane sulfonate (PFOS)	40	ng/L	ND	ND	ND	**0.809 J**	ND

Notes and Acronyms:

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

DANC - Development Authority of the North Country
DW - Drinking water
EP - entry point
FB - field blank
ID - identification
NA - not available
ng/L - nanograms per liter
PFAS - per- and polyfluoroalkyl substances
OSD - Office of the Secretary of Defense
USAEC - U.S. Army Environmental Command
WW - wastewater
WTP - water treatment plant

Qualifier Descriptions:

ND, U, <- not detected above the laboratory limit of detection (LOD)
J - estimated value is greater or equal to the Method Detection Limit (MDL or DL) and less than the Limit of Quantitation (LOQ or RL)

Data Sources:

- Evaluation of Existing Well Fields PFAS Sampling presentation (Well 2, Well 3, Well 4, Well 5, Well 6, Well 7, Well 8, Well 9, Well 10, Well 11, Well 1
- New Wellfield PFAS Sampling (WTP01, Well 14, Well 15, Well 16, Well 17, Well 18) from May 2018, July 2018, August 2018, November 2018, and February 2019 table and figures provided by Fort Drum
- Various lab reports provided by Fort Drum (February 2020, May 2020, August 2020, October 2020, February 2021)

Table 2-2b. Historical PFOS, PFOA, and PFBS Analytical Results - Groundwater and Seeps
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Associated AOPI			OSL/Building 2018 Soil Barn	OSL	OSL	OSL/Route 26 Car Crash	OSL/Route 26 Car Crash	ASL	ASL	ASL	FTA	FTA	FTA
Sample ID			OSL-MW08-July2016	FTB	Duplicate	OSL-MW9A-July2016	OSL-MW10-July2016	ASL-MW961-July2016	ASL-MW14-July2016	ASL-MW12A-July2016	MW-1	MW-2	MW-3
Sample Date			7/21/2016	7/21/2016	7/21/2016	7/21/2016	7/21/2016	7/21/2016	7/21/2016	7/21/2016	9/8/2016	9/8/2016	9/8/2016
Chemical name	**OSD risk screening level - tap water**	**Units**											
Perfluorooctanoic acid (PFOA)	40	ng/L	2.0 U	2.0 U	**4.0**	**6.6**	**4.2**	**4.3**	2.0 U	**2.6**	**1,400**	**1,500**	**2,100**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U	**100**	**96**	**1,100**
Perfluorooctane sulfonate (PFOS)	40	ng/L	**7.6**	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	**1,500**	**3,900**	**4,800**

Table 2-2b. Historical PFOS, PFOA, and PFBS Analytical Results - Groundwater and Seeps
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media			**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**AQ- Water**	**Seep**	**Seep**
Associated AOPI			**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**NA**	**NA**	**NA**
Sample ID			**MW-4**	**MW-5**	**MW-6**	**MW-6D**	**MW-8**	**MW-11**	**MW-11D**	**MW-12**	**GWRC SYSTEM DISCHARGE**	**Seep 1 North Water FT. DRUM**	**Seep 2 Middle Water FT. DRUM**
Sample Date			**9/8/2016**	**12/7/2016**	**5/12/2017**	**5/12/2017**	**NA**	**12/18/2016**	**12/19/2016**	**12/19/2016**	**12/16/2020**	**5/17/2018**	**5/17/2018**
Chemical name	**OSD risk screening level - tap water**	**Units**											
Perfluorooctanoic acid (PFOA)	40	ng/L	**150**	< 1.9	**94**	**190**	**77**	**940**	**130**	**1,200**	ND	**1,100**	**690**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**130**	**9.9 J**	**7.1 J**	**10 J**	**110**	**260**	**21**	**190 J**	**0.0024**	**240**	**270**
Perfluorooctane sulfonate (PFOS)	40	ng/L	**4,500**	**42**	**170**	**25**	**51**	**14,000**	**150**	**8,600**	**0.0022**	**12,000**	**13,000**

Table 2-2b. Historical PFOS, PFOA, and PFBS Analytical Results - Groundwater and Seeps
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

		Media	**Seep**
		Associated AOPI	**NA**
		Sample ID	**Seep 3 South Water FT. DRUM**
		Sample Date	**5/17/2018**
Chemical name	**OSD risk screening level - tap water**	**Units**	
Perfluorooctanoic acid (PFOA)	40	ng/L	**37**
Perfluorobutanesulfonic acid (PFBS)	600	ng/L	**3.1**
Perfluorooctane sulfonate (PFOS)	40	ng/L	**79**

Notes and Acronyms:

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

2. Gray shaded values indicate the result was detected greater than or equal to the Office of the Secretary of Defense (OSD) risk screening levels for tap water, which are also used to evaluate groundwater and potable use surface water in the Army PA/SIs (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).

ASL - Airfield Sanitary Landfill

AOPI - area of potential interest

FTA - fire training area

GW - groundwater

ID - identification

MW - monitoring well

NA - not available

ND = not detected

ng/L - nanograms per liter

OSD - Office of the Secretary of Defense

OSL - Old Sanitary Landfill

PFAS - per- and polyfluoroalkyl substances

USAEC - U.S. Army Environmental Command

Qualifier Descriptions:

ND, U, <- not detected above the laboratory limit of detection (LOD)

J - estimated value is greater or equal to the Method Detection Limit (MDL or DL) and less than the Limit of Quantitation (LOQ or RL)

Data sources:

- 2016 Laboratory Report (Eurofins Lancaster Laboratories) for the Fire Pit Water Sampling
- 2017. USACE Baltimore District. Site Wide PFC Screening Level Investigation. Fort Drum, New York. May.
- 2018. PFC Site Characterization Investigation Summary Report- Old Fire Training Pit, Fort Drum, New York. January.
- 2021. SGS North America Inc. Techical Report for Arcadis, Fort Drum Oasis, NY. Sampling Date 12/16/2020. January.

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media				**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Associated AOPI				**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**FTA**	**Laundry Pad 1**
Sample ID				**SLUDGE**	**PIT#1**	**OH #1**	**OH #2**	**OH #3**	**OWS**	**OIL TANK**	**LP #1**	**LP #2**	**LP #3**	**WTR TANK**	**SB1Drain**
Sample Date				**6/9/2016**	**6/9/2016**	**6/9/2016**	**6/9/2016**	**6/9/2016**	**10/26/2016**	**10/26/2016**	**10/26/2016**	**10/26/2016**	**10/26/2016**	**10/26/2016**	**11/1/2016**
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**												
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	**0.20**	**0.012**	**0.0013**	**0.0026**	**0.0011**	**0.00074**	< 0.00031	< 0.00031	**0.0056**	< 0.00031	< 0.00043 J	< 0.00034
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	**0.038**	ND	ND	**0.00053**	ND	< 0.00051	< 0.00052	< 0.00051	< 0.00049	< 0.00051	< 0.00052	<0.00056
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	***11***	**0.21**	**0.35**	***2.6***	**0.15**	**0.1**	**0.02**	< 0.00072	**0.068**	< 0.00072	**0.013**	< 0.00079

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

			Media	Soil	Soil	Soil	Soil	Soil	Soil	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)
			Associated AOPI	Laundry Pad 1	Laundry Pad 2	Laundry Pad 2	Laundry Pad 3	Laundry Pad 3	Laundry Pad 3	FTA	FTA	FTA	FTA	FTA	FTA
			Sample ID	SB1Sump	SB2Drain	SB2Sump	SB3Drain	SB3SumpA	SB3SumpB	DH-1	DH-2	DH-3	DH-4	DH-5	DH-6
			Sample Date	11/1/2016	11/2/2016	11/2/2016	11/2/2016	11/2/2016	11/2/2016	4/18/2017	4/18/2017	4/18/2017	4/18/2017	4/18/2017	4/18/2017
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**												
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	< 0.00037	< 0.00034	< 0.00036	< 0.00030	< 0.00033	< 0.00033	**0.016**	**0.0024**	**0.00086**	**0.0061**	**0.0042**	**0.0054**
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	< 0.00062	< 0.00057	< 0.00059	< 0.00050	< 0.00054	< 0.00055	0.00054 U	**0.016**	0.00049 U	0.00055 U	0.00053 U	0.00060 U
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	< 0.00087	< 0.00080	< 0.00083	< 0.00070	**0.0016 J**	< 0.00076	**0.0094**	**0.099**	**0.035**	**0.011**	**0.047**	**0.0012**

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media				Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (3-5 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)
Associated AOPI				FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA
Sample ID				DH-7	DH-8	DH-9	DH-10	DH-11	DH-12	DH-13	DH-16	DH-1	DH-2	DH-3	DH-4
Sample Date				4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/20/2017	4/20/2017	4/18/2017	4/18/2017	4/18/2017	4/18/2017
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**												
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	**0.0082**	**0.00057 J**	**0.0018**	**0.0058 J**	0.00049 U	**0.0026**	**0.00071 J**	**0.00041 J**	**0.007**	**0.0019**	**0.00061 J**	**0.0019**
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	0.00060 U	0.00049 U	0.00056 U	0.006 U	0.00049 U	0.00059 U	0.00050 U	0.00050 U	0.00058 U	0.00059 U	0.00051 U	0.00058 U
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	**0.00072 J**	**0.340**	**0.130**	**0.260**	**0.019**	**0.00081 J**	**0.0092**	**0.0019**	**0.036**	**0.018**	**0.320**	**0.00055 J**

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media				Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (8-10 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)
Associated AOPI				FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA
Sample ID				DH-5	DH-6	DH-7	DH-8	DH-9	DH-10	DH-11	DH-13	DH-16	DH-1	DH-2	DH-3
Sample Date				4/18/2017	4/18/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/20/2017	4/20/2017	4/18/2017	4/18/2017	4/18/2017
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**												
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	**0.005**	**0.0017**	**0.0012**	**0.0088**	**0.0033**	**0.00036**	**0.00024 J**	**0.00026 J**	**0.00057 J**	**0.0071**	**0.0052**	**0.0037**
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	**0.00018 J**	0.00056 U	0.00060 U	0.00052 U	0.00049 U	0.00055 U	0.00050 U	0.00052 U	0.00060 U	0.00049 U	0.00059 U	0.00059 U
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	**0.0016**	**0.021**	0.00060 U	**0.0012**	**0.0039**	**0.021**	**0.0032**	**0.0027**	0.00060 U	**0.0077**	**0.29**	**0.12**

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media				Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (13-15 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)
Associated AOPI				FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA
Sample ID				DH-4	DH-5	DH-6	DH-7	DH-8	DH-9	DH-10	DH-13	DH-16	DH-1	DH-2	DH-3
Sample Date				4/18/2017	4/18/2017	4/18/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/20/2017	4/20/2017	4/18/2017	4/18/2017	4/18/2017
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**												
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	**0.00043 J**	**0.0048**	**0.0094**	**0.0011**	0.00056 U	**0.0042**	**0.0028**	**0.00034 J**	**0.00029 J**	**0.0095**	**0.0062 J**	**0.0043**
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	0.00059 U	**0.00051 J**	**0.00031 J**	0.00059 U	**0.0019**	0.00059 U	0.00049 U	0.00056 U	0.00049 U	**0.00074 J**	0.0055 U	0.00066 U
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	0.00059 U	**0.021**	**0.034**	0.00059 U	0.00056 U	**0.018**	**0.0039**	**0.002**	**0.0017**	**0.13**	**0.62**	**0.25**

Table 2-2c. Historical PFOS, PFOA, and PFBS Analytical Results - Soil
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Media				Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)	Soil (18-20 feet)
Associated AOPI				FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA	FTA
Sample ID				DH-4	DH-5	DH-6	DH-7	DH-9	DH-10	DH-11	DH-13	DH-16
Sample Date				4/18/2017	4/18/2017	4/18/2017	4/19/2017	4/19/2017	4/19/2017	4/19/2017	4/20/2017	4/20/2017
Chemical name	**OSD risk screening level - residential scenario**	**OSD risk screening level - industrial / commercial scenario**	**Units**									
Perfluorooctanoic acid (PFOA)	0.13	1.6	mg/kg	**0.0011**	**0.0015**	**0.0033**	**0.0016**	**0.0031**	**0.0034**	0.00058 U	**0.00026 J**	**0.00077 J**
Perfluorobutanesulfonic acid (PFBS)	1.9	25	mg/kg	0.00052 U	0.00057 U	**0.00053 J**	0.00066 U	0.00058 U	0.00060 U	0.00058 U	0.00052 U	0.00066 U
Perfluorooctane sulfonate (PFOS)	0.13	1.6	mg/kg	**0.013**	**0.0047**	**0.00096**	**0.55**	0.00058 U	**0.0019**	**0.0079**	**0.0012**	**0.028**

Notes and Acronyms:

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

2. Data are compared to the OSD risk screening levels for both the residential as well as the industrial/commercial exposure scenarios for soil (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September).

3. Gray shaded values indicate the result was detected greater than or equal to the residential scenario risk screening levels (OSD 2021).

4. Gray shaded and italicized values indicate the result was detected greater than or equal to the industrial/commercial scenario (i.e., and therefore also greater than the residential scenario) risk screening levels (OSD 2021).

Units are provided in milligrams per kilogram (mg/kg)

AOPI - area of potential interest
FTA - fire training area
ID - identification
NA - not available
mg/kg - milligrams per kilogram
OSD - Office of the Secretary of Defense
OWS - oil water separator
PFAS - per- and polyfluoroalkyl substances
USAEC - U.S. Army Environmental Command

Qualifier Descriptions:

J - estimated value is greater or equal to the Method Detection Limit (MDL or DL) and less than the Limit of Quantitation (LOQ or RL)
ND, U, < - not detected above the laboratory limit of detection (LOD)

Data Sources:

- 2017. USACE Baltimore District. Site Wide PFC Screening Level Investigation. Fort Drum, New York. May.
- 2018. PFC Site Characterization Investigation Summary Reort- Old Fire Training Pit, Fort Drum, New York. January.

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Area of Potential Interest	Sampling Location ID[1]	Total Well Depth (ft bgs)	Measuring Point Elevation (ft ags)	Measuring Point	Depth to Groundwater from MP (ft)	Groundwater Elevation (ft amsl)	Screened Interval (ft bgs)	Casing Diameter (inches)	DPT or MW
Fire Station #3 Nozzle Testing Area	FTD-FS3/NOZZLE-1-GW	49.4	NM	MP	39	NC	40-49.4	2	MW
	FTD-FS3/NOZZLE-2-GW	49.25	NM	TOC	40.99	NC	40-49.25	2	MW
	FTD-FS3/NOZZLE-3-GW	51	NM	TOC	42.66	NC	41-51	2	MW
Hangars 2070, 2072, 2074 AFFF Suppression Systems	FTD-HNG-1-GW	70	NM	TOC	42.4	NC	60-70	2	MW
	FTD-HNG-2-GW	69.35	NM	TOC	10.95	NC	60-69.35	2	MW
	FTD-HNG-3-GW	19.8	NM	TOC	6.25	NC	5-15	2	MW
	FTD-BLDG-2086	71.35	NM	TOC	49.29	NC	59-69	2	MW
Mountain Ramp Nozzle Testing Area	FTD-MTNRAMP-1-GW	68.92	NM	TOC	41.95	NC	59-69	2	MW
	FTD-MTNRAMP-2-GW	59.44	NM	TOC	52.1	NC	50-60	2	MW
	FTD-MTNRAMP-3-GW	70	NM	TOC	58.2	NC	59-69	2	MW
	FTD-OBS-05	146.1	NM	TOC	55.49	NC	130.2 - 140.2	2	MW
Building 2725	FTD-B2725-1-GW	20	0.53	TOC	17.7	NC	14.5-19.5	1	DPT
Former Army Fire Station (George & Cannon, Building 3828)	FTD-FAFS(G&C)-1-GW	18	2.23	TOC	14.7	NC	13-18	1	DPT
Building 19855 AFFF Fire Suppression System	FTD-ASL-MW943	67.84	NM	MP	58.8	NC	Unknown	60-67.84	MW
Hangar 19710 Fire Suppression System	FTD-19710/2060-1-GW	56	NM	GS	52.74	NC	51-56	1	DPT
Hangar 2060 Fire Suppression System	FTD-2060-1-GW	50.63	NM	TOC	46.64	NC	45-50	1	DPT
Former WWTP	FTD-WWTP-1-GW	17	2.88	TOC	15.79	NC	12--17	1	DPT
Former WWTP Sludge Beds	FTD-WWTPSB-1-GW	27.5	2.47	TOC	26.57	NC	22.5-27.5	1	DPT
Historical Tank Repair/ Vehicle Maintenance Shop	FTD-PCERI-MW-19S	39.45	NM	MP	17.43	NC	Unknown	2	DPT
	FTD-TR&VMS-1-GW	20.71	NM	TOC	14.79	NC	10-20	1	DPT
	FTD-PCERI-MW-18I	46.30	NM	TOC	15.52	NC	36-46	2	MW
Former Army Fire Station (Building 1860)	FTD-3805-001	20.72	NM	TOC	19.12	NC	Unknown	2	MW
	FTD-PCERI-MW-10I	44.25	NM	TOC	19.17	NC	35-45	2	MW
Fire Station #1 (Building 10710)	FTD-FS-1-GW	7.61	2.51	TOC	3.82	NC	2.61-7.61	1	DPT
Former Army Fire Station (Kennedy & Dunn, Building 2419)	FTD-FAFS(K&D)-1-GW	25.5	1.7	TOC	23.68	NC	20.5-25.5	1	DPT
Former Building 1131 AFFF Storage and Spill	FTD-B1131-1-GW	24.63	0.96	TOC	18.19	NC	19.63-24.63	1	DPT
Storm Sewer AFFF Deployment	FTD-1795-MWS10	16.77	NM	MP	15.19	NC	Unknown	2	MW

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

Area of Potential Interest	Sampling Location ID[1]	Total Well Depth (ft bgs)	Measuring Point Elevation (ft ags)	Measuring Point	Depth to Groundwater from MP (ft)	Groundwater Elevation (ft amsl)	Screened Interval (ft bgs)	Casing Diameter (inches)	DPT or MW
Sludge Pile Near OSL	FTD-SludgePile-1-GW	38.59	1.54	TOC	34.51	NC	33.59-38.59	1	DPT
Former Fire Station 3 (Building 181)	FTD-FFS3-1-GW	19.7	0.65	TOC	15.68	NC	14.7-19.7	1	DPT
Former Fire Station (Building T-2330)	FTD-FFS2330-1-GW	18	2.09	TOC	14.95	NC	13-18	1	DPT
Former Building 1943 OWS	FTD-1943OWS-1-GW	28	1.95	TOC	25.58	NC	23-28	1	DPT
Former Building 3829 OWS	FTD-3829OWS-1-GW	23	1.17	TOC	22.08	NC	18-23	1	DPT
Former Airfield Fire Station (Building 2041)	FTD-FAFS2041-1-GW	24.1	NM	TOC	18.71	NC	19-24	1	DPT
Fire Station 2 (Building 1585)	FTD-FS2-1-GW	19.16	NM	TOC	15.63	NC	14-19	1	DPT
	FTD-FS2-2-GW	11.01	NM	TOC	8.38	NC	6-11	1	DPT
	FTD-FS2-3-GW	12.37	NM	TOC	8.58	NC	7-12	1	DPT

Notes:

1. Permanent wells were not installed at the DPT sampling locations. The total depth listed indicates the total depth of the temporary borehole; the screened interval listed for DPT sampling points indicates the interval at which the drill casing was retracted for collection of a grab groundwater sample through a decontaminated screen-point sampler.

Acronyms/Abreviations:

AOPI - area of potential interest
AFFF - aqueous film-forming foam
ags - above ground surface
amsl - above mean sea level
bgs - below ground surface
DPT - direct push technology
ft - feet
GS - ground surface
GW- groundwater
ID - identification
MW - monitoring well
MP - measuring point
NA - not available
NC - not calculated
NM - not measured (not surveyed)
OSL - Old Sanitary Landfill
OWS - oil water separator
TOC - top of casing
WWTP - wasterwater treatment plant

Sources:

- Fort Drum SI field work notes
-PIKA-MP JV LLC. 2020. 2019 Annual Basewide Monitoring Report. Fort Drum Installation Restoration Program. Fort Drum, New York. March.
-PIKA-MP JV LLC. 2015. Final Feasibility Study 3800 Area PCE Site. Fort Drum Installation Restoration Program. Fort Drum, New York. September.

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

ARCADIS

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Risk Screening Level for Tap Water	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Sludge Pile Near OSL	FTD-SLUDGE PILE-1-GW-121620	12/16/2020	N	**43**		**6.0**		**0.86**	J
Storm Sewer AFFF Deployment	FTD-1795-MW510-111020	11/10/2020	N	1.6	U	1.6	U	**0.84**	J
Former Building 1943 OWS	FTD-1943OWS-1-GW-111020	11/10/2020	N	**11**		**2.4**		**2.4**	
Hangar 19710 and Hangar 2060	FTD-19710/2060-1-GW-121620	12/16/2020	N	**3.2**		**3.2**		**2.3**	
Hangar 2060	FTD-2060-1-GW-100421	10/04/2021	N	**25**	J	**61**	J+	**4.5**	
Building 19855	FTD-ASL-MW943-111220	11/12/2020	N	**65**	J-	**32**		**7.1**	
Former Building 1131	FTD-B1131-1-GW-110620	11/06/2020	N	**150**		**13**		**1.3**	J
Building 2725	FTD-B2725-1-GW-110920	11/09/2020	N	1.6	U	1.6	U	1.6	U
Building 3829 OWS	FTD-B3829OWS-1-GW-110920	11/09/2020	N	**3.3**		1.6	U	1.6	U
Former Army Fire Station (George & Cannon, Building 3828)	FTD-FD-1-GW-110620 / FTD-FAFS (G+C)-1-GW-110620	11/06/2020	FD	**17**		**2.2**		**1.7**	
	FTD-FAFS (G+C)-1-GW-110620	11/06/2020	N	**17**		**2.2**		**1.6**	J
Former Army Fire Station (Kennedy & Dunn, Building 2419)	FTD-FAFS(K+D)-1-FW-111020	11/10/2020	N	**9.8**		**2.2**		1.6	U
Former Fire Station (Building T-2330)	FTD-FFS2330-1-GW-110620	11/06/2020	N	**6,600**		**160**		**4.0**	
Former Fire Station 3 (Building 181)	FTD-FFS3-1-GW-110920	11/09/2020	N	**15**		**0.98**	J	1.6	U
Fire Station #1 (Building 10710)	FTD-FS1-1-GW-121620	12/16/2020	N	**2,700**		**870**		27	U
Historical Tank Repair/ Vehicle Maintenance Shop	FTD-PCERI-MW-19S-111220	11/12/2020	N	**20**		**6.4**		**3.2**	
	FTD-TR&VMS-1-GW-100421	10/04/2021	N	**6.4**		**7.0**		**4.3**	
	FTD-PCERI-MW18I-100521	10/05/2021	N	**2.5**		**3.1**		**3.7**	
Former WWTP	FTD-WWTP-1-GW-110920	11/09/2020	N	1.7	U	**2.2**		1.7	U
	FTD-WWTPSB-1-GW-110920	11/09/2020	N	**3.6**		**1.4**	J	1.7	U
Fire Station #3 Nozzle Testing Area	FTD-FD-1-GW-122019FD / FTD-FS3/NOZZLE-1-GW-122019	12/20/2019	FD	1.7	U	**14**		**2.8**	J+
	FTD-FS3/NOZZLE-1-GW-122019	12/20/2019	N	1.7	U	**14**		**2.8**	J+
	FTD-FS3/NOZZLE-2-GW-010320	01/03/2020	N	1.6	U	**15**		**3.4**	
	FTD-FS3/NOZZLE-3-GW-010920	01/09/2020	N	**2,400**	J	**45**		**7.2**	
Hangars 2070, 2072, 2074, and Surface Water Flows from WSAAF	FTD-BLDG2086-1-GW-011020	01/10/2020	N	**30**		**6.0**		**3.0**	
	FTD-HNG-1-GW-010920	01/09/2020	N	**16**		**11**		**1.1**	J
	FTD-HNG-2-GW-010920	01/09/2020	N	**44**		**8.2**		**4.0**	
	FTD-HNG-3-GW-011020	01/10/2020	N	**2.4**		**1.7**	J	1.8	U
Mountain Ramp Nozzle Testing Area	FTD-OBS-05-010320	01/03/2020	N	**71**		**40**		**11**	
	FTD-MTNRAMP-1-GW-011020	01/10/2020	N	**170**	J	**28**		**2.4**	
	FTD-MTNRAMP-2-GW-010320	01/03/2020	N	**3.9**		**31**		**25**	
	FTD-MTNRAMP-3-GW-010920	01/09/2020	N	1.8	U	1.8	U	**4.5**	

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

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
			OSD Risk Screening Level for Tap Water	40		40		600	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Former Army Fire Station (Building 1860)	FTD-3805-001-101221	10/12/2021	N	**8.2**		**93**		**100**	
	FTD-PCERI-MW10I-101421	10/14/2021	N	**36**		**74**		**7.5**	
Former Airfield Fire Station (Building 2041)	FTD-FAFS2041-1-GW-100421	10/04/2021	N	**17**		**12**		**3.1**	
Fire Station 2 (Building 1585)	FTD-FS2-1-GW-100421	10/04/2021	N	**4.4**		**3.0**		1.6	U
	FTD-FD-1-GW-100421/ FTD-FS2-1-GW-100421	10/04/2021	FD	**4.0**	J	**2.8**		1.6	U
	FTD-FS2-2-GW-100421	10/04/2021	N	**280**		**66**		**1.4**	J
	FTD-FS2-3-GW-100421	10/04/2021	N	**59**		**22**		**1.7**	

Notes:

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

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

Acronyms/Abbreviations:

AFFF = aqueous film forming foam
AOPI = Area of Potential Interest
FD = field duplicate sample
FTD = Fort Drum
GW = groundwater
ID = identification
MW = monitoring well
N = primary sample
ng/L = nanograms per liter (parts per trillion)
OSD = Office of the Secretary of Defense
OSL = Old Sanitary Landfill
OWS = oil water separator
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
WSAAF = Wheeler Sack Army Airfield
WWTP = wastewater treatment plant
USAEC = U.S. Army Environmental Command

Qualifiers:

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

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
			OSD Risk Screening Level for Industrial/Commercial Scenario	1.6		1.6		25	
			OSD RiskScreening Level for Residential Scenario	0.13		0.13		1.9	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Sludge Pile Near OSL	FTD-SLUDGEPILE-1-SO(0.5-2)-102720	10/27/2020	N	**0.0057**		0.00060	U	0.0020	U
	FTD-SLUDGEPILE-2-SO(0.5-2)-102720	10/27/2020	N	**0.0045**		0.00063	U	0.0021	U
	FTD-SLUDGEPILE-3-SO(0.5-2)-102720	10/27/2020	N	**0.00042**	J	0.00063	U	0.0021	U
Hangar 19710	FTD-19710-1-SO (0.5-2)-110520	11/05/2020	N	0.00057	U	0.00057	U	0.0019	U
	FTD-19710-2-SO (0.5-2)-110520	11/05/2020	N	0.00064	U	0.00064	U	0.0021	U
Hangar 2049	FTD-2049-1-SO (0.5-2)-110420	11/04/2020	N	0.00062	U	0.00062	U	0.0021	U
Hangar 2050	FTD-2050-1-SO (0.5-2)-110420	11/04/2020	N	**0.0021**		0.00061	U	0.0020	U
	FTD-2050-2-SO (0.9-2)-110420	11/04/2020	N	**0.00067**		0.00060	U	0.0020	U
Hangar 2060	FTD-2060-1-SO (0.5-2)-110220	11/02/2020	N	**0.00081**		**0.0062**		0.0021	U
Former Building 1131	FTD-B1131-1-SO(0.5-2)-102920	10/29/2020	N	0.00066	U	0.00066	U	0.0022	U
	FTD-B1131-2-SO(0.5-2)-102920	10/29/2020	N	0.00059	U	0.00059	U	0.0020	U
	FTD-B1131-3-SO(0.5-2)-102920	10/29/2020	N	0.00061	U	0.00061	U	0.0020	U
Building 19855	FTD-B19855-1-SO (0.5-2)-110220	11/02/2020	N	0.00065	U	0.00065	U	0.0022	U
	FTD-B19855-2-SO (0.5-2)-110420	11/04/2020	N	**0.00062**		0.00062	U	0.0021	U
	FTD-B19855-3-SO (0.5-2)-110220	11/02/2020	N	0.00064	U	**0.00084**		0.0021	U
	FTD-B19855-4-SO (0.5-2)-110220	11/02/2020	N	0.00065	U	0.00065	U	0.0022	U
Building 2018- Soil Barn	FTD-B2018-1-SO(0.5-2)-102720	10/27/2020	N	**0.0022**		0.00067	U	0.0022	U
	FTD-B2018-2-SO(0.5-2)-102720	10/27/2020	N	**0.00047**	J	0.00063	U	0.0021	U
Building 2725	FTD-B2725-1-SO(0.5-2)-102820	10/28/2020	N	0.00059	U	0.00059	U	0.0020	U
	FTD-B2725-2-SO(0.5-2)-102820	10/28/2020	N	0.00060	U	0.00060	U	0.0020	U
Building 3829 OWS	FTD-B3829-1-SO(20-21.3)-103020	10/30/2020	N	0.00066	U	0.00066	U	0.0022	U

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
			OSD Risk Screening Level for Industrial/Commercial Scenario	1.6		1.6		25	
			OSD RiskScreening Level for Residential Scenario	0.13		0.13		1.9	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Former Army Fire Station (George & Cannon, Building 3828)	FTD-FAFS(G+C)-1-SO(1-2)-103020	10/30/2020	N	**0.00083**		0.00061	U	0.0020	U
	FTD-FAFS(G+C)-2-SO(0.8-2)-103020	10/30/2020	N	0.00057	U	0.00057	U	0.0019	U
	FTD-FAFS(G+C)-3-SO(1-2)-103020	10/30/2020	N	0.00060	U	0.00060	U	0.0020	U
Former Army Fire Station (Kennedy & Dunn, Building 2419)	FTD-FAFS(K+D)-1-SO(0.5-2)-102920	10/29/2020	N	**0.048**		0.00060	UJ	0.0020	U
	FTD-FAFS(K+D)-2-SO(0.5-2)-102920	10/29/2020	N	**0.28**	J+	**0.0017**	J+	0.0022	UJ
Former Fire Station (Building T-2330)	FTD-FFS2330-1-SO(0.5-2)-102920	10/29/2020	N	**0.00047**	J	0.00061	U	0.0020	U
	FTD-FFS2330-2-SO(0.5-2)-102920	10/29/2020	N	**0.0097**		**0.00060**	J	0.0021	U
Former Fire Station 3 (Building 181)	FTD-FFS3-1-SO(0.5-2)-102920	10/29/2020	N	0.00062	U	0.00062	U	0.0021	U
	FTD-FFS3-2-SO(0.5-2)-102920	10/29/2020	N	0.00063	U	0.00063	U	0.0021	U
	FTD-FD-2-SO-102920/ FTD-FFS3-2-SO(0.5-2.0)-102920	10/29/2020	FD	0.00064	U	0.00064	U	0.0021	U
	FTD-FFS3-3-SO(0.5-2)-102920	10/29/2020	N	**0.0022**		0.00064	U	0.0021	U
Fire Station #1 (Building 10710)	FTD-FS1-1-SO (0.5-2)-110420	11/04/2020	N	**0.041**		**0.0018**		0.0021	U
	FTD-FD-1-SO-110420 / FTD-FS1-1-SO (0.5-2)-110420	11/04/2020	FD	**0.044**		**0.0021**		0.0021	U
	FTD-FS1-2-SO (0.5-2)-110420	11/04/2020	N	**0.033**		**0.0017**		0.0024	U
Fire Station #3 Nozzle Testing Area	FTD-FS3/NOZZLE-1-SS-120519	12/05/2019	N	**0.021**		**0.00077**		0.0021	U
	FTD-FS3/NOZZLE-2-SS-120519	12/05/2019	N	**0.014**		**0.00069**		0.0020	U
	FTD-FS3/NOZZLE-3-SS-120519	12/05/2019	N	**0.00070**		0.00059	U	0.0020	U
	FTD-FS3-NOZZLE-4-SS-120619	12/06/2019	N	**0.014**		0.00062	UB	0.0020	U
	FTD-FS3-NOZZLE-5-SS-120619	12/06/2019	N	**0.0021**		0.00059	U	0.0020	U
	FTD-FS3/NOZZLE-6-SS-120519	12/05/2019	N	**0.0069**		**0.0012**		0.0020	U
	FTD-FS3/NOZZLE-7-SS-120519	12/05/2019	N	**0.00086**		0.00060	U	0.0020	U

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

AOPI	Sample/ Parent ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
			OSD Risk Screening Level for Industrial/Commercial Scenario	1.6		1.6		25	
			OSD RiskScreening Level for Residential Scenario	0.13		0.13		1.9	
			Sample Type	Result	Qual	Result	Qual	Result	Qual
Hangars 2070, 2072, 2074, and Surface Water Flows from WSAAF	FTD-BLDG2086-1-SO-(20)-010320	01/03/2020	N	0.00063	U	0.00063	U	0.0021	U
Mountain Ramp Nozzle Testing Area	FTD-MTN RAMP-1-SS-120519	12/05/2019	N	**0.00054**	J	0.00060	U	0.0020	U
	FTD-MTN RAMP-2-SS-120519	12/05/2019	N	**0.011**		0.00062	U	0.0021	U
	FTD-MTN RAMP-3-SS-120519	12/05/2019	N	**0.013**		0.00060	U	0.0020	U
	FTD-MTN RAMP-4-SS-120519	12/05/2019	N	**0.0029**		0.00062	U	0.0021	U
	FTD-MTNRAMP-5-SS-120619	12/06/2019	N	**0.011**		0.00060	U	0.0020	U
	FTD-FD-2-SS-120619FD / FTD-MTNRAMP-6-SS-120619	12/06/2019	FD	**0.017**		0.00060	U	0.0020	U
	FTD-MTNRAMP-6-SS-120619	12/06/2019	N	**0.019**	J	0.00061	U	0.0020	U
Fire Station 2 (Building 1585)	FTD-FS2-1-SO(0.5-2)-100121	10/01/2021	N	0.00061	UJ		R	0.002	UJ
	FTD-FS2-2-SO(0.5-2)-093021	09/30/2021	N	**0.0012**		**0.00056**	J	0.0021	U
	FTD-FD-3-SO-093021 / FTD-FS2-2-SO(0.5-2)-093021	09/30/2021	FD	**0.001**		**0.0007**		0.002	U
	FTD-FS2-3-SO(0.5-2)-100121	10/01/2021	N	**0.003**		0.00061	U	0.002	U
	FTD-FS2-4-SO(0.5-2)-093021	09/30/2021	N	**0.0011**	J	0.00061	U	0.002	U

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 expsoure scenarios for soil, (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September.).
3. Grey shaded values indicate the result was detected greater than the residential scenario risk screening levels (OSD 2021). There were no detections greater than the commercial/industrial scenario risk screening levels.

Acronyms/Abbreviations:

AOPI = Area of Potential Interest
FD = field duplicate sample
FTD = Fort Drum
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
OSD = Office of the Secretary of Defense
OSL = Old Sanitary Landfill
OWS = oil water separator
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SO = Soil
WSAAF = Wheeler Sack Army Airfield

Qualifiers:

J = The analyte was positively identified; however the associated numerical value is an estimated concentration only
J+ = The result is an estimated quantity; the result may be biased high.
R= The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Rejection of the data was decided by the project team and USACE chemist.
U= The analyte was analyzed for but the result was not detected above thelimit of quantitation (LOQ).
UB = The analyte is considered nondetect at the listed value due to associated blank contamination.
UJ = The analyte was analyzed for but was not detected. The LOQ is approximate and may be inaccurate or imprecise.

Table 7-3 - Surface Water PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

AOPI	Location	Sample/ Parent ID	Sample Date	Analyte	PFOS (ng/L)		PFOA (ng/L)		PFBS (ng/L)	
				OSD Risk Screening Level for Tap Water	40		40		600	
				Sample Type	Result	Qual	Result	Qual	Result	Qual
Hangar 19710 and 2060	FTD-OF01-1	FTD-OF01-1-SW-110520*	11/05/2020	N	**2.9**		**1.2**	J	1.6	U
Hangar 2049 and 2050	FTD-OF06-1	FTD-OF06-1-SW-110520*	11/05/2020	N	**120**		**27**		**3.6**	
OSL	FTD-OSL-1	FTD-OSL-1-SW-110520*	11/05/2020	N	**55**		**13**		**3.2**	
	FTD-OSL-LS31	FTD-FD-1-SW-110520 / FTD-FTD-OSL-LS31-110520*	11/05/2020	FD	**15**	J	20	U	20	U
		FTD-OSL-LS31-110520	11/05/2020	N	**14**	J	20	U	20	U
	FTD-OSL-SP03	FTD-OSL-SP03-110520	11/05/2020	N	**31**		20	U	20	U
Storm Sewer AFFF Deployment	FTD-SSAD-1	FTD-SSAD-1-SW-110620*	11/06/2020	N	**13**		**4.7**		**1.4**	J
Hangars 2070, 2072, 2074, and Surface Water Flows from WSAAF	FTD-HNG-CLVRT-42	FTD-FD-4-SW-120519FD / FTD-HNGCLVRT42-1-SW-120519*	12/05/2019	FD	1.7	U	**1.2**	J	1.7	U
		FTD-HNGCLVRT42-1-SW-120519*	12/05/2019	N	**0.98**	J	1.7	U	1.7	U

Notes:
*Sample results for these surface water samples were not compared to the OSD risk screening levels for tap water because the surface water sample source is not a direct expression of groundwater at the related AOPIs and the associated surface water bodies are not used as a source of drinking water.

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 tap water (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. October.), when applicable.

Acronyms/Abbreviations:
AFFF = aqueous film forming foam
AOPI = Area of Potential Interest
FD = field duplicate sample
FTD = Fort Drum
ID = identification
N = primary sample
ng/L = nanograms per liter (parts per trillion)
OSD = Office of the Secretary of Defense
OSL = Old Sanitary Landfill
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SW = Surface water
WSAAF = Wheeler Sack Army Airfield
USAEC = U.S. Army Environmental Command

Qualifiers:
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 7-4 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Fort Drum, New York

AOPI	Location	Sample/ Parent ID	Sample Date	Analyte	PFOS (mg/kg)		PFOA (mg/kg)		PFBS (mg/kg)	
				Sample Type	Result	Qual	Result	Qual	Result	Qual
Hangar 19710 and 2060	FTD-OF01-1	FTD-FD-1-SE-110520 / FTD-OF01-1-SE-110520	11/05/2020	FD	0.00074	U	0.00074	U	0.0025	U
		FTD-OF01-1-SE-110520	11/05/2020	N	0.00078	U	0.00078	U	0.0026	U
Hangar 19710 and 2060	FTD-OF01-2	FTD-OF01-2-SE-110520	11/05/2020	N	0.00070	U	0.00070	U	0.0023	U
Hangar 2049	FTD-OF06-1	FTD-OF06-1-SE-110520	11/05/2020	N	0.00087	U	0.00087	U	0.0029	U
OSL	FTD-OSL-1	FTD-OSL-1-SE-110520	11/05/2020	N	0.00078	U	0.00078	U	0.0026	U
Storm Sewer AFFF Deployment	FTD-SSAD-1	FTD-SSAD-1-SE-110620	11/06/2020	N	0.00072	U	0.00072	U	0.0024	U
	FTD-SSAD-2	FTD-SSAD-2-SE-110620	11/06/2020	N	0.00090	U	0.00090	U	0.0030	U
Hangars 2070, 2072, 2074, and Surface Water Flows from WSAAF	FTD-HNG-CLVRT-42	FTD-FD-3-SE-120519FD / FTD-HNG-CLVRT42-1-SE-120519	12/05/2019	FD	0.00081	U	0.00081	U	0.0027	U
		FTD-HNG-CLVRT42-1-SE-120519	12/05/2019	N	0.00081	U	0.00081	U	0.0027	U

Notes:

1. Sediment data collected as part of the SI were not compared to the Office of the Secretary of Defense risk screening levels for soil since the sediment sample collection areas were not represenative of soil exposures.

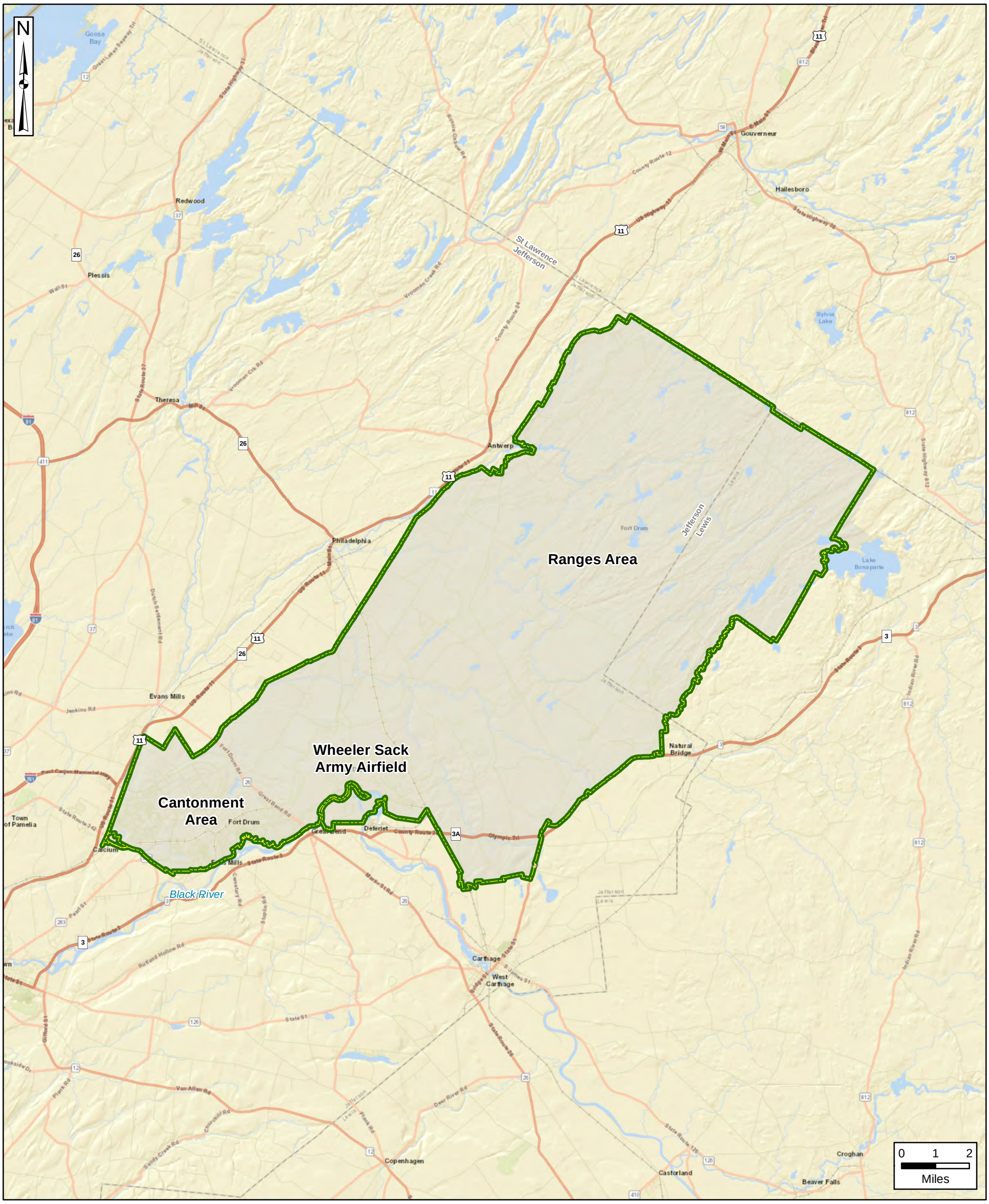
Acronyms/Abbreviations:
AFFF = aqueous film forming foam
AOPI = area of potential interest
FD = field duplicate sample
FTD = Fort Drum
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
OSL = Old Sanitary Landfill
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SE = sediment
WSAAF = Wheeler Sack Army Airfield
USAEC = U.S. Army Environmental Command

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

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 2-1
Site Location



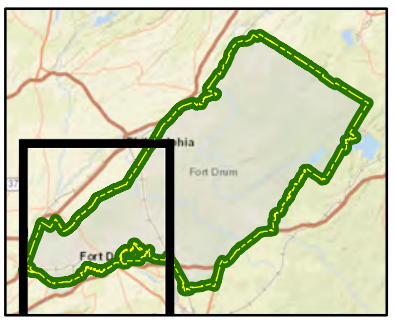
Installation Boundary

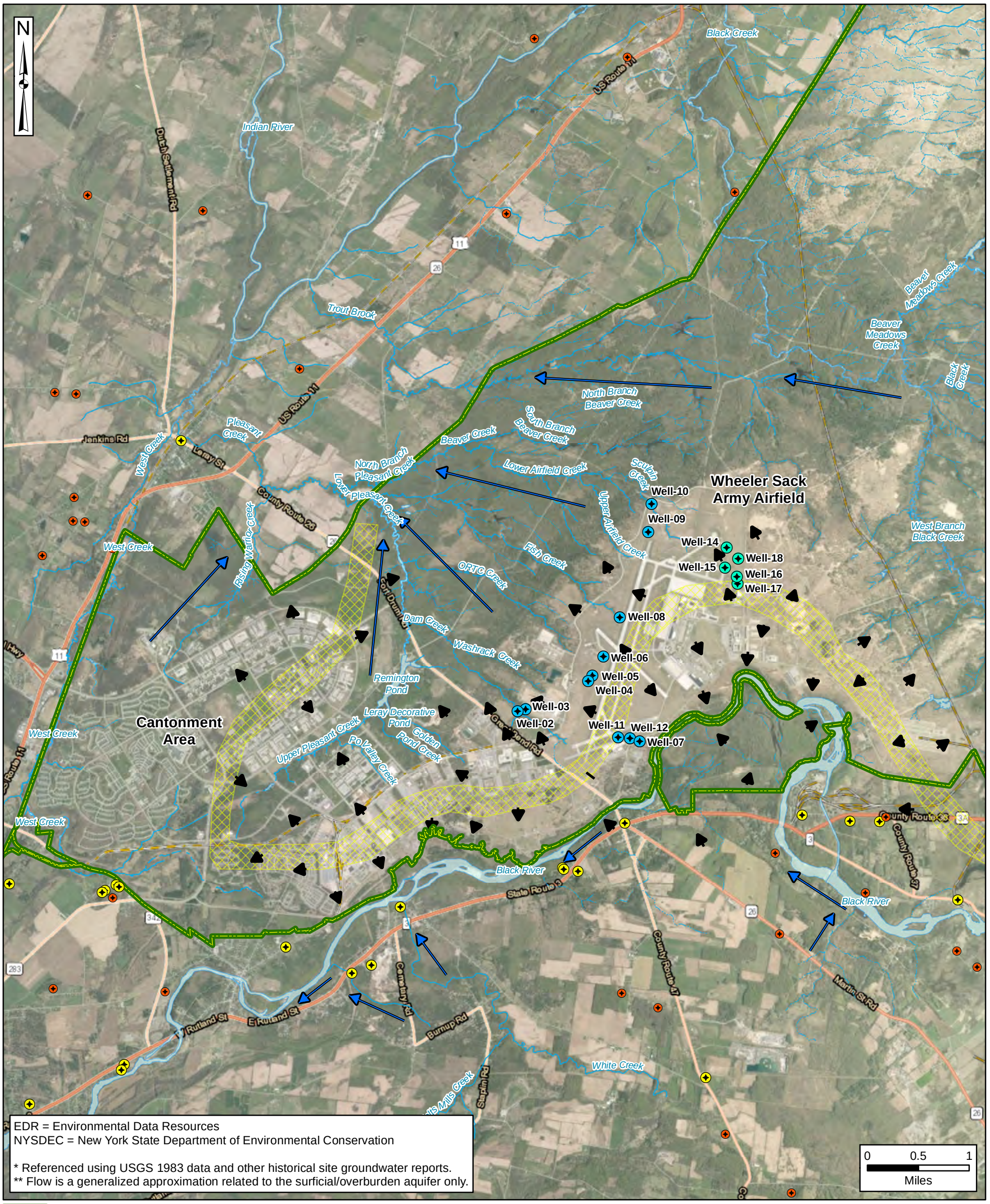
Data Sources:
ESRI, State Data, 2019
ESRI ArcGIS Online, StreetMap Data, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 2-2
Site Layout





EDR = Environmental Data Resources
NYSDEC = New York State Department of Environmental Conservation

* Referenced using USGS 1983 data and other historical site groundwater reports.
** Flow is a generalized approximation related to the surficial/overburden aquifer only.

- Installation Boundary
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Water Body
- Fort Drum Shallow Groundwater Divide *
- Groundwater Flow Direction **
- General Surface Water Flow Direction
- Potable Supply Well - Offline
- Potable Supply Well - Active
- Water Supply Well (EDR Data)
- New York State Well (NYSDEC Data)

Data Sources:
Arcadis, Shallow Groundwater Divide, 2021
Arcadis, Surface Water Flow Direction, 2021
DEC, NYS Wells, Accessed 2019
EDR, Water Supply Wells, 2018
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Groundwater Flow Direction, 2019
Fort Drum, Installation Boundary, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

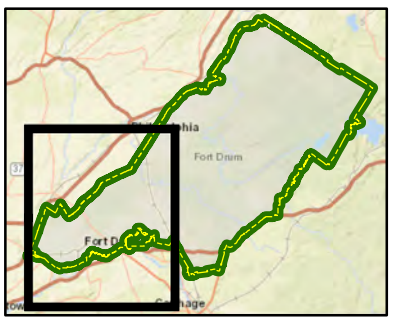


Figure 2-3
Topographic Map

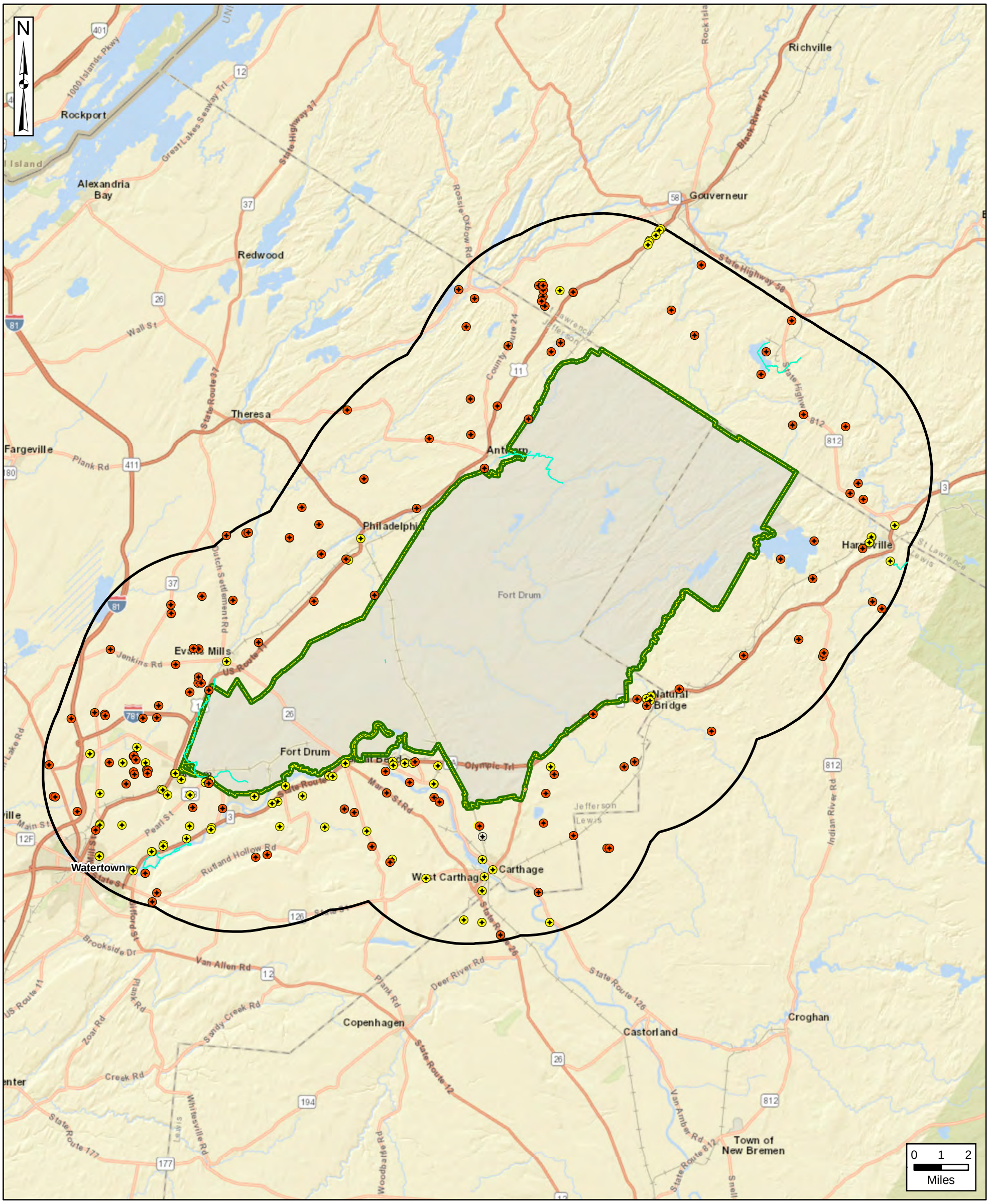
Installation Boundary
River/Stream (Perennial)
Stream (Ephemeral/Intermittent)
Water Body
Elevation Contour (10 feet)

Data Sources:
Arcadis, Elevation Contours, 2021
ESRI ArcGIS Online, USGS Topo Map, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 2-4
Off-Post Potable Supply Wells



Installation Boundary

5-Mile Radius

New York State DEC Class A River/Stream*

New York State DEC Class A Waterbody*

Water Supply Well (EDR Data)

New York State Well (NYSDEC Data)

EDR = Environmental Data Resources
NYSDEC = New York State Department of Environmental Conservation

* The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Data Sources:
Arcadis, 5-Mile Radius, 2021
DEC, NYS Waterbodies, 2017
DEC, NYS Wells, Accessed 2019
EDR, Water Supply Wells, 2018
ESRI ArcGIS Online, StreetMap Data, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

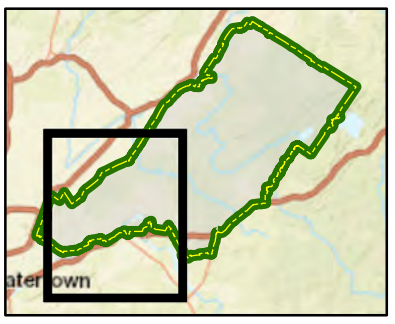
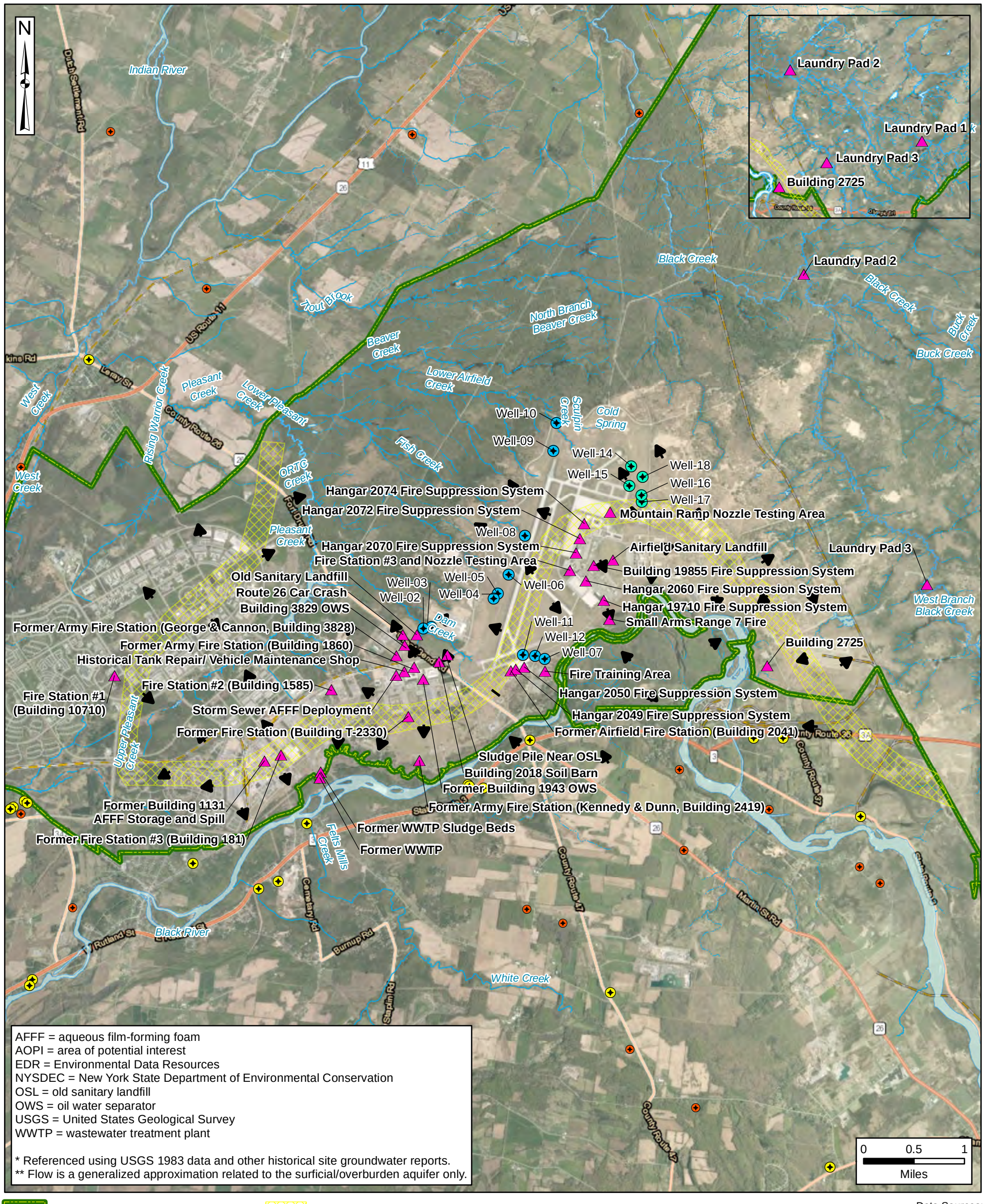


Figure 5-2
AOPI Locations



AFFF = aqueous film-forming foam
AOPI = area of potential interest
EDR = Environmental Data Resources
NYSDEC = New York State Department of Environmental Conservation
OSL = old sanitary landfill
OWS = oil water separator
USGS = United States Geological Survey
WWTP = wastewater treatment plant

* Referenced using USGS 1983 data and other historical site groundwater reports.
** Flow is a generalized approximation related to the surficial/overburden aquifer only.

- Installation Boundary
- AOPI
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Water Body
- Fort Drum Shallow Groundwater Divide *
- Inferred Groundwater Flow Direction **
- Potable Supply Well - Active
- Potable Supply Wells - Offline
- Public Water Supply System Well (EDR)
- State Water Well (NYSDEC)

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Shallow Groundwater Divide, 2021
DEC, NYS Wells, Accessed 2019
EDR, Water Supply Wells, 2018
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Groundwater Flow Direction, 2019
Fort Drum, Installation Boundary, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

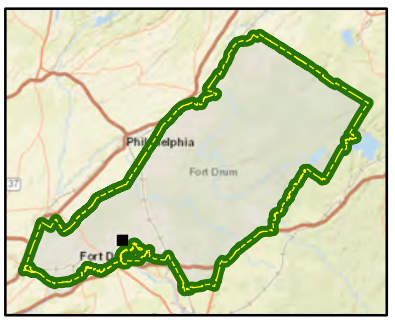
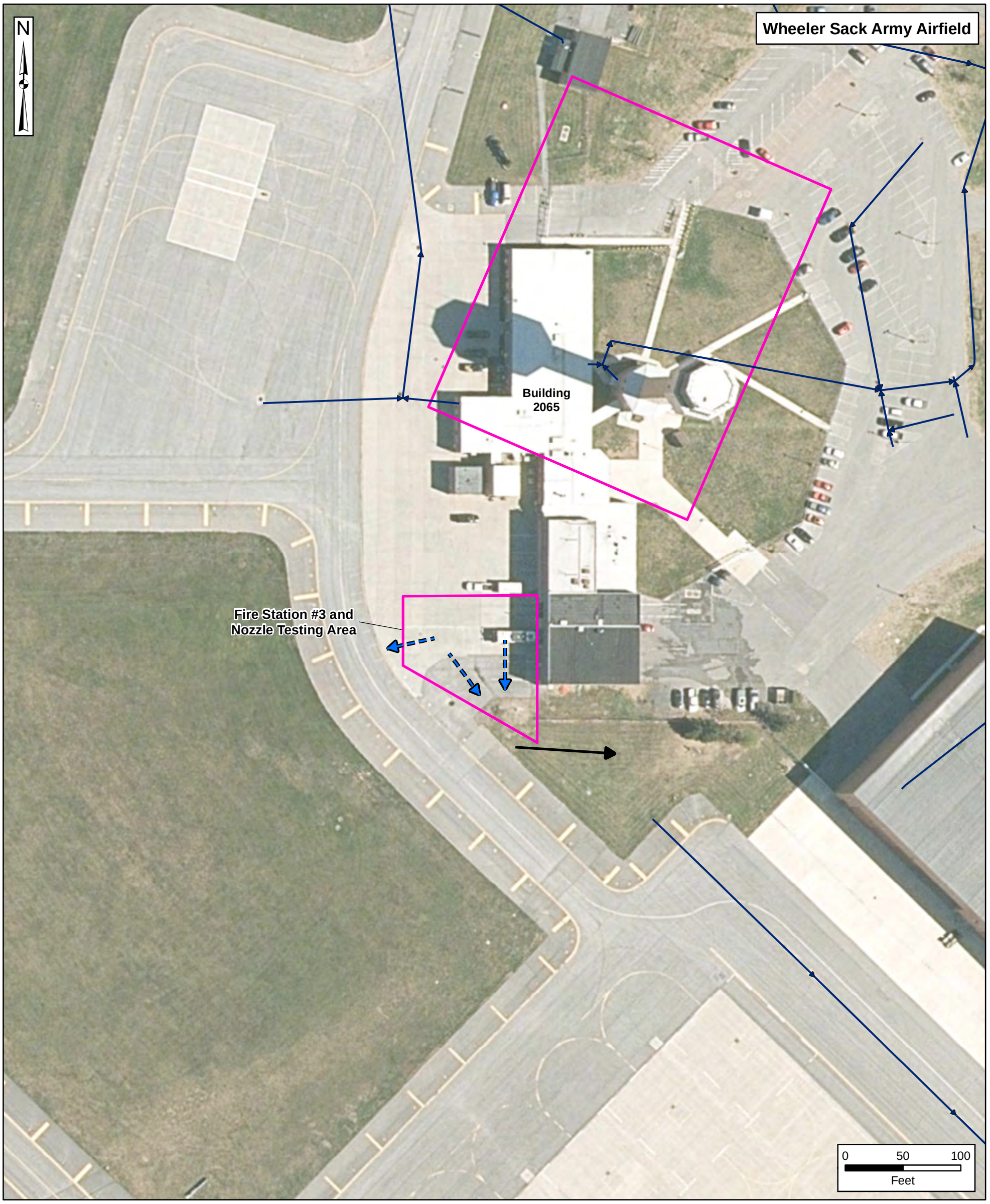


Figure 5-3
Aerial Photo of
Fire Station #3 and Nozzle Testing Area



Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction
Stormwater Sewer

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

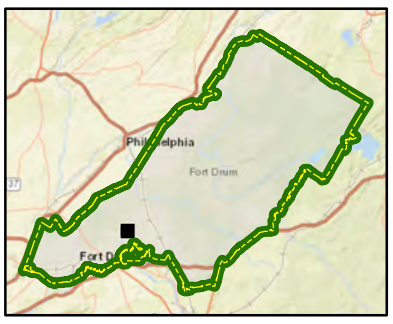
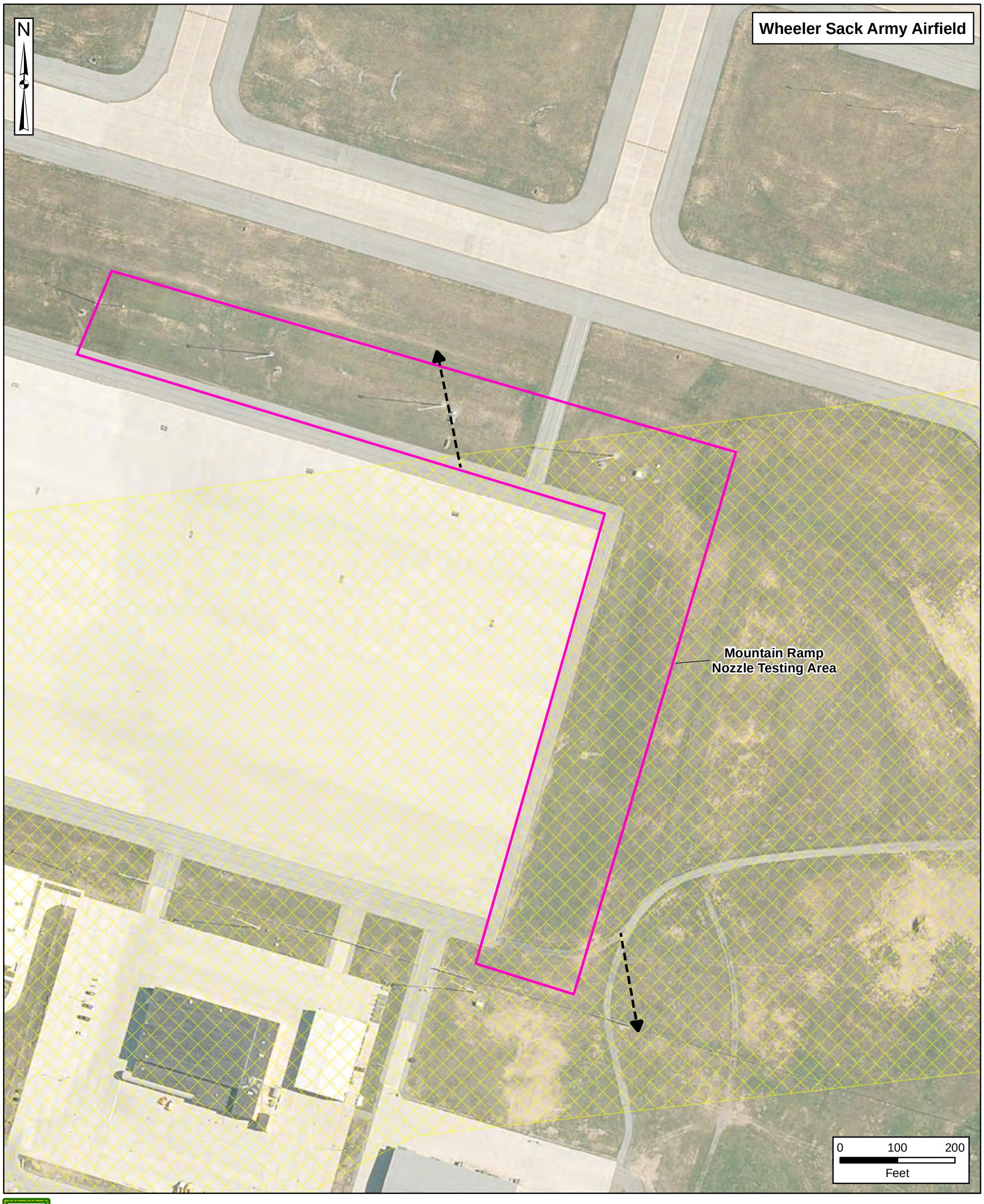


Figure 5-4
Aerial Photo of
Mountain Ramp Nozzle Testing Area



Installation Boundary
AOPI
Fort Drum Shallow Groundwater Divide *
Assumed Groundwater Flow Direction

AOPI = area of potential interest
USGS = United States Geological Survey

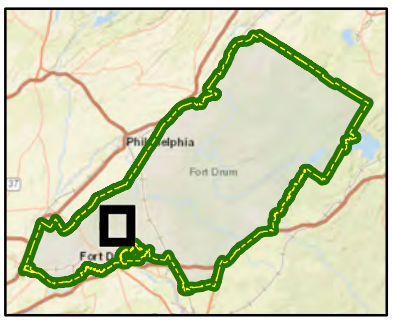
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

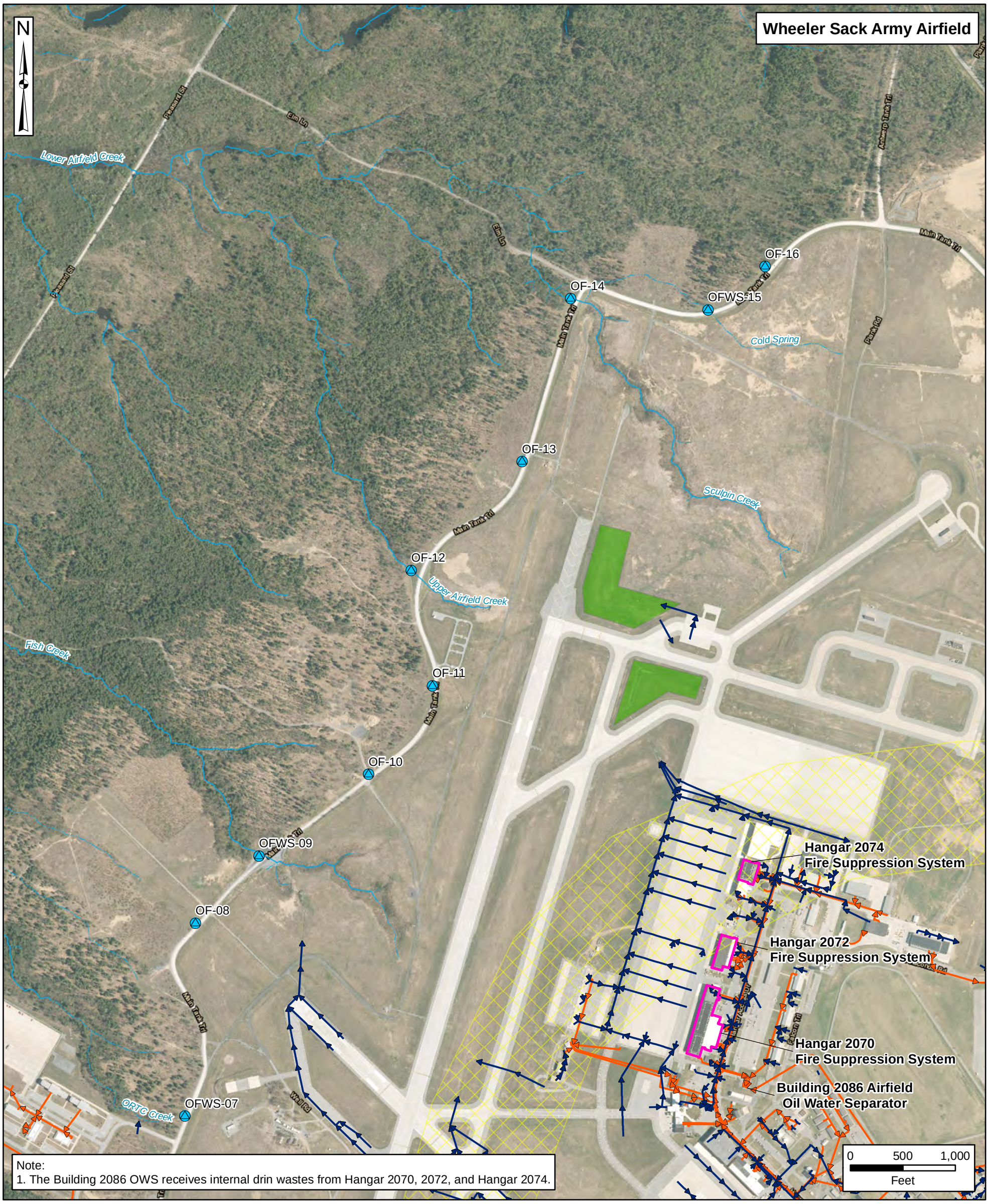
Coordinate System:
WGS 1984, UTM Zone 18 North

* Referenced using USGS 1983 data and other historical site groundwater reports.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 5-5
Aerial Photo of
Hangars 2070, 2072, and 2074 and
Secondary Source Building 2086 Airfield OWS





Note:
1. The Building 2086 OWS receives internal drin wastes from Hangar 2070, 2072, and Hangar 2074.

- Installation Boundary
- AOPI
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Fort Drum Shallow Groundwater Divide *
- Storm Water Collection, Retention, and Infiltration Area
- Stormwater Sewer
- Sanitary Sewer
- Stormwater Discharge Point

* Referenced using USGS 1983 data and other historical site groundwater reports.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Shallow Groundwater Divide, 2021
Arcadis, Stormwater Retention Areas, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Sanitary Sewers, 2019
Fort Drum, Stormwater Sewers, 2019
Fort Drum, Stormwater Discharge Points, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

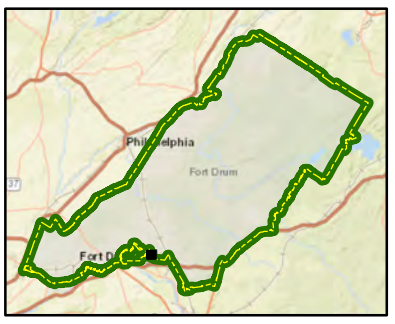


Figure 5-6
Aerial Photo of
Building 2725

Installation Boundary

AOPI

Stream (Ephemeral/Intermittent)

Inferred Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

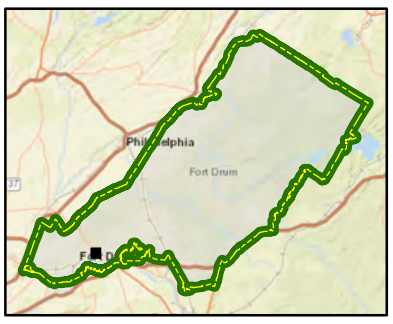


Figure 5-7
Aerial Photo of Former Army
Fire Station (George & Cannon, Building 3828)

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

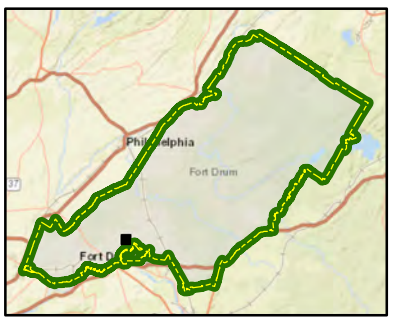


Figure 5-8
Aerial Photo of Building 19855
Fire Suppression System

Installation Boundary

AOPI

Inferred Groundwater Flow Direction

Surface Runoff Flow Direction

Stormwater Sewer

Monitoring Well

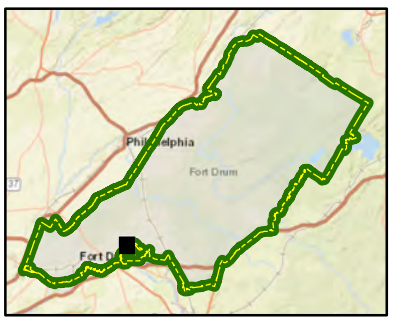
AOPI = area of potential interest

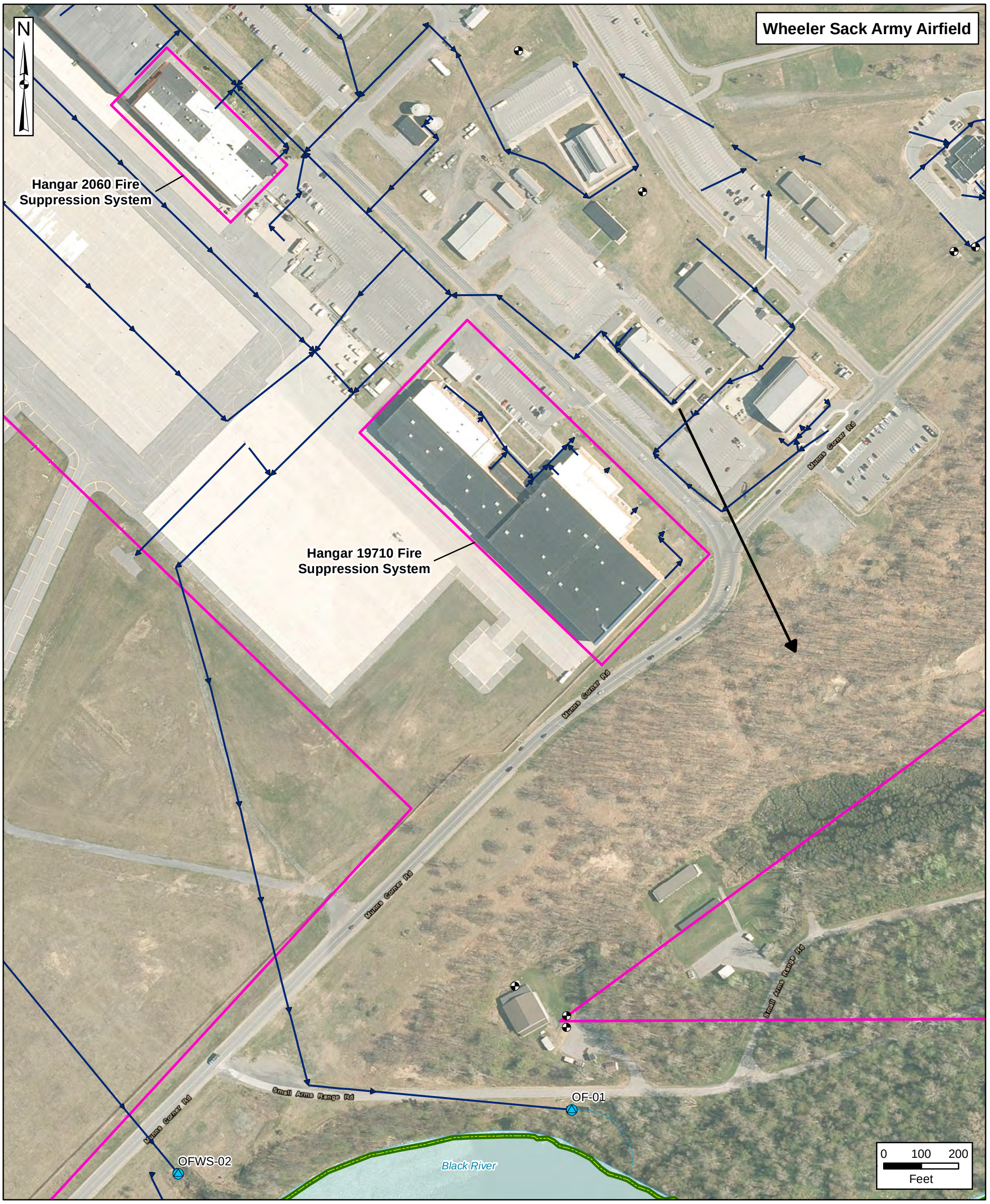
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 5-9
Aerial Photo of
Hangar 2060 Fire Suppression System and
Hangar 19710 Fire Suppression System





Installation Boundary
AOPI
Stream (Ephemeral/Intermittent)
Water Body
Inferred Groundwater Flow Direction
Stormwater Sewer
Monitoring Well
Stormwater Discharge Point

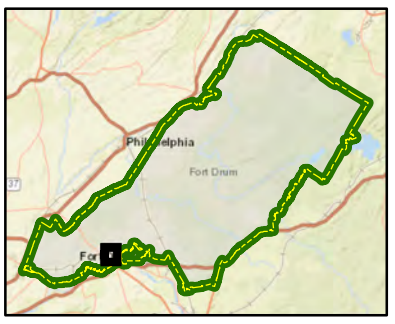
AOPI = area of potential interest

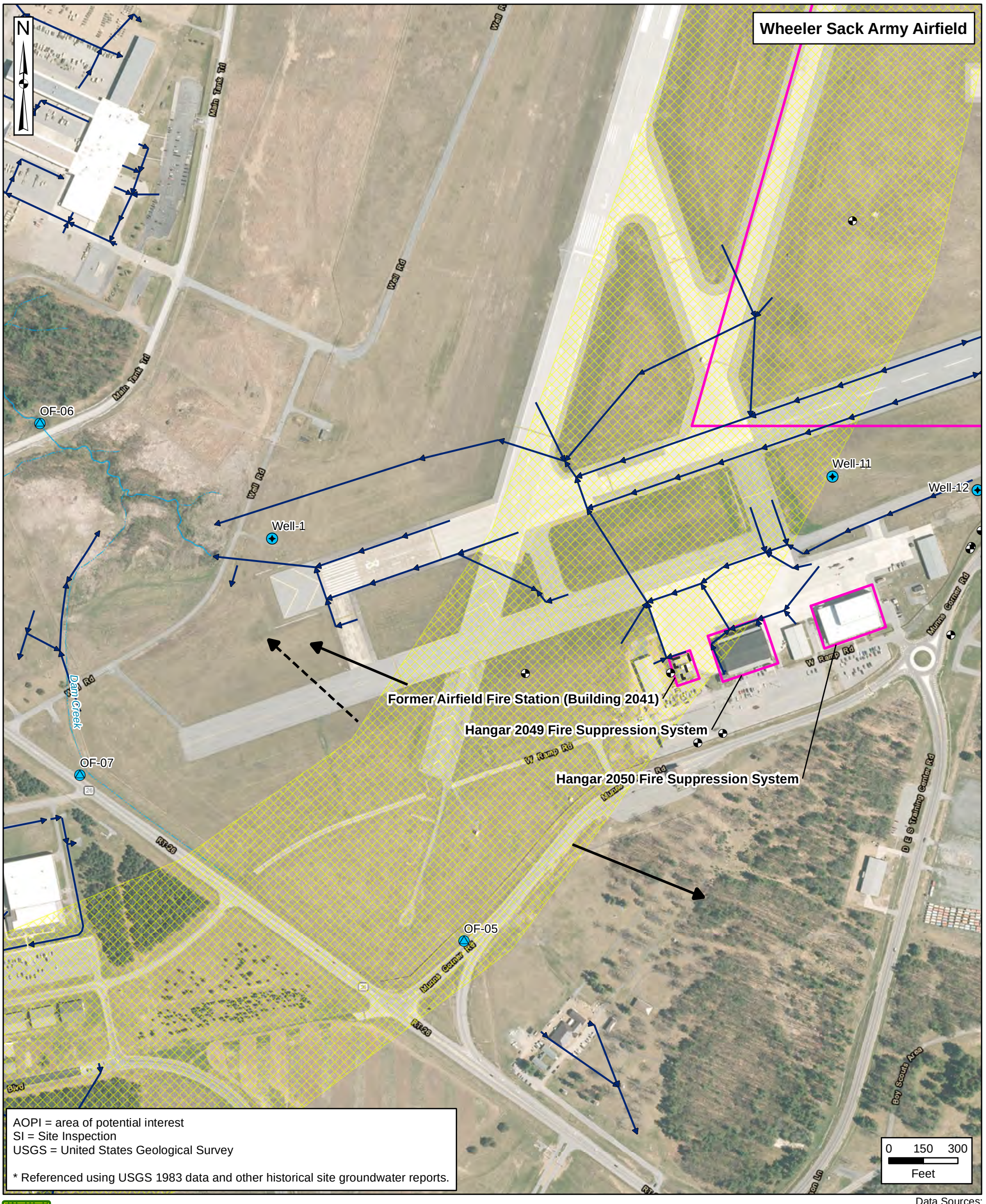
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Stormwater Sewers, 2019
Fort Drum, Stormwater Discharge Points, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 5-10
Aerial Photo of Hangar 2049 Fire Suppression System, Hangar 2050 Fire Suppression System, and Former Airfield Fire Station (Building 2041)





AOPI = area of potential interest
SI = Site Inspection
USGS = United States Geological Survey

* Referenced using USGS 1983 data and other historical site groundwater reports.

- Installation Boundary
- AOPI
- Historical Building Footprint
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Shallow Groundwater Divide *
- Inferred Groundwater Flow Direction
- Assumed Groundwater Flow Direction
- Stormwater Sewer
- Potable Supply Well - Original Well Field
- Monitoring Well
- Stormwater Discharge Point

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Foodprint, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, River/Streams, 2021
Fort Drum, Stormwater Sewers, 2019
Fort Drum, Stormwater Discharge Points, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

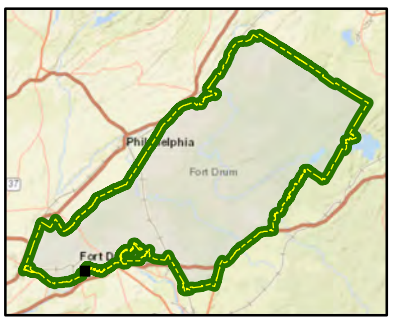


Figure 5-11
Aerial Photo of Former WWTP and Former WWTP Sludge Drying Beds

Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Stormwater Sewer
Phase 2 Sampling Location Outfall

AOPI = area of potential interest
WWTP = wastewater treatment plant

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Outfalls, 2019
Fort Drum, Stormwater Sewers, 2019

Note:
Former WWTP Sludge Drying Beds AOPI location interpreted from William S. Lozier, Inc. as-built drawing, 1941.

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

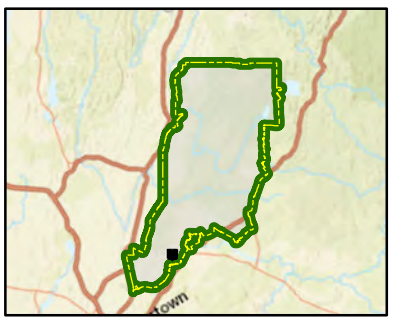


Figure 5-12
Aerial Photo Former Army Fire Station (Building 1860) and Historical Tank Repair/Vehicle Maintenance Shop

Installation Boundary

AOPI

Historical Building Footprint

Inferred Groundwater Flow Direction

Monitoring Well

AOPI = area of potential interest
BLDG = Building

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

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Fort Drum, NY

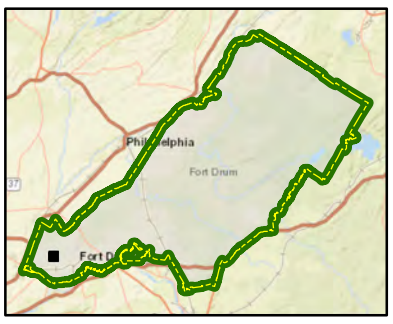

Figure 5-13
Aerial Photo of
Fire Station #1 (Building 10710)

Installation Boundary

AOPI

Inferred Groundwater Flow Direction

Surface Runoff Flow Direction

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Water Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

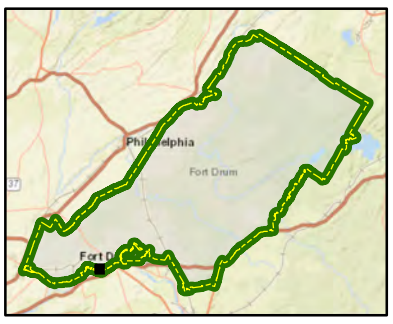

Figure 5-14
Aerial Photo of Former Army
Fire Station (Kennedy & Dunn, Building 2419)

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

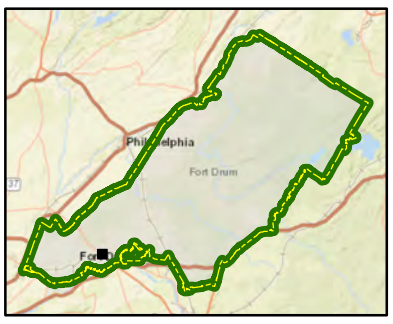

Figure 5-15
Aerial Photo of
Building 2018 Soil Barn

Installation Boundary
AOPI
Surface Runoff Flow Direction
Inferred Groundwater Flow Direction
Monitoring Well

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

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Fort Drum, NY

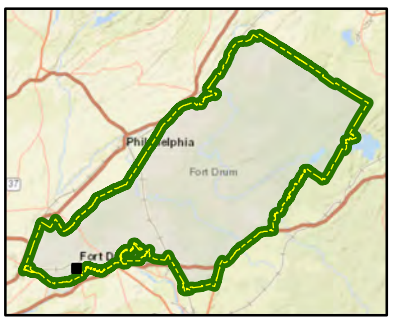

Figure 5-16
Aerial Photo of
Former Building 1131 AFFF Storage and Spill

Installation Boundary
AOPI
Historical Building Footprint
Fort Drum Shallow Groundwater Divide *
Inferred Groundwater Flow Direction

AOPI = area of potential interest
AFFF = aqueous film-forming foam
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

* Referenced using USGS 1983 data and other historical site groundwater reports.

USAEC PFAS Preliminary Assessment / Site Inspection
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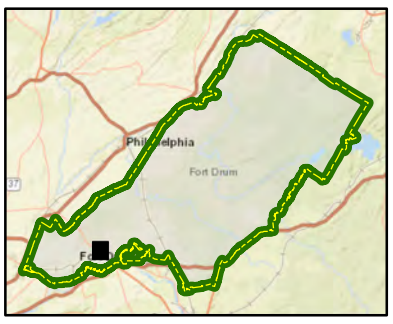


Figure 5-17
Aerial Photo of Old Sanitary Landfill (OSL) and Route 26 Car Crash

N

Washrack Creek
Dam Creek
OSL
Route 26
Car Crash
Rt-26
26
OSL
Former Army Fire Station
(George & Cannon, Building 3828)
Olsen Plz
Main Tank Trl
Sludge Pile
Near OSL
Building 2018 Soil Barn
Oneida Ave
Ontario Ave
8th St E
Former Army Fire Station
(Building 1860)
Storm Sewer AFFF Deployment
Historical Tank Repair/
Vehicle Maintenance Shop
0 250 500
Feet

Installation Boundary
AOPI
River/Stream (Perennial)
Stream (Ephemeral/Intermittent)
Surface Water Flow Direction
Inferred Groundwater Flow Direction
Monitoring Well
Potable Supply Well - Original Well Field
Stormwater Discharge Point
Seep

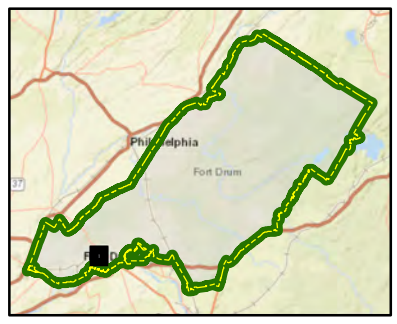
AFFF = aqueous film-forming foam
AOPI = area of potential interest
OSL = old sanitary landfill

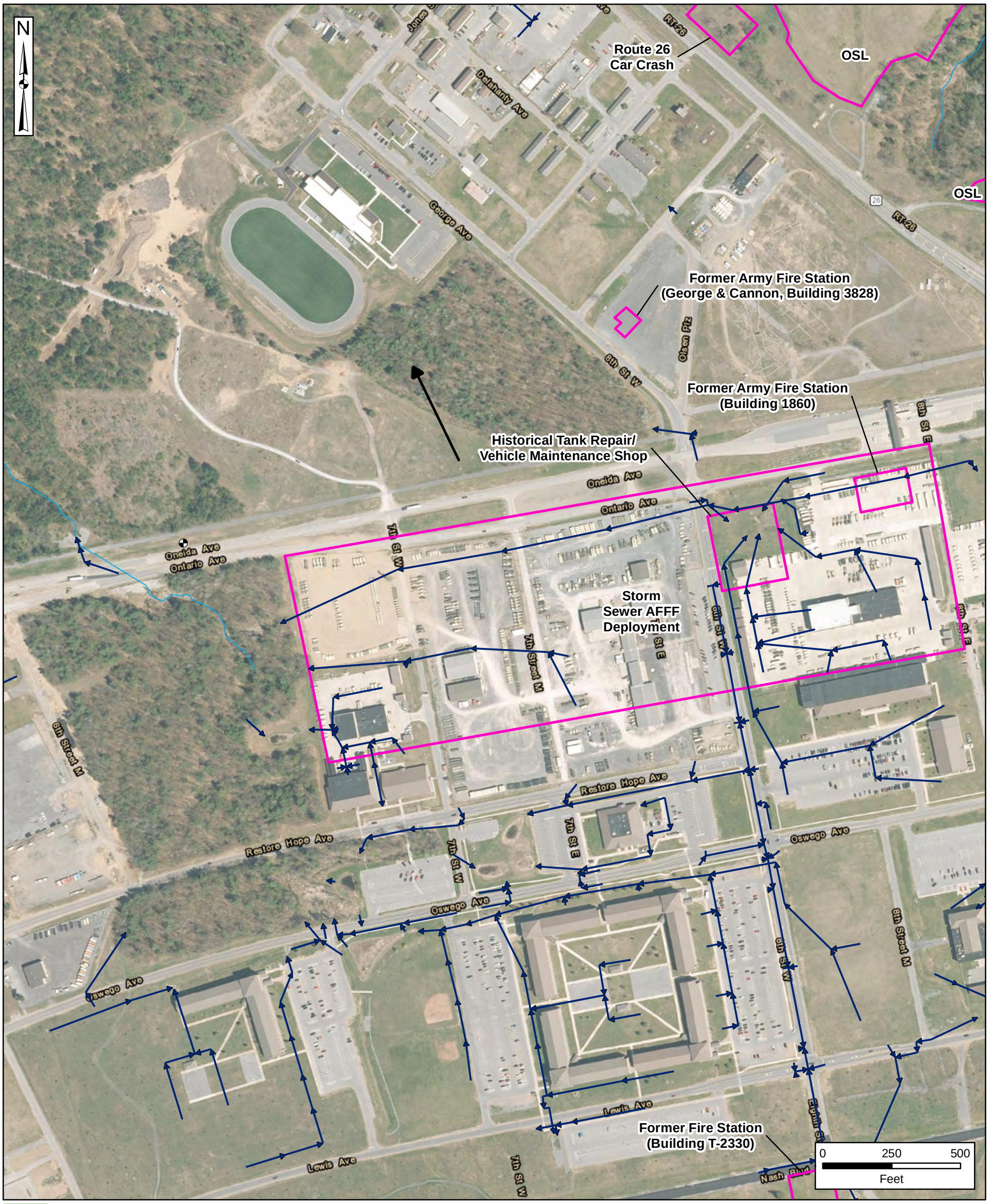
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Water Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Seeps, 2019
Fort Drum, Stormwater Discharge Points, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 5-18
Aerial Photo of Storm Sewer AFFF Deployment





Installation Boundary
AOPI
River/Stream (Perennial)
Inferred Groundwater Flow Direction
Stormwater Sewer
Monitoring Well

AOPI = area of potential interest
AFFF = aqueous film-forming foam
OSL = old sanitary landfill

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

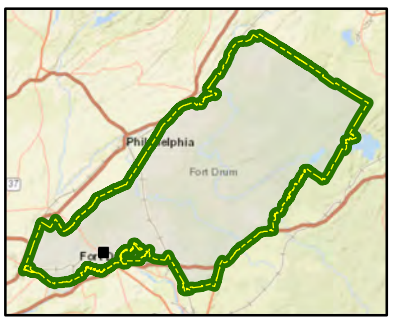
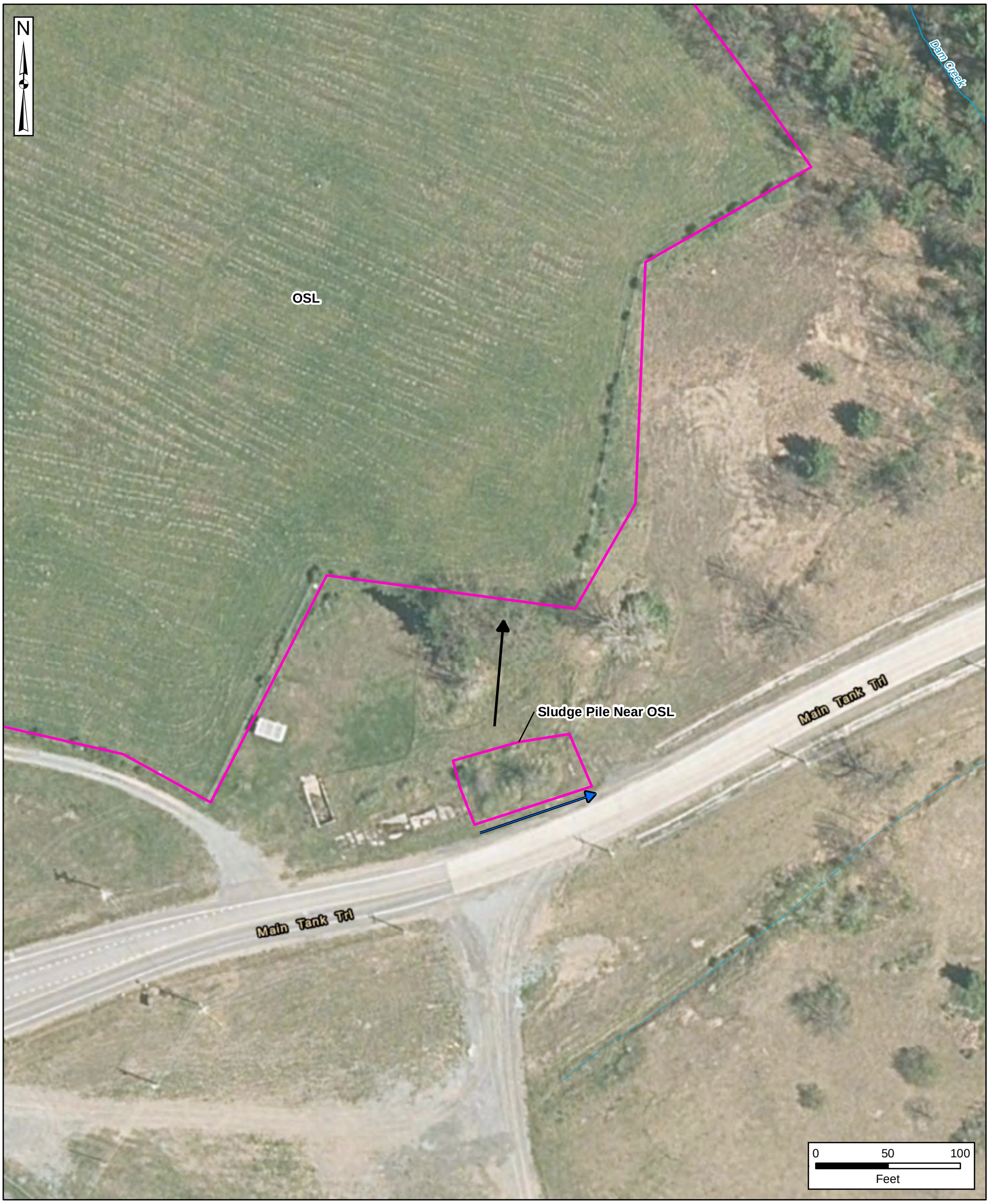


Figure 5-19
Aerial Photo of
Sludge Pile Near OSL



Installation Boundary
AOPI
River/Stream (Perennial)
Stream (Ephemeral/Intermittent)
Inferred Groundwater Flow Direction
Surface Water Flow Direction

AOPI = area of potential interest
OSL = old sanitary landfill

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Surface Water Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

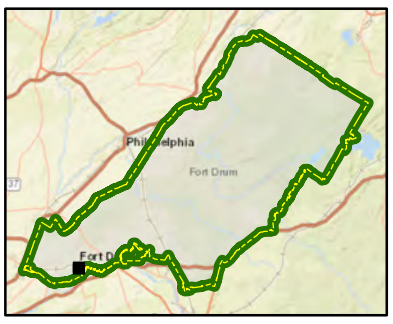


Figure 5-20
Aerial Photo of
Former Fire Station #3 (Building 181)

Installation Boundary
AOPI
Historical Building Footprint
Fort Drum Shallow Groundwater Divide *
Inferred Groundwater Flow Direction

AOPI = area of potential interest
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

* Referenced using USGS 1983 data and other historical site groundwater reports.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

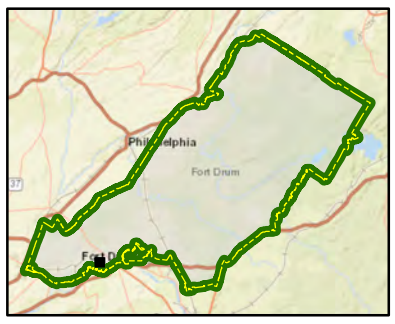


Figure 5-21
Aerial Photo of
Former Fire Station (Building T-2330)

Installation Boundary
AOPI
Historical Building Footprint
Fort Drum Shallow Groundwater Divide *
Inferred Groundwater Flow Direction

AOPI = area of potential interest
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

* Referenced using USGS 1983 data and other historical site groundwater reports.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

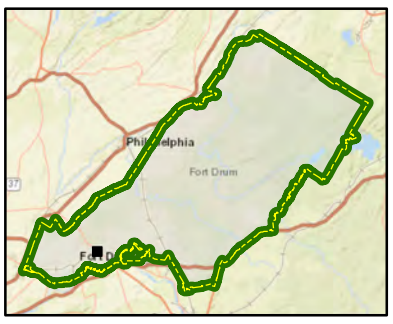


Figure 5-22
Aerial Photo of
Building 3829 OWS

Installation Boundary

AOPI

Inferred Groundwater Flow Direction

AOPI = area of potential interest
OWS = oil water separator

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

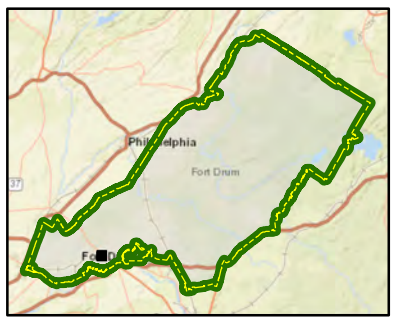
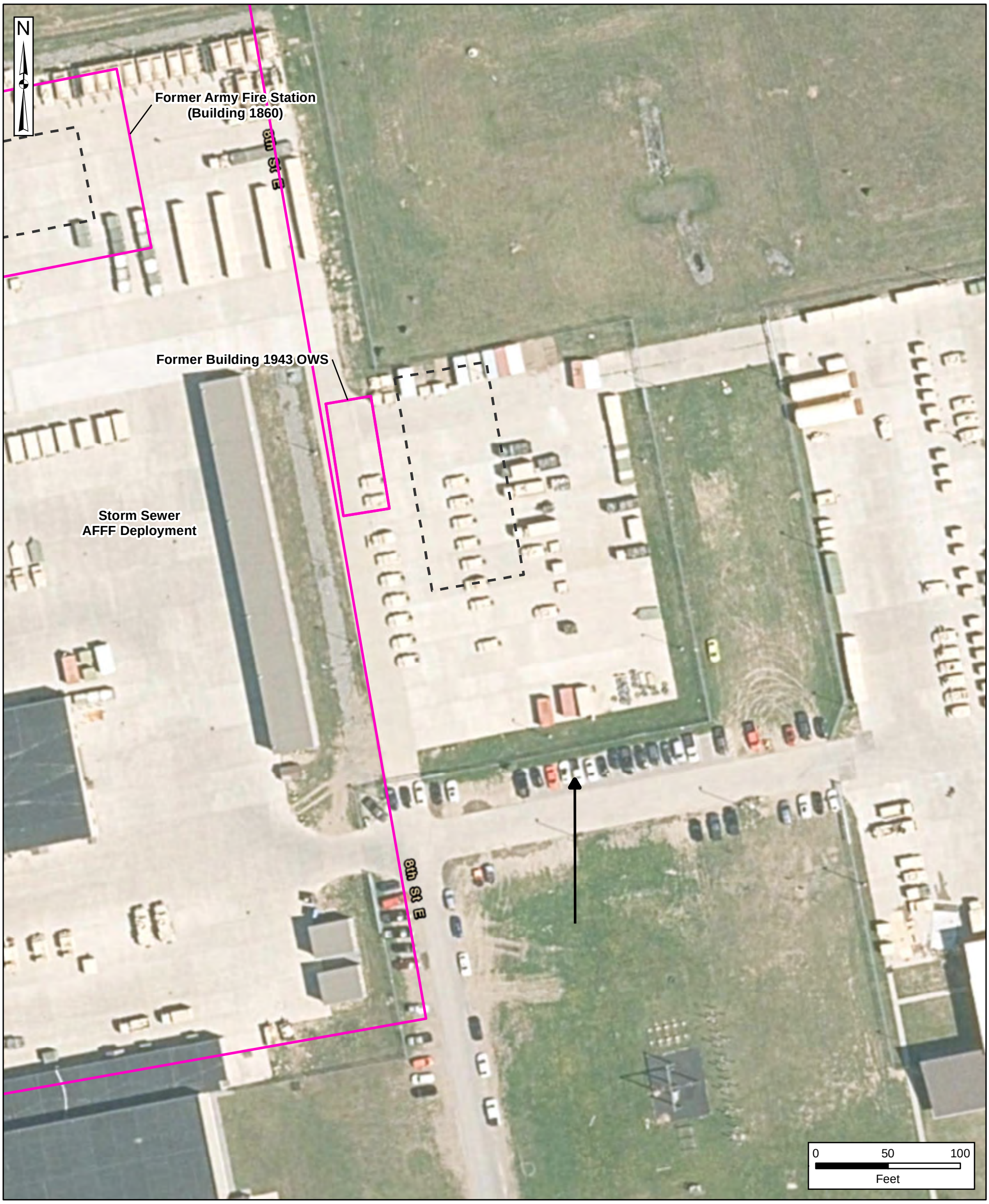


Figure 5-23
Aerial Photo of
Former Building 1943 OWS



Installation Boundary
Inferred Groundwater Flow Direction
AOPI
Historical Building Footprint

AFFF = aqueous film-forming foam
AOPI = area of potential interest
OWS = oil water separator

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

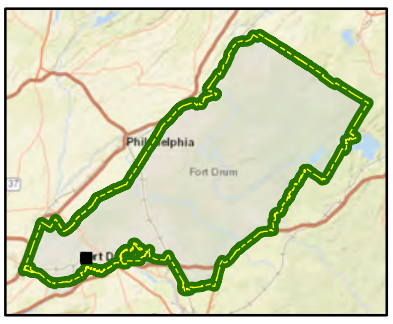
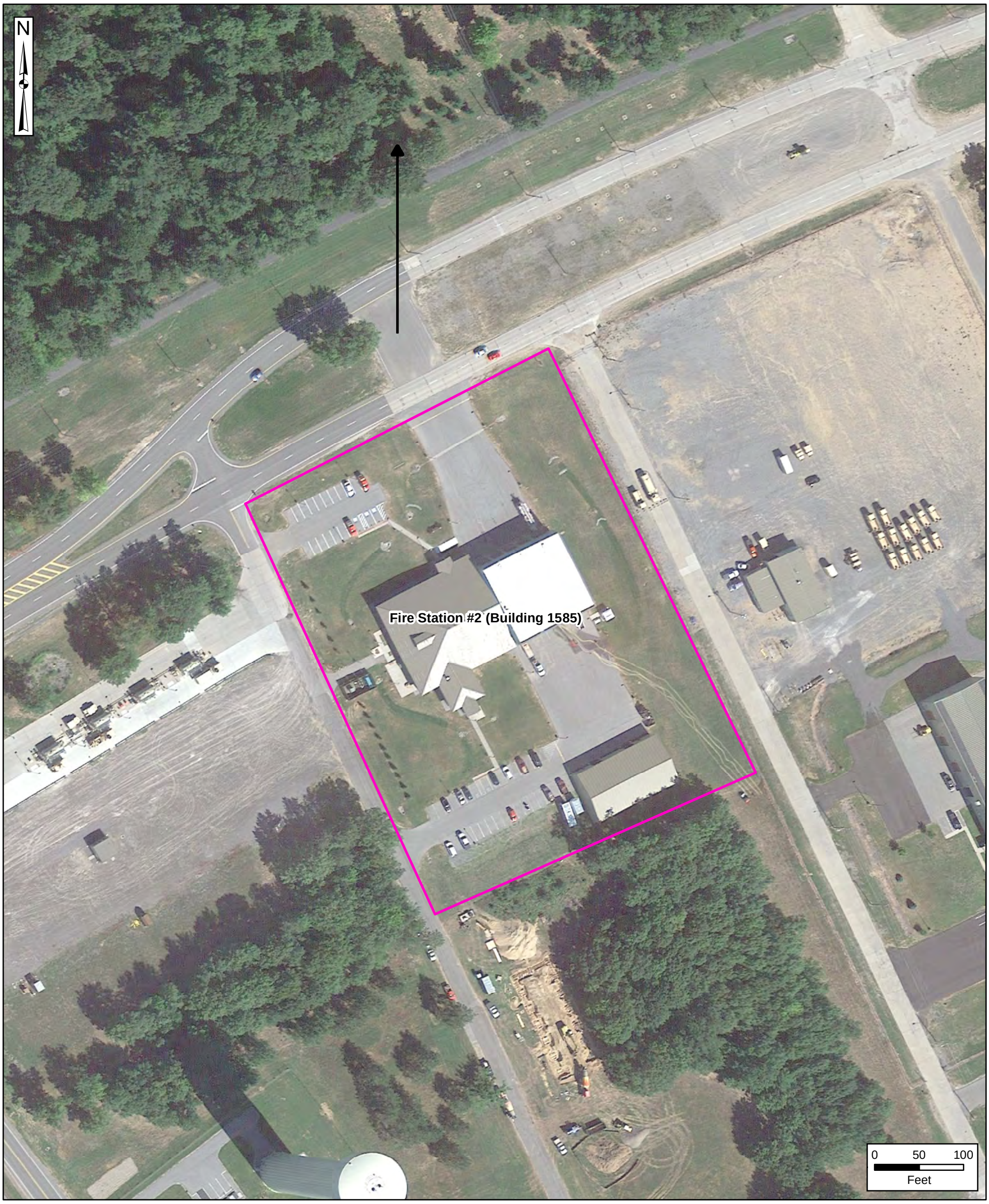


Figure 5-24
Aerial Photo of
Fire Station #2 (Building 1585)



Installation Boundary

AOPI

Inferred Groundwater Flow Direction

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Fort Drum, Installation Boundary, 2019
Google Earth, Aerial Imagery, Accessed 2016

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

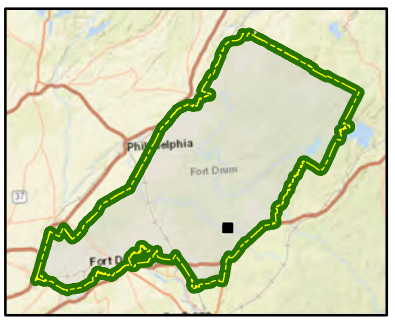


Figure 5-25
Aerial Photo of
Laundry Pad 1 AOPI

N

Black Creek

Laundry Pad 1

SB-1 Drain	
Date	11/2/2016
PFOS	< 0.00080
PFOA	< 0.00034
PFBS	< 0.00057

SB-1 Sump	
Date	11/2/2016
PFOS	< 0.00087
PFOA	< 0.00037
PFBS	< 0.00062

S Tank Trl

4900

S Tank Trl

Notes:
1. Sampling results from USACE: Site Wide PFC Screening Level Investigation Report, 2017.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.

0 50 100
Feet

Installation Boundary

AOPI (No SI Sampling - has existing data)

Stream (Ephemeral/Intermittent)

Water Body

Soil Boring (2016)

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

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, 2016 Soil Borings, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

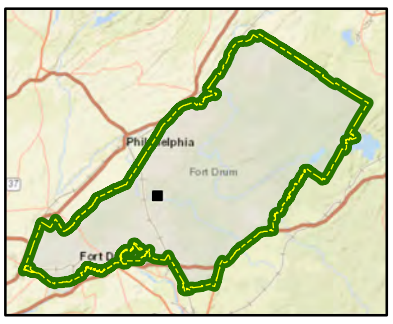


Figure 5-26
Aerial Photo of
Laundry Pad 2 AOPI

N

SB-2 Sump	
Date	11/2/2016
PFOS	< 0.00083
PFOA	< 0.00036
PFBS	< 0.00059

Laundry Pad 2

SB-2 Drain	
Date	11/2/2016
PFOS	< 0.00080
PFOA	< 0.00034
PFBS	< 0.00057

Black Creek

Reedville Rd

Notes:
1. Sampling results from USACE: Site Wide PFC Screening Level Investigation Report, 2017.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.

0 50 100
Feet

Installation Boundary

AOPI (No SI Sampling - has existing data)

Stream (Ephemeral/Intermittent)

Water Body

Soil Boring (2016)

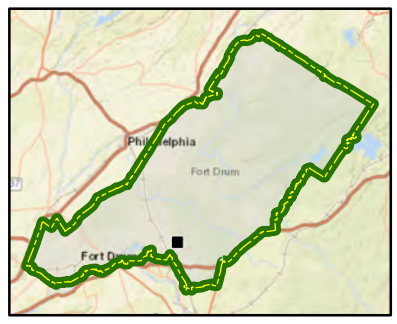
AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SI = site inspection

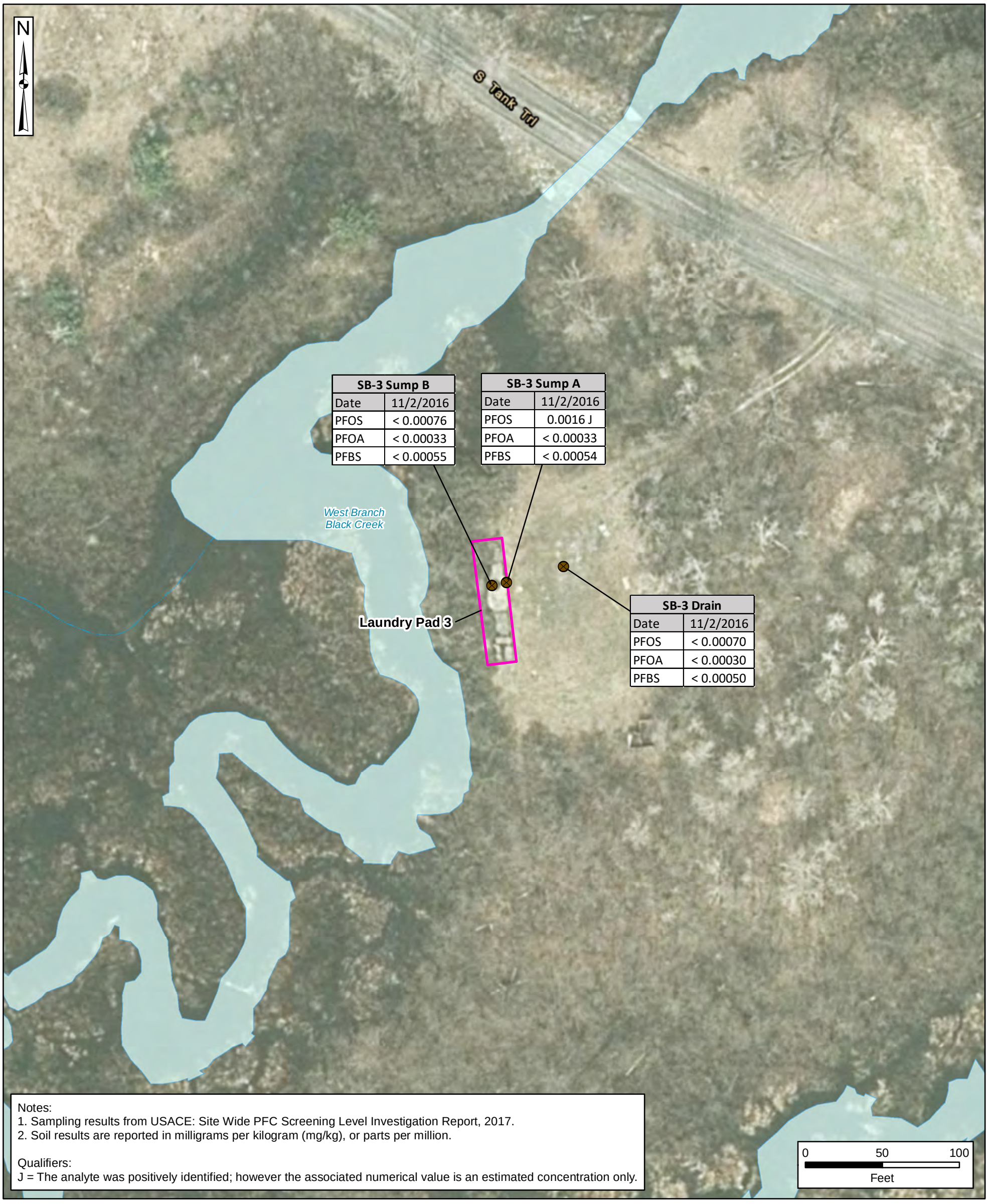
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, 2016 Soil Borings, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 5-27
Aerial Photo of
Laundry Pad 3 AOPI





SB-3 Sump B	
Date	11/2/2016
PFOS	< 0.00076
PFOA	< 0.00033
PFBS	< 0.00055

SB-3 Sump A	
Date	11/2/2016
PFOS	0.0016 J
PFOA	< 0.00033
PFBS	< 0.00054

SB-3 Drain	
Date	11/2/2016
PFOS	< 0.00070
PFOA	< 0.00030
PFBS	< 0.00050

Notes:
1. Sampling results from USACE: Site Wide PFC Screening Level Investigation Report, 2017.
2. Soil results are reported in milligrams per kilogram (mg/kg), or parts per million.

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

Installation Boundary
AOPI (No SI Sampling - has existing data)
Stream (Ephemeral/Intermittent)
Water Body
Soil Boring (2016)

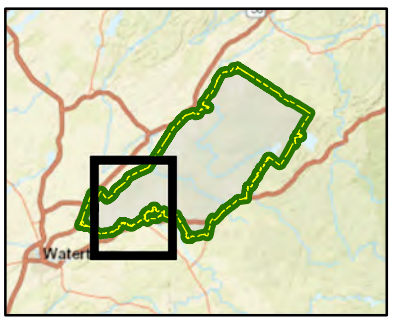
AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
SI = site inspection

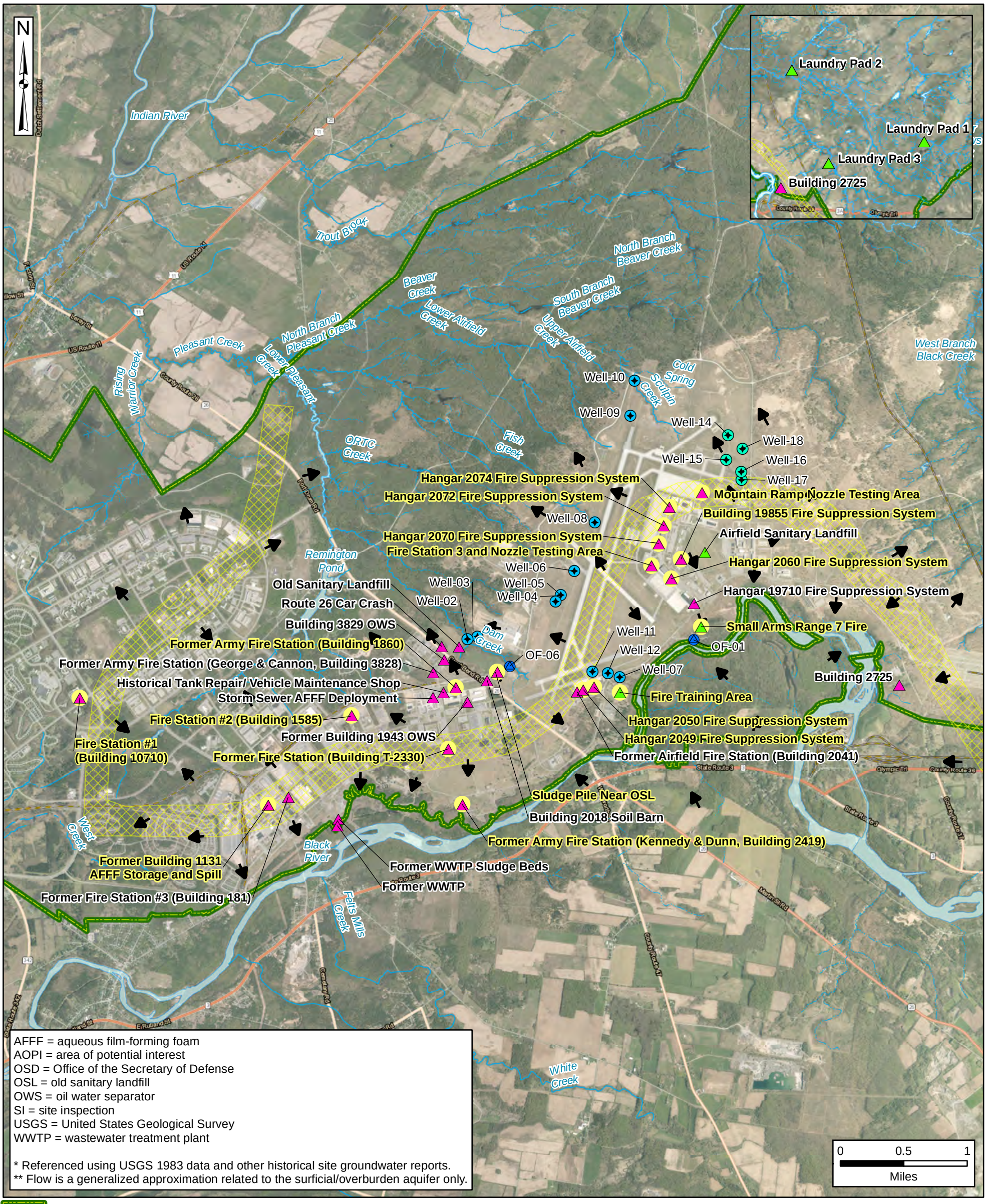
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, 2016 Soil Borings, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

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





AFFF = aqueous film-forming foam
AOPI = area of potential interest
OSD = Office of the Secretary of Defense
OSL = old sanitary landfill
OWS = oil water separator
SI = site inspection
USGS = United States Geological Survey
WWTP = wastewater treatment plant

* Referenced using USGS 1983 data and other historical site groundwater reports.
** Flow is a generalized approximation related to the surficial/overburden aquifer only.

- Installation Boundary
- AOPI Sampled as Part of the SI
- AOPI Not Sampled as Part of the SI
- AOPI Location with OSD Risk Screening Level Exceedance
- Phase 2 Sampling Location Outfall
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Water Body
- Fort Drum Shallow Groundwater Divide *
- Inferred Groundwater Flow Direction **
- Potable Supply Well - Active
- Potable Supply Well - Offline

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Groundwater Flow Direction, 2019
Fort Drum, Installation Boundary, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Waterbodies, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

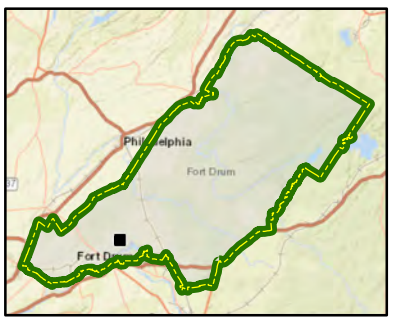


Figure 7-2
Fire Station #3 and Nozzle Testing Area AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Wheeler Sack Army Airfield

Building 2065

Fire Station #3 and Nozzle Testing Area

FTD-FS3-NOZZLE-1-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.021**
PFOA	**0.00077**
PFBS	0.0021 U

FTD-FS3-NOZZLE-2-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.014**
PFOA	**0.00069**
PFBS	0.0020 U

FTD-FS3-NOZZLE-1-GW	
Date	12/20/2019
PFOS	1.7 U [1.7 U]
PFOA	**14 [14]**
PFBS	**2.8 J+ [2.8 J+]**

FTD-FS3-NOZZLE-3-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.00070**
PFOA	0.00059 U
PFBS	0.0020 U

FTD-FS3-NOZZLE-7-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.00086**
PFOA	0.00060 U
PFBS	0.0020 U

FTD-FS3-NOZZLE-3-GW	
Date	1/9/2020
PFOS	**2,400 J**
PFOA	**45**
PFBS	**7.2**

FTD-FS3-NOZZLE-5-SS	
Date	12/6/2019
Depth	0-1 ft bgs
PFOS	**0.0021**
PFOA	0.00059 U
PFBS	0.0020 U

FTD-FS3-NOZZLE-4-SS	
Date	12/6/2019
Depth	0-1 ft bgs
PFOS	**0.014**
PFOA	0.00062 UB
PFBS	0.0020 U

FTD-FS3-NOZZLE-6-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.0069**
PFOA	**0.0012**
PFBS	0.0020 U

FTD-FS3-NOZZLE-2-GW	
Date	1/3/2020
PFOS	1.6 U
PFOA	**15**
PFBS	**3.4**

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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
J+ = The result is an estimated quantity; the result may be biased high.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).
UB = The analyte is considered nondetect at the listed value due to associated blank contamination.

0 50 100
Feet

Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction
Stormwater Sewer

Sample Locations

Surface Soil - Hand Auger
Groundwater - New Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

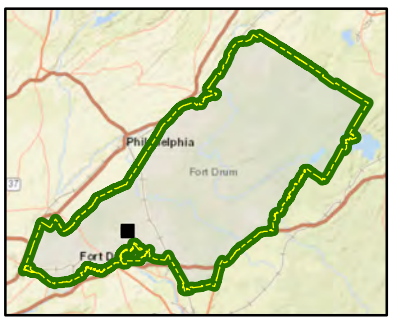


Figure 7-3
Mountain Ramp Nozzle Testing Area AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Wheeler Sack Army Airfield

FTD-MTNRAMP-1-GW	
Date	1/10/2020
PFOS	**170 J**
PFOA	**28**
PFBS	**2.4**

FTD-MTNRAMP-1-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.00054 J**
PFOA	0.00060 U
PFBS	0.0020 U

FTD-MTNRAMP-2-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.011**
PFOA	0.00062 U
PFBS	0.0021 U

FTD-MTNRAMP-3-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.013**
PFOA	0.00060 U
PFBS	0.0020 U

FTD-MTNRAMP-4-SS	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	**0.0029**
PFOA	0.00062 U
PFBS	0.0021 U

FTD-OBS-05	
Date	1/3/2020
PFOS	**71**
PFOA	**40**
PFBS	**11**

FTD-MTNRAMP-2-GW	
Date	1/3/2020
PFOS	**3.9**
PFOA	**31**
PFBS	**25**

FTD-MTNRAMP-5-SS	
Date	12/6/2019
Depth	0-1 ft bgs
PFOS	**0.011**
PFOA	0.00060 U
PFBS	0.0020 U

FTD-MTNRAMP-3-GW	
Date	1/9/2020
PFOS	1.8 U
PFOA	1.8 U
PFBS	**4.5**

Mountain Ramp Nozzle Testing Area

FTD-MTNRAMP-6-SS	
Date	12/6/2019
Depth	0-1 ft bgs
PFOS	**0.019 J [0.017]**
PFOA	0.00061 U [0.00060 U]
PFBS	0.0020 U [0.0020 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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

* Referenced using USGS 1983 data and other historical site groundwater reports.

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
AOPI
Fort Drum Shallow Groundwater Divide *
Assumed Groundwater Flow Direction
Groundwater Well

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

Sample Locations

Surface Soil - Hand Auger
Groundwater - New Well
Groundwater - Existing Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Groundwater Wells, 2019
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

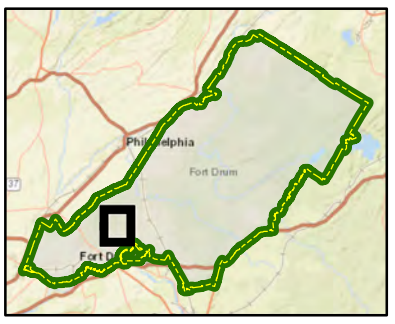


Figure 7-4
Hangars 2070, 2072, and 2074 AOPIs
PFOS, PFOA, and PFBS Analytical Results

Wheeler Sack Army Airfield

FTD-HNG-3-GW	
Date	1/10/2020
PFOS	**2.4**
PFOA	**1.7 J**
PFBS	1.8 U

FTD-HNG-CLVRT-42-1-SW	
Date	12/5/2019
PFOS	**0.98 J** [1.7 U]
PFOA	1.7 U **[1.2 J]**
PFBS	1.7 U [1.7 U]

FTD-HNG-CLVRT-42-1-SE	
Date	12/5/2019
Depth	0-1 ft bgs
PFOS	0.00081 U [0.00081 U]
PFOA	0.00081 U [0.00081 U]
PFBS	0.0027 U [0.0027 U]

FTD-HNG-1-GW	
Date	1/9/2020
PFOS	**16**
PFOA	**11**
PFBS	**1.1 J**

FTD-HNG-2-GW	
Date	1/9/2020
PFOS	**44**
PFOA	**8.2**
PFBS	**4.0**

FTD-BLDG2086-1-GW	
Date	1/10/2020
PFOS	**30**
PFOA	**6.0**
PFBS	**3.0**

FTD-BLDG2086-1-SO	
Date	1/3/2020
Depth	20 ft bgs
PFOS	0.00063 U
PFOA	0.00063 U
PFBS	0.0021 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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.
6. The secondary source was sampled to evaluate AFFF releases from the Hangar 2070, 2072, and 2074 AOPIs.

* Referenced using USGS 1983 data and other historical site groundwater reports.

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).

Lower Airfield Creek
Upper Airfield Creek
Cold Spring
Sculpin Creek
Fish Creek
Elm Ln
Basset St
Main Tank Trl
Falcon Trl
Park Rd
Anaconda Rd
Wolf Rd
OF-08
OF-10
OF-11
OF-12
OF-13
OF-14
OF-16
OFWS-09
OFWS-15
Hangar 2074
Fire Suppression System
Hangar 2072
Fire Suppression System
Hangar 2070
Fire Suppression System
Building 2086 Airfield
Oil Water Separator
0 500 1,000
Feet

AFFF = aqueous film-forming foam
AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
USGS = United States Geological Survey

Installation Boundary
AOPI
Secondary Source
River/Stream (Perennial)
Stream (Ephemeral/Intermittent)
Storm Water Collection, Retention, and Infiltration Area
Shallow Groundwater Divide *
Stormwater Sewer
Stormwater Discharge Point

Sample Locations
Surface Water/Sediment
Soil and Groundwater
Groundwater - New Well

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Sample Locations, 2021
Arcadis, Secondary Sources, 2021
Arcadis, Stormwater Retention Areas, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

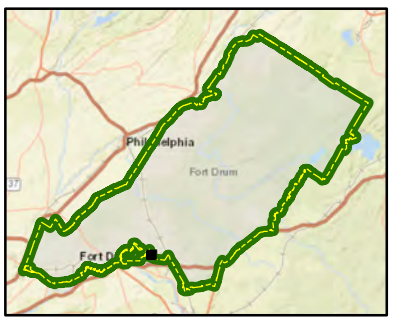


Figure 7-5
Building 2725 AOPI
PFOS, PFOA, and PFBS Analytical Results

N

FTD-B2725-1-GW	
Date	11/9/2020
PFOS	1.6 U
PFOA	1.6 U
PFBS	1.6 U

FTD-B2725-1-SO	
Date	10/28/2020
Depth	0.5-2 ft bgs
PFOS	0.00059 U
PFOA	0.00059 U
PFBS	0.0020 U

FTD-B2725-2-SO	
Date	10/28/2020
Depth	0.5-2 ft bgs
PFOS	0.00060 U
PFOA	0.00060 U
PFBS	0.0020 U

Building 2725

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.

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

0 50 100
Feet

Installation Boundary
AOPI
Stream (Ephemeral/Intermittent)
Inferred Groundwater Flow Direction

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater

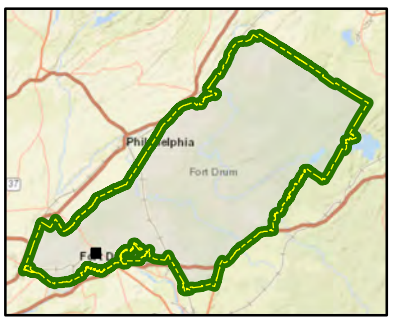
AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

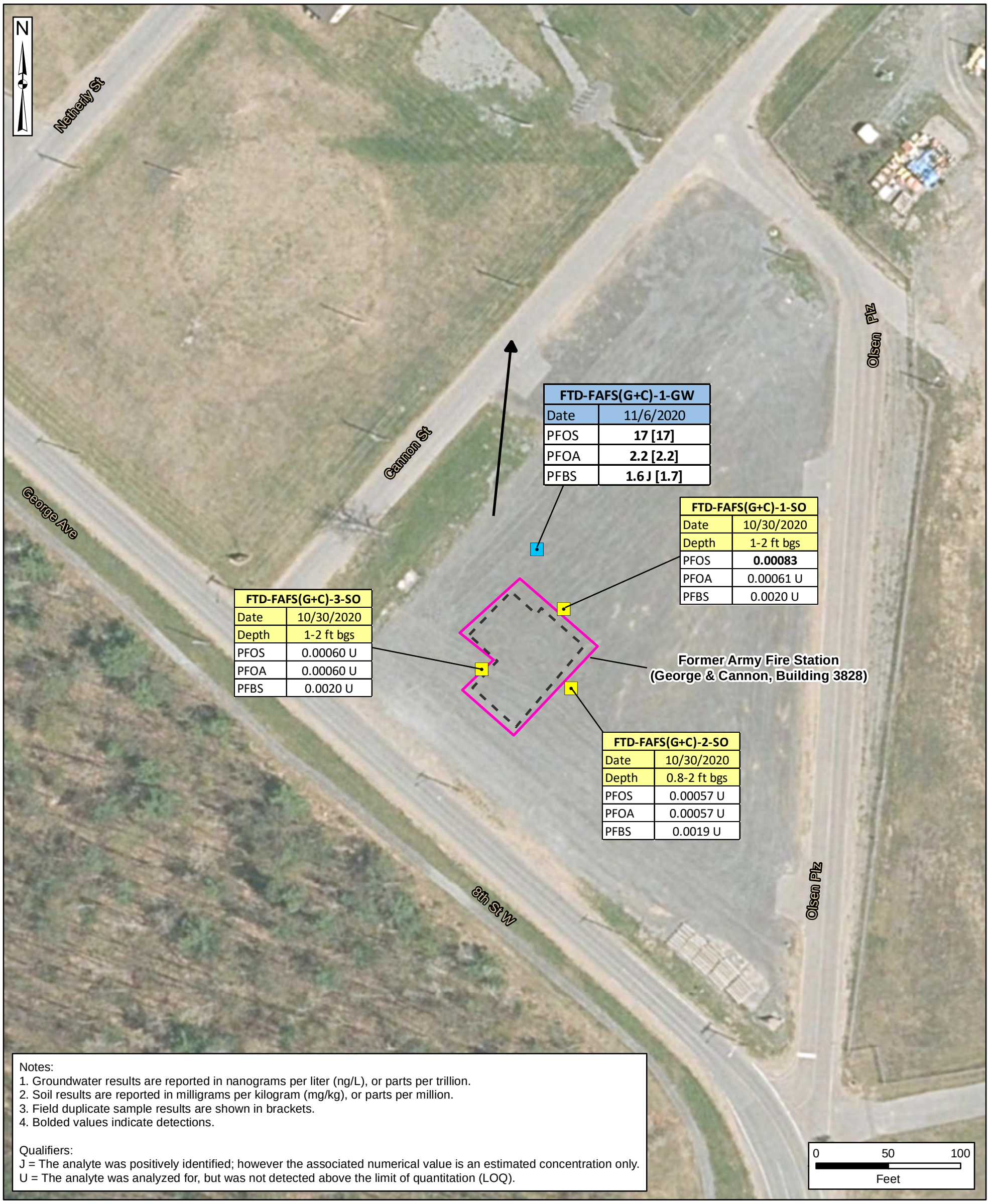
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 7-6
Former Army Fire Station
(George & Cannon, Building 3828) AOPI
PFOS, PFOA, and PFBS Analytical Results





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. Field 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
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction

Sample Locations

Surface Soil - Hand Auger
Grab Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

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Fort Drum, NY

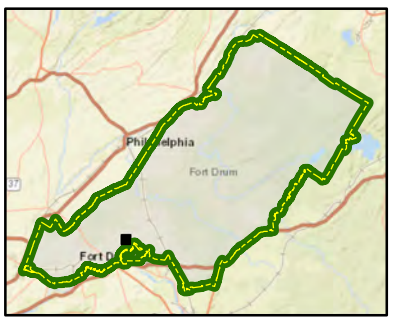
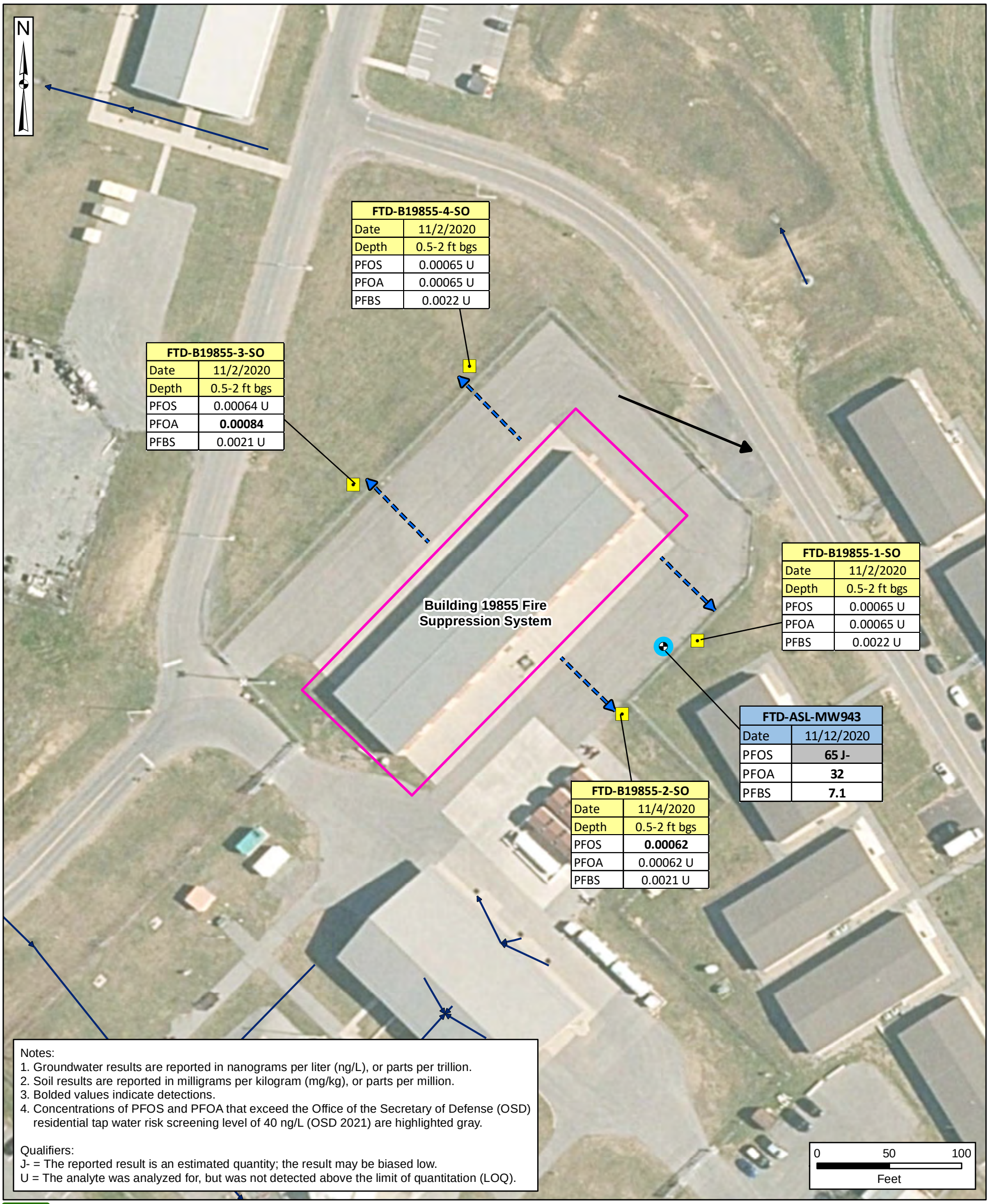


Figure 7-7
Building 19855 Fire Suppression System AOPI
PFOS, PFOA, and PFBS Analytical Results



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. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

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

Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction
Stormwater Sewer

Monitoring Well

Sample Locations

Surface Soil - Hand Auger
Groundwater - Existing Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

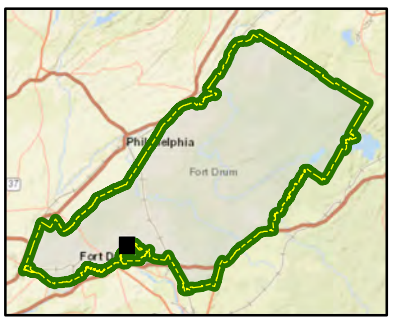
OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

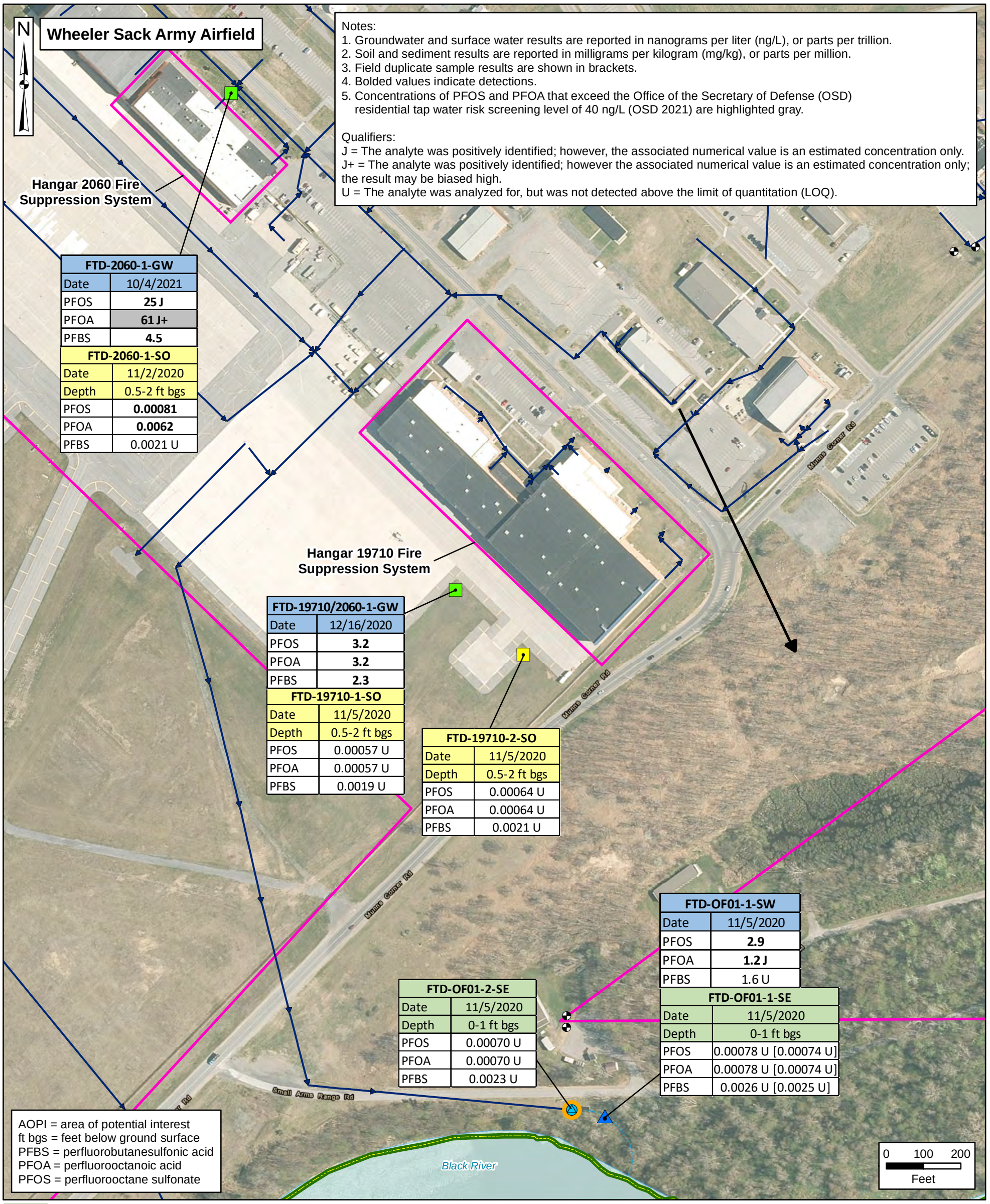
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 7-8
Hangar 2060 Fire Suppression System and Hangar 19710 Fire Suppression System PFOS, PFOA, and PFBS Analytical Results





Installation Boundary
AOPI
Stream (Ephemeral/Intermittent)
Water Body
Inferred Groundwater Flow Direction
Stormwater Sewer
Stormwater Discharge Point
Monitoring Well

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater
Sediment and Surface Water
Sediment (Stormwater Discharge Point)

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Stormwater Discharge Points, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

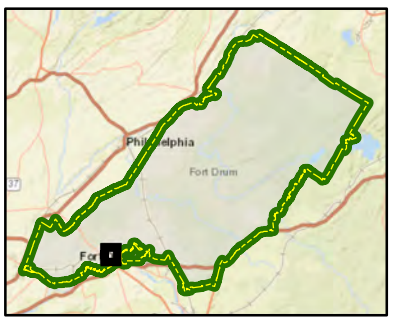


Figure 7-9
Hangar 2049 Fire Suppression System, Hangar 2050 Fire Suppression System, and Former Airfield Fire Station (Building 2041) PFOS, PFOA, and PFBS Analytical Results

Wheeler Sack Army Airfield

FTD-OF06-1-SW	
Date	11/5/2020
PFOS	**120**
PFOA	**27**
PFBS	**3.6**

FTD-OSL-1-SE	
Date	11/5/2020
Depth	0-1 ft bgs
PFOS	0.00078 U
PFOA	0.00078 U
PFBS	0.0026 U

FTD-2050-2-SO	
Date	11/4/2020
Depth	0.9-2 ft bgs
PFOS	**0.00067**
PFOA	0.00060 U
PFBS	0.0020 U

MW-5	
Date	12/7/2016
PFOS	**42**
PFOA	< 1.9
PFBS	**9.9 J**

FTD-FAFS2041-1-GW	
Date	10/4/2021
PFOS	**17**
PFOA	**12**
PFBS	**3.1**

FTD-2049-1-SO	
Date	11/4/2020
Depth	0.5-2 ft bgs
PFOS	0.00062 U
PFOA	0.00062 U
PFBS	0.0021 U

FTD-2050-1-SO	
Date	11/4/2020
Depth	0.5-2 ft bgs
PFOS	**0.0021**
PFOA	0.00061 U
PFBS	0.0020 U

Hangar 2049 Fire Suppression System

Former Airfield Fire Station (Building 2041)

Hangar 2050 Fire Suppression System

Well-1 Well-11 Well-12

Main Tank Trl Well Rd Dam Creek RT 26 Munns Corner Rd W Ramp Rd Boy Scouts Area

0 150 300 Feet

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOS = perfluorooctane sulfonate
PFOA = perfluorooctanoic acid
SI = site inspection
USGS = United States Geological Survey

Notes:
1. Groundwater and surface water results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Soil and sediment results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. Bolded values indicate detections.
4. 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.
5. FTD-OF06-1-SW was not compared to the OSD risk screening levels for tap water because the surface water sample is not a direct expression of groundwater at the related AOPIs and the associated surface water body (Dam Creek) is not used as a source of drinking water.
* Referenced using USGS 1983 data and other historical site groundwater reports.

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
- Historical Building Footprint
- River/Stream (Perennial)
- Stream (Ephemeral/Intermittent)
- Shallow Groundwater Divide *
- Inferred Groundwater Flow Direction
- Assumed Groundwater Flow Direction
- Stormwater Sewer
- Stormwater Discharge Point
- Potable Supply Well - Original Well Field
- Monitoring Well

Sample Locations

- Surface Soil - Hand Auger
- Grab Groundwater
- Surface Water
- Sediment (Stormwater Discharge Point)

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Directions, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019
Fort Drum, Stormwater Discharge Points, 2019
Fort Drum, Stormwater Sewers, 2019
Fort Drum, Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

References:
1. Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.
2. USACE. 2018. PFC Site Characterization Investigation Summary Report- Old Fire Training Pit, Fort Drum, New York. January.

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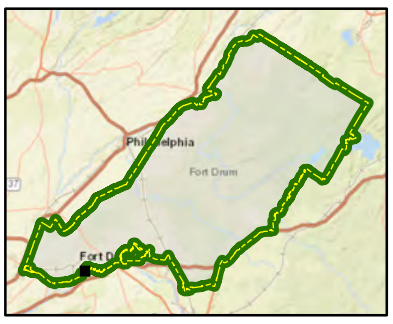
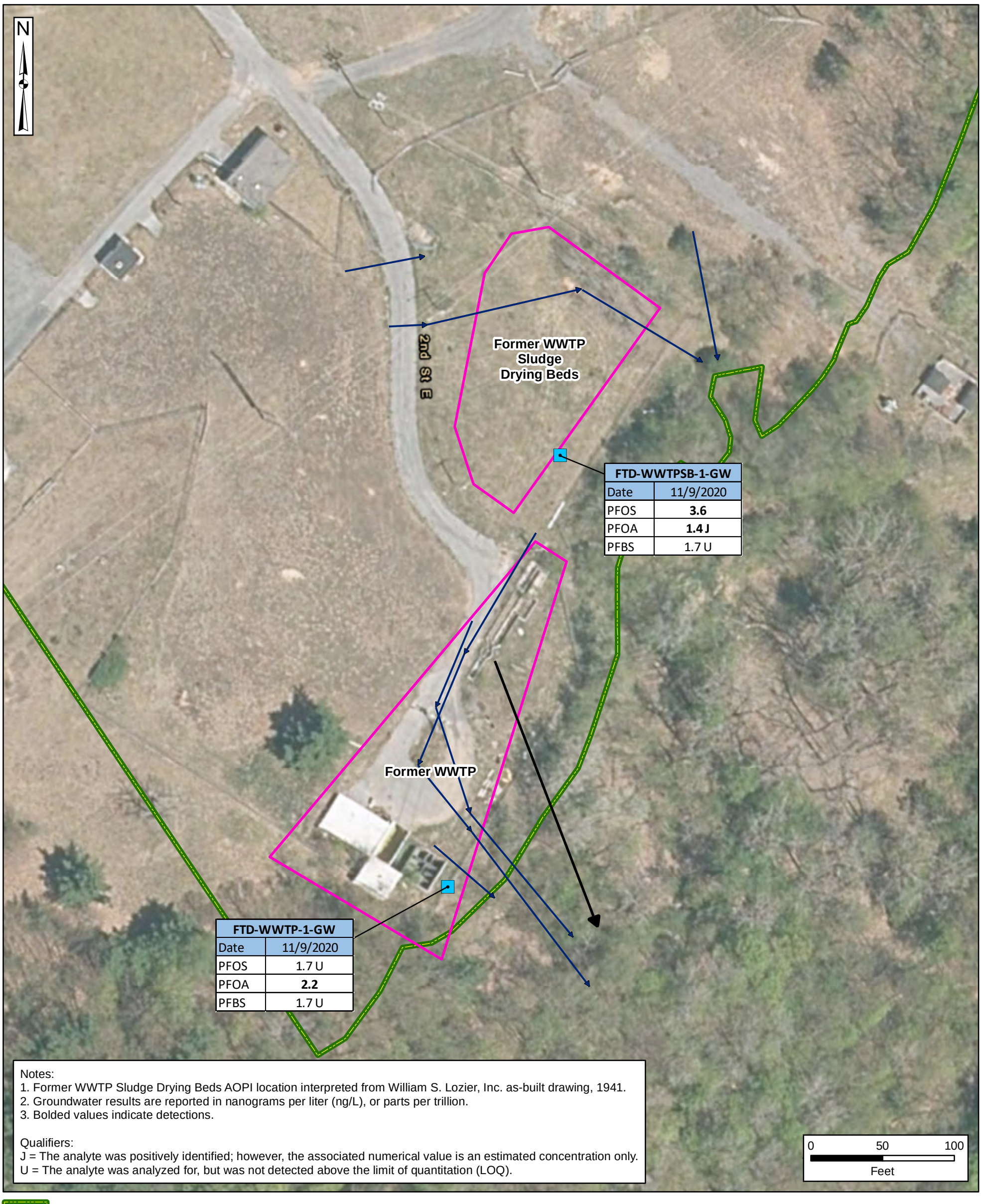
Figure 7-10
Former WWTP and Former WWTP Sludge Drying Beds AOPIs
PFOS, PFOA, and PFBS Analytical Results





Notes:
1. Former WWTP Sludge Drying Beds AOPI location interpreted from William S. Lozier, Inc. as-built drawing, 1941.
2. Groundwater results are reported in nanograms per liter (ng/L), or parts per trillion.
3. Bolded values indicate detections.

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

Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Stormwater Sewer

Sample Locations

Grab Groundwater

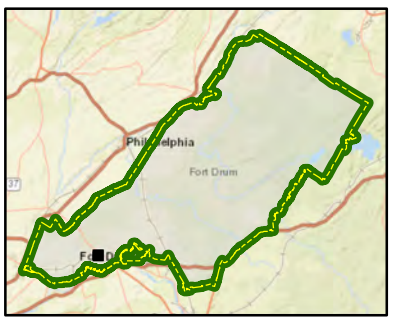
AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
WWTP = wastewater treatment plant

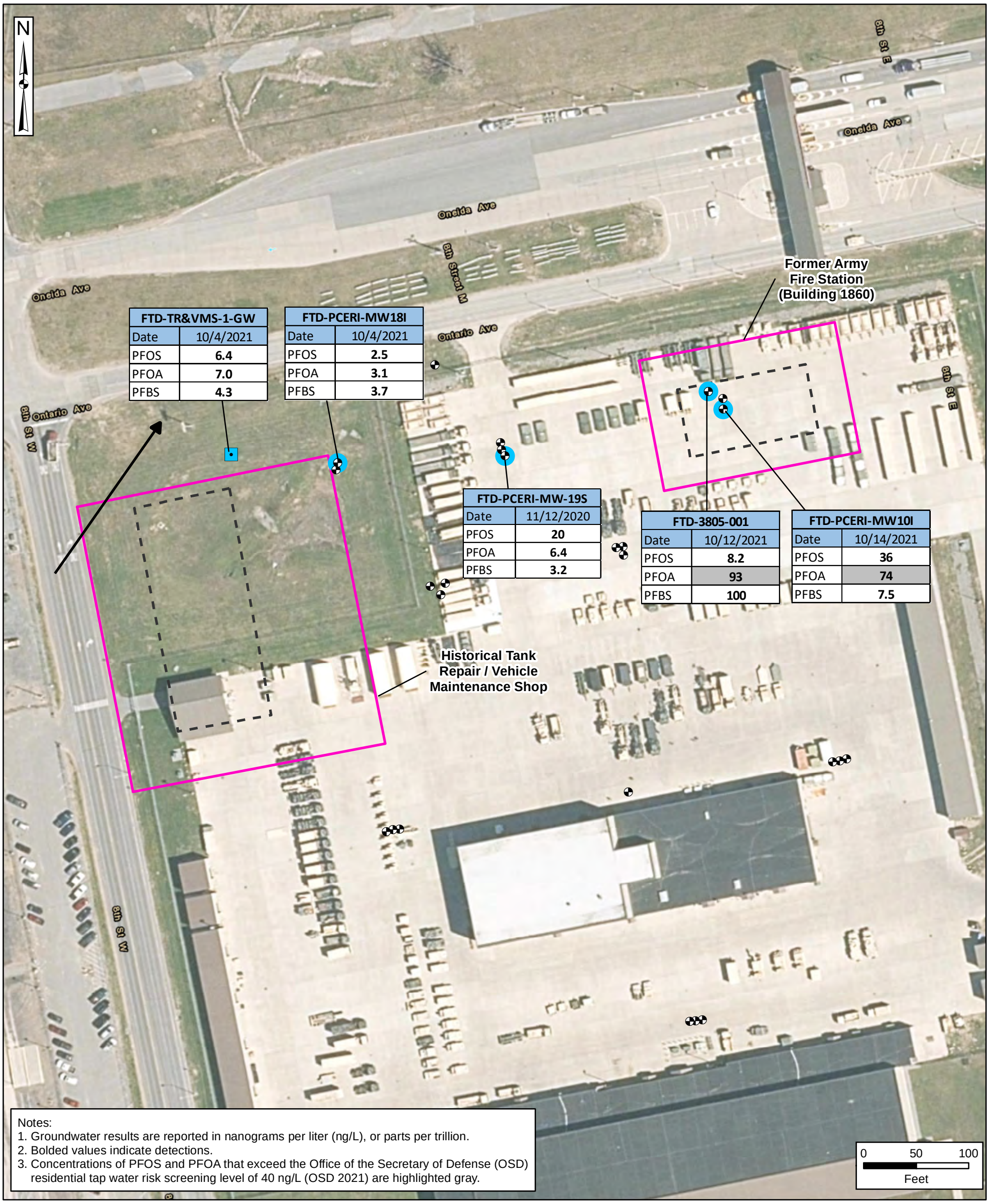
Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

Figure 7-11
Former Army Fire Station (Building 1860) and Historical Tank Repair/Vehicle Maintenance Shop AOPIs PFOS, PFOA, and PFBS Analytical Results





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

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction
Monitoring Well

Sample Locations

Grab GW
Groundwater - Existing Well

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

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Fort Drum, NY

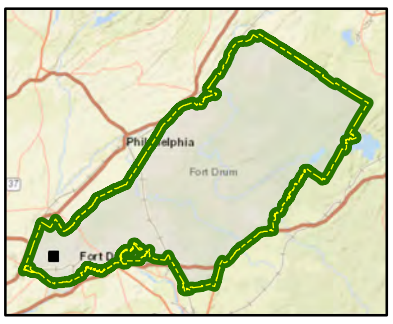

Figure 7-12
Fire Station #1 (Building 10710) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Mt Belvedere

Fire Station #1
(Building 10710)

S Riva Ridge Loop

Riva Ridge

FTD-FS1-1-GW	
Date	12/16/2020
PFOS	**2,700**
PFOA	**870**
PFBS	27 U

FTD-FS1-1-SO	
Date	11/4/2020
Depth	0.5-2 ft bgs
PFOS	**0.041 [0.044]**
PFOA	**0.0018 [0.0021]**
PFBS	0.0021 U [0.0021 U]

FTD-FS1-2-SO	
Date	11/4/2020
Depth	0.5-2 ft bgs
PFOS	**0.033**
PFOA	**0.0017**
PFBS	0.0024 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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

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

0 50 100
Feet

Installation Boundary
AOPI
Inferred Groundwater Flow Direction
Surface Runoff Flow Direction

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

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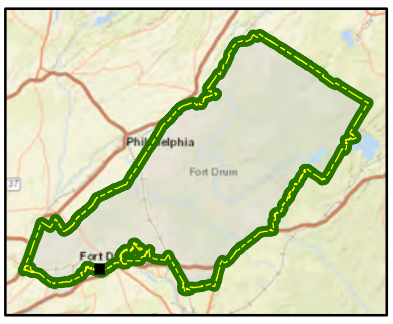
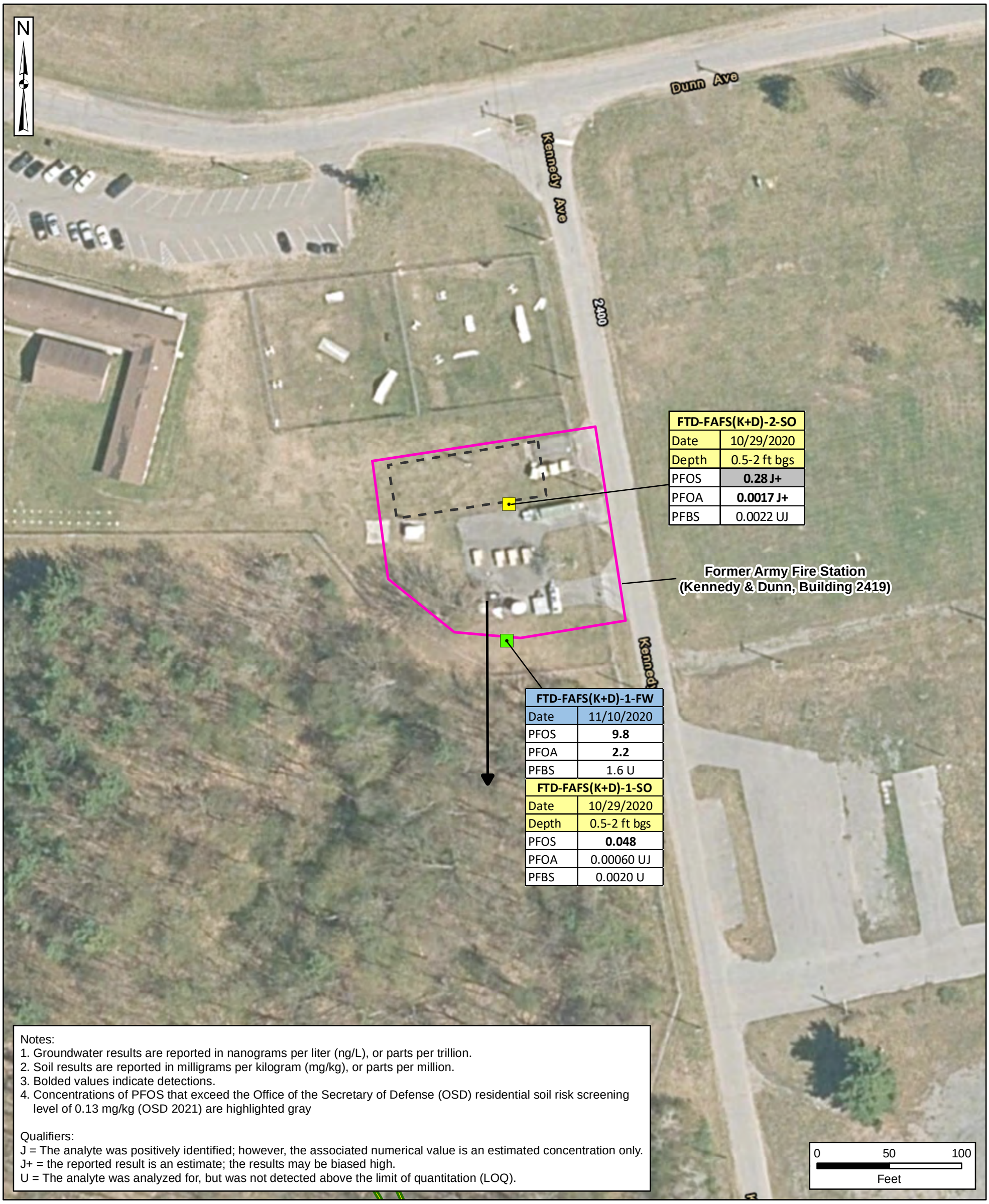
Fort Drum, NY

Figure 7-13
Former Army Fire Station
(Kennedy & Dunn, Building 2419) AOPI
PFOS, PFOA, and PFBS Analytical Results





FTD-FAFS(K+D)-2-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	**0.28 J+**
PFOA	**0.0017 J+**
PFBS	0.0022 UJ

FTD-FAFS(K+D)-1-FW	
Date	11/10/2020
PFOS	**9.8**
PFOA	**2.2**
PFBS	1.6 U

FTD-FAFS(K+D)-1-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	**0.048**
PFOA	0.00060 UJ
PFBS	0.0020 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. Bolded values indicate detections.
4. Concentrations of PFOS that exceed the Office of the Secretary of Defense (OSD) residential soil risk screening level of 0.13 mg/kg (OSD 2021) are highlighted gray

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

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

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Fort Drum, NY

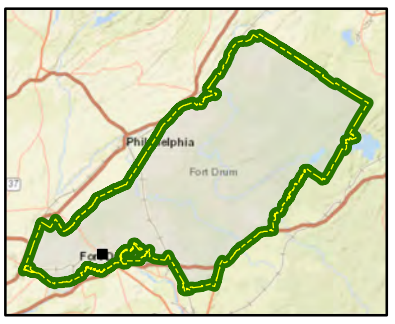
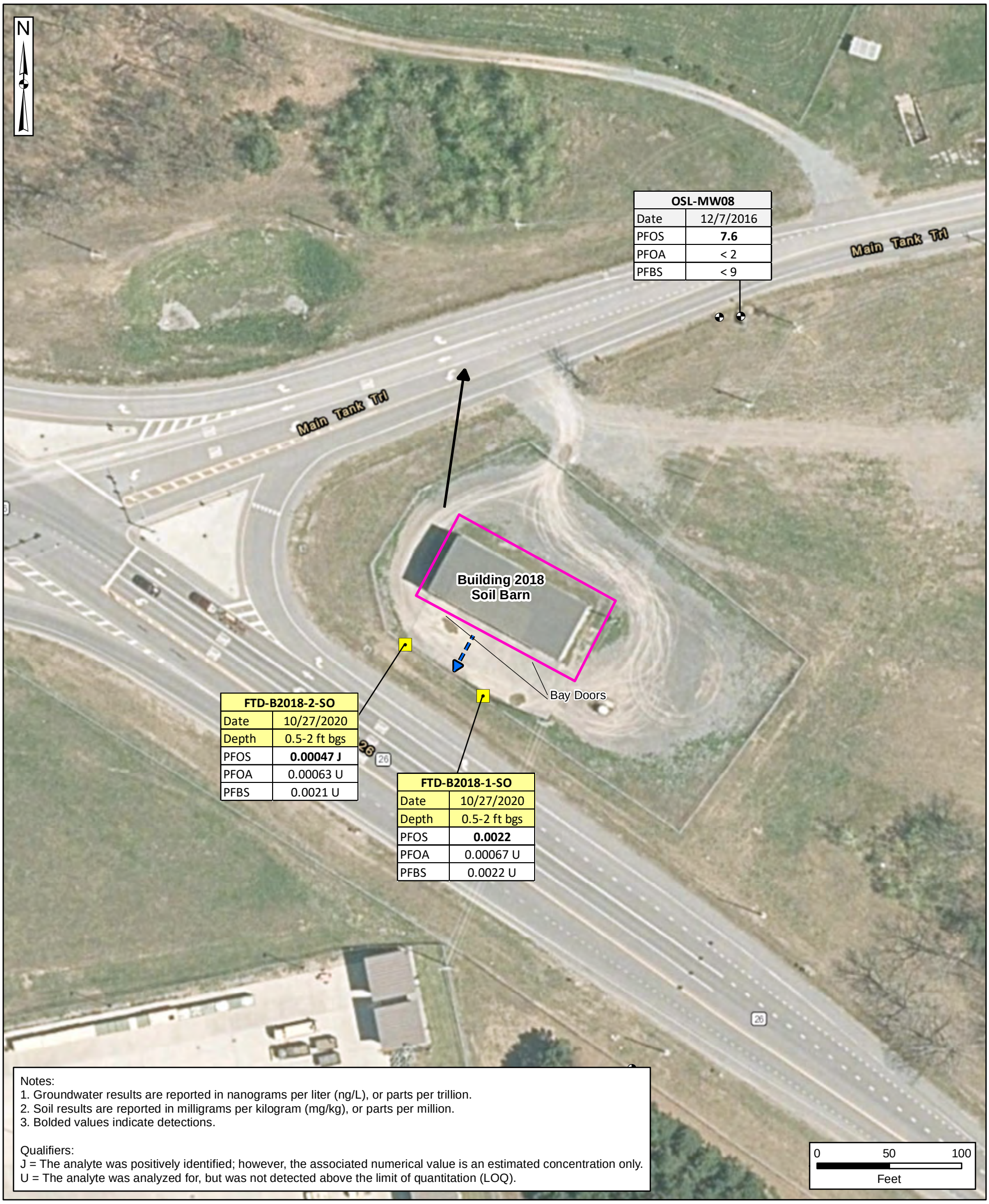


Figure 7-14
Building 2018 Soil Barn AOPI
PFOS, PFOA, and PFBS Analytical Results



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. 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
AOPI
Surface Runoff Flow Direction
Inferred Groundwater Flow Direction
Monitoring Well

Sample Locations

Surface Soil - Hand Auger

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Runoff Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

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Fort Drum, NY

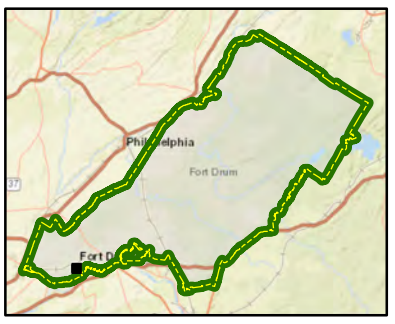

Figure 7-15
Former Building 1131 AFFF Storage and Spill AOPI
PFOS, PFOA, and PFBS Analytical Results

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. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

* Referenced using USGS 1983 data and other historical site groundwater reports.

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).

FTD-B1131-1-GW	
Date	11/6/2020
PFOS	**150**
PFOA	**13**
PFBS	**1.3 J**

FTD-B1131-1-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	0.00066 U
PFOA	0.00066 U
PFBS	0.0022 U

FTD-B1131-2-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	0.00059 U
PFOA	0.00059 U
PFBS	0.0020 U

FTD-B1131-3-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	0.00061 U
PFOA	0.00061 U
PFBS	0.0020 U

Former Building 1131
AFFF Storage and Spill

1st St W
1st Street M
Utility Rd
Retiree Hope Ave

0 50 100
Feet

Installation Boundary
AOPI
Historical Building Footprint
Fort Drum Shallow Groundwater Divide *
Inferred Groundwater Flow Direction

Sample Locations
Surface Soil - Hand Auger
Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
AFFF = aqueous film-forming foam
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

Coordinate System:
WGS 1984, UTM Zone 18 North

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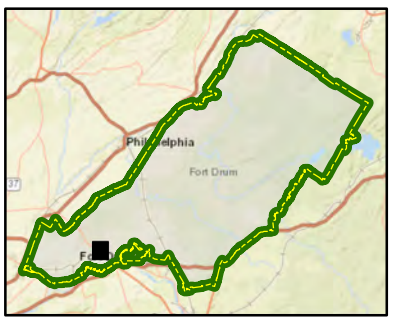
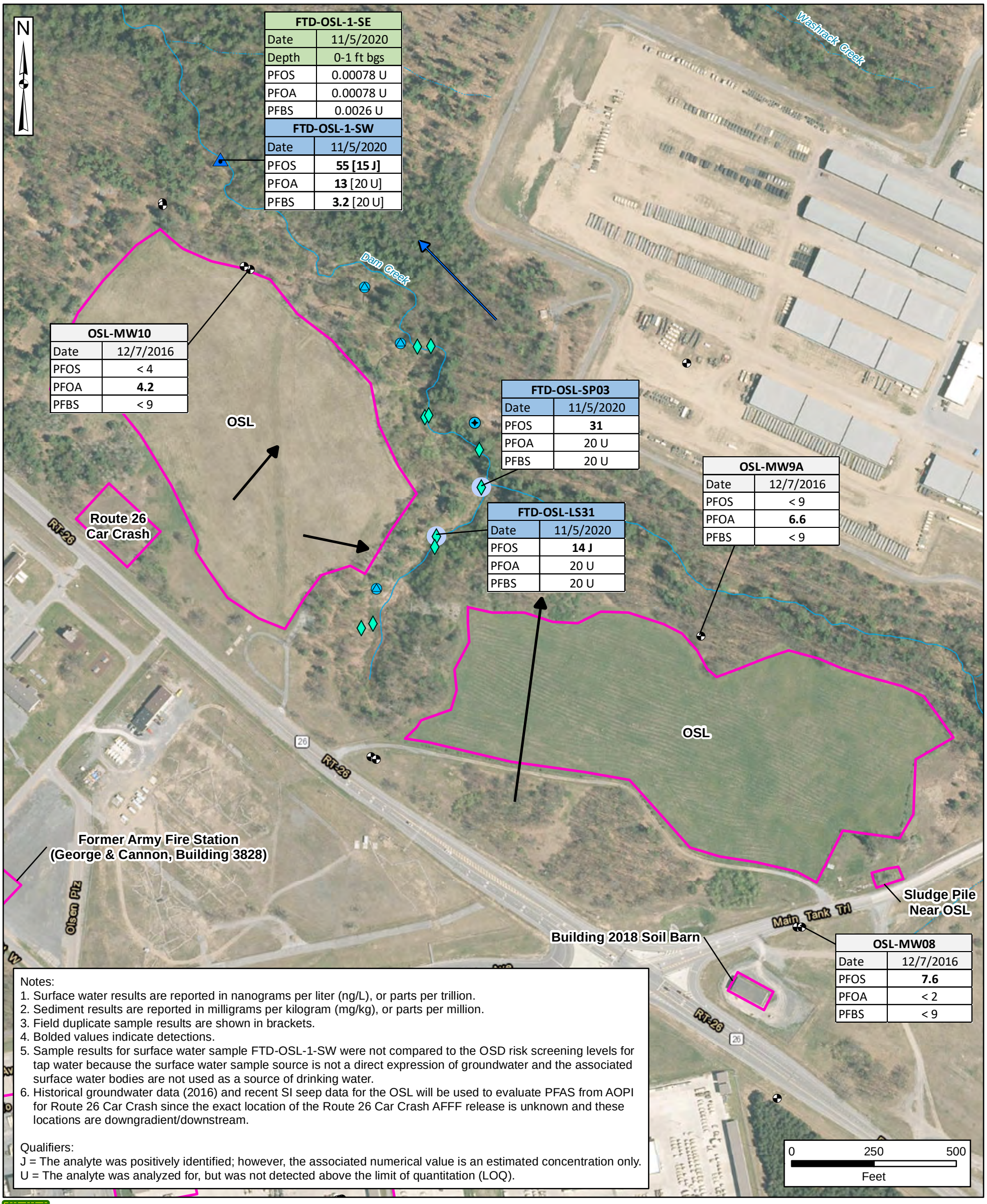
Figure 7-16
Old Sanitary Landfill (OSL) and Route 26 Car Crash AOPIs
PFOS, PFOA, and PFBS Analytical Results





Notes:
1. Surface water results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Sediment results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Sample results for surface water sample FTD-OSL-1-SW were not compared to the OSD risk screening levels for tap water because the surface water sample source is not a direct expression of groundwater and the associated surface water bodies are not used as a source of drinking water.
6. Historical groundwater data (2016) and recent SI seep data for the OSL will be used to evaluate PFAS from AOPI for Route 26 Car Crash since the exact location of the Route 26 Car Crash AFFF release is unknown and these locations are downgradient/downstream.

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 (Perennial)
- Stream (Ephemeral/Intermittent)
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Potable Supply Well - Original Well Field
- Monitoring Well
- Stormwater Discharge Point
- Seep

Sample Locations

- Sediment and Surface Water
- Surface Water (Seep)

AOPI = area of potential interest
OSL = old sanitary landfill
PFBS = perfluorobutanesulfonic acid
PFOS = perfluorooctane sulfonate
PFOA = perfluorooctanoic acid

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Water Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, Potable Supply Wells, 2019
Fort Drum, Seeps, 2019
Fort Drum, Stormwater Discharge Points, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

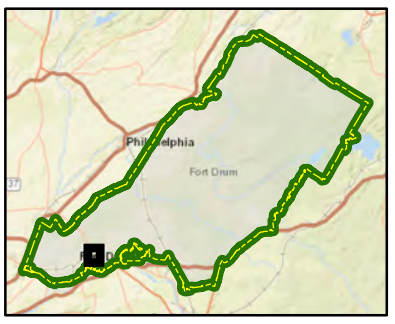


Figure 7-17
Storm Sewer AFFF Deployment AOPI
PFOS, PFOA, and PFBS Analytical Results

FTD-SSAD-1-SE	
Date	11/6/2020
Depth	0-1 ft bgs
PFOS	0.00072 U
PFOA	0.00072 U
PFBS	0.0024 U

FTD-SSAD-1-SW	
Date	11/6/2020
PFOS	**13**
PFOA	**4.7**
PFBS	**1.4 J**

FTD-1795-MW510	
Date	11/10/2020
PFOS	1.6 U
PFOA	1.6 U
PFBS	**0.84 J**

FTD-SSAD-2-SE	
Date	11/6/2020
Depth	0-1 ft bgs
PFOS	0.00090 U
PFOA	0.00090 U
PFBS	0.0030 U

OSL
Route 26 Car Crash
Former Army Fire Station (George & Cannon, Building 3828)
Former Army Fire Station (Building 1860)
Historical Tank Repair/ Vehicle Maintenance Shop
Storm Sewer AFFF Deployment
Former Fire Station (Building T-2330)
Dam Creek
Ninninger St
Jones St
Railey Ave
RT-26
Delahanty Ave
George Ave
Olsen Plz
8th St W
8th St E
7th St W
7th St E
6th St W
6th St E
Ontario Ave
Oneida Ave
Oswego Ave
Restore Hope Ave
6th Street M
7th Street M
Leray Dr
Nash Blvd
Eagle St
0 250 500
Feet

Notes:
1. Groundwater and surface water results are reported in nanograms per liter (ng/L), or parts per trillion.
2. Sediment results are reported in milligrams per kilogram (mg/kg), or parts per million.
3. Field 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
AOPI
River/Stream (Perennial)
Inferred Groundwater Flow Direction
Stormwater Sewer

Monitoring Well

Sample Locations

Sediment
Sediment and Surface Water
Groundwater - Existing Well

AOPI = area of potential interest
AFFF = aqueous film-forming foam
ft bgs = feet below ground surface
OSL = old sanitary landfill
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, Monitoring Wells, 2019
Fort Drum, Stormwater Sewers, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

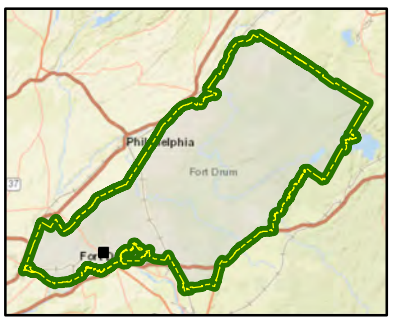


Figure 7-18
Sludge Pile Near OSL AOPI
PFOS, PFOA, and PFBS Analytical Results

N

OSL

Dam Creek

Main Tank Trl

Sludge Pile Near OSL

FTD-SLUDGEPILE-1-SO	
Date	10/27/2020
Depth	0.5-2 ft bgs
PFOS	**0.0057**
PFOA	0.00060 U
PFBS	0.0020 U

FTD-SLUDGEPILE-2-SO	
Date	10/27/2020
Depth	0.5-2 ft bgs
PFOS	**0.0045**
PFOA	0.00063 U
PFBS	0.0021 U

FTD-SLUDGE PILE-1-GW	
Date	12/16/2020
PFOS	**43**
PFOA	**6.0**
PFBS	**0.86 J**

FTD-SLUGDEPILE-3-SO	
Date	10/27/2020
Depth	0.5-2 ft bgs
PFOS	**0.00042 J**
PFOA	0.00063 U
PFBS	0.0021 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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

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

0 50 100
Feet

Installation Boundary
AOPI
River/Stream (Perennial)
Stream (Ephemeral/Intermittent)
Surface Water Flow Direction
Inferred Groundwater Flow Direction

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
OSL = old sanitary landfill
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Arcadis, Surface Water Flow Direction, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019
Fort Drum, River/Streams, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

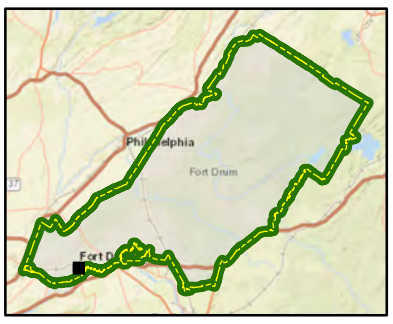


Figure 7-19
Former Fire Station #3 (Building 181)
PFOS, PFOA, and PFBS Analytical Results

N

Euphrates River Valley Rd
131 St E
Restore Hope Ave
Oswego Ave

Former Fire Station #3
(Building 181)

FTD-FFS3-3-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	**0.0022**
PFOA	0.00064 U
PFBS	0.0021 U

FTD-FFS3-2-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	0.00063 U [0.00064 U]
PFOA	0.00063 U [0.00064 U]
PFBS	0.0021 U [0.0021 U]

FTD-FFS3-1-GW	
Date	11/9/2020
PFOS	**15**
PFOA	**0.98 J**
PFBS	1.6 U

FTD-FFS3-1-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	0.00062 U
PFOA	0.00062 U
PFBS	0.0021 U

0 50 100
Feet

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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
* Referenced using USGS 1983 data and other historical site groundwater reports.

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
Historical Building Footprint
Fort Drum Shallow Groundwater Divide *
Inferred Groundwater Flow Direction

Sample Locations

Surface Soil - Hand Auger
Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
USGS = United States Geological Survey

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

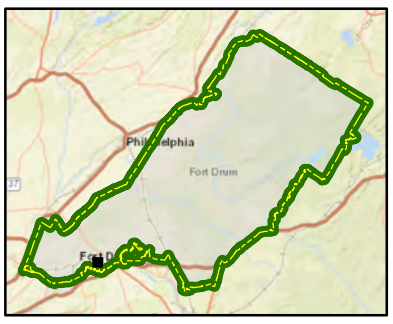


Figure 7-20
Former Fire Station (Building T-2330) AOPI
PFOS, PFOA, and PFBS Analytical Results

N

Elwood St

6th St W

Nash Blvd

Former Fire Station
(Building T-2330)

FTD-FFS2330-1-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	**0.00047 J**
PFOA	0.00061 U
PFBS	0.0020 U

FTD-FFS2330-1-GW	
Date	11/6/2020
PFOS	**6,600**
PFOA	**160**
PFBS	**4.0**

FTD-FFS2330-2-SO	
Date	10/29/2020
Depth	0.5-2 ft bgs
PFOS	**0.0097**
PFOA	**0.0006 J**
PFBS	0.0021 U

Hospital Ln

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. Bolded values indicate detections.
4. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

* Referenced using USGS 1983 data and other historical site groundwater reports.

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 50 100
Feet

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction
Fort Drum Shallow Groundwater Divide *

Sample Locations

Surface Soil - Hand Auger
Grab Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
Arcadis, Shallow Groundwater Divide, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

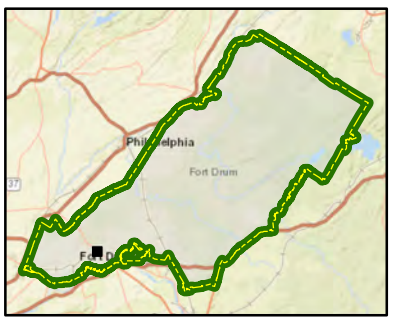


Figure 7-21
Building 3829 OWS AOPI
PFOS, PFOA, and PFBS Analytical Results

FTD-B3829OWS-1-GW	
Date	11/9/2020
PFOS	**3.3**
PFOA	1.6 U
PFBS	1.6 U
FTD-B3829-1-SO	
Date	10/30/2020
Depth	20-21.3 ft bgs
PFOS	0.00066 U
PFOA	0.00066 U
PFBS	0.0022 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. Bolded values indicate detections.

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

Installation Boundary
AOPI
Inferred Groundwater Flow Direction

Sample Locations

Soil and Groundwater

AOPI = area of potential interest
ft bgs = feet below ground surface
OWS = oil water separator
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

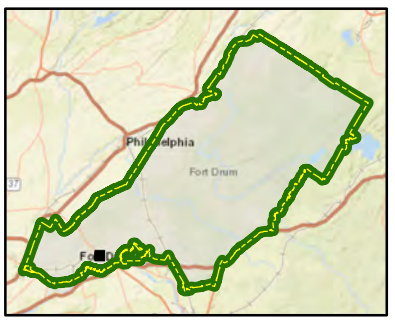
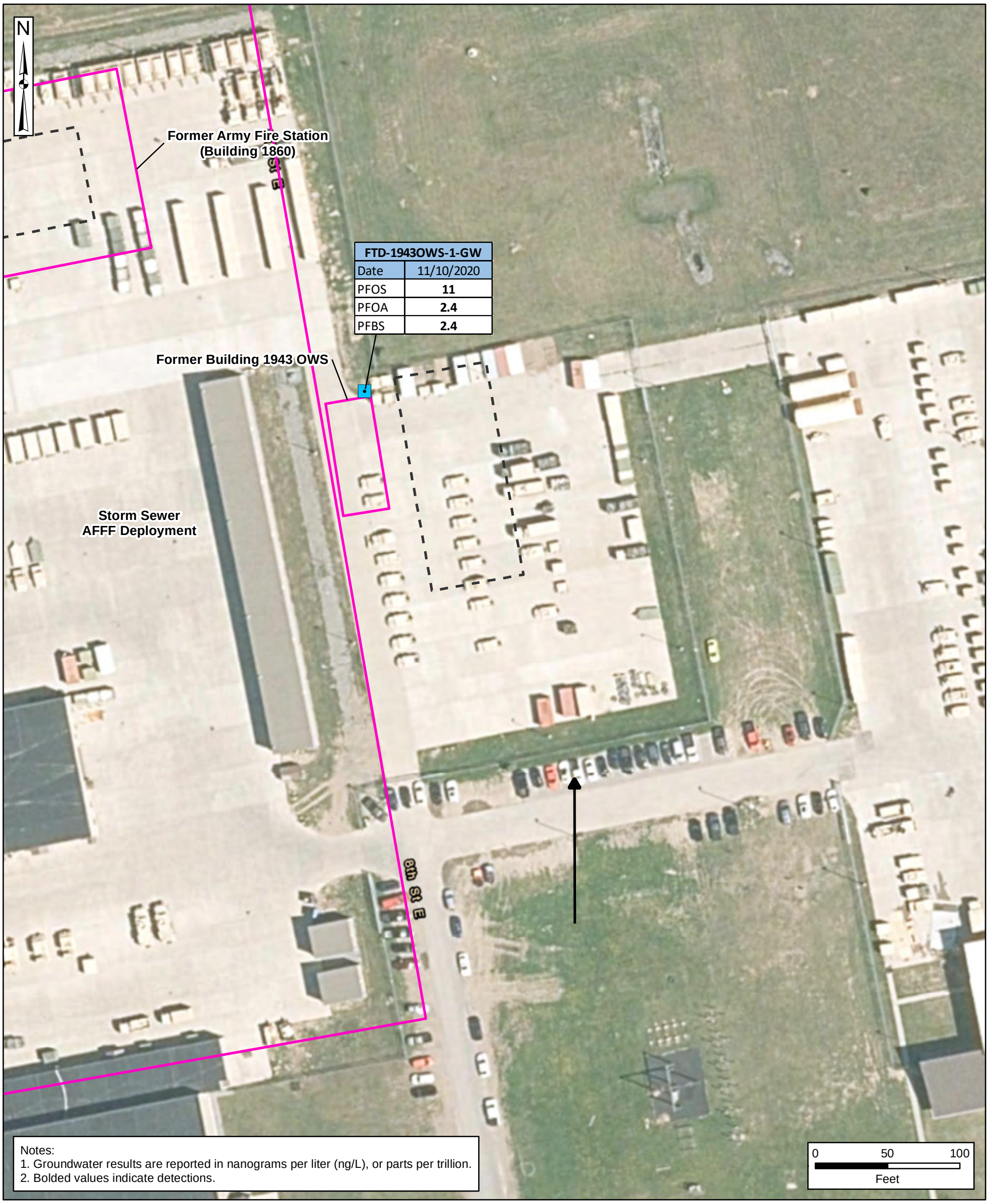


Figure 7-22
Former Building 1943 OWS AOPI
PFOS, PFOA, and PFBS Analytical Results



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

Installation Boundary
AOPI
Historical Building Footprint
Inferred Groundwater Flow Direction

Sample Locations

Grab Groundwater

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

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Historical Building Footprint, 2021
Arcadis, Sample Locations, 2021
ESRI ArcGIS Online, Aerial Imagery, Accessed 2021
Fort Drum, Installation Boundary, 2019

Coordinate System:
WGS 1984, UTM Zone 18 North

USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, NY

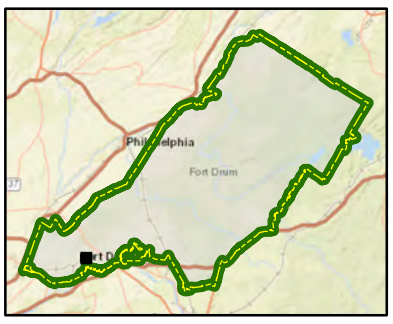


Figure 7-23
Fire Station #2 (Building 1585) AOPI
PFOS, PFOA, and PFBS Analytical Results

FTD-FS2-3-GW	
Date	10/4/2021
PFOS	**59**
PFOA	**22**
PFBS	**1.7**

FTD-FS2-2-GW	
Date	10/4/2021
PFOS	**280**
PFOA	**66**
PFBS	**1.4 J**

FTD-FS2-4-SO	
Date	09/30/2021
Depth	0.5-2 ft bgs
PFOS	**0.0011 J**
PFOA	0.00061 U
PFBS	0.002 U

FTD-FS2-2-SO	
Date	09/30/2021
Depth	0.5-2 ft bgs
PFOS	**0.0012**
PFOA	**0.00056 J**
PFBS	0.0021 U

Fire Station #2 (Building 1585)

FTD-FS2-3-SO	
Date	10/01/2021
Depth	0.5-2 ft bgs
PFOS	**0.003 [0.001]**
PFOA	0.00061 U **[0.0007]**
PFBS	0.002 U [0.002 U]

FTD-FS2-1-GW	
Date	10/4/2021
PFOS	**4.4 [4.0 J]**
PFOA	**3.0 [2.8]**
PFBS	1.6 U [1.6 U]

FTD-FS2-1-SO	
Date	10/01/2021
Depth	0.5-2 ft bgs
PFOS	0.00061 UJ
PFOA	R
PFBS	0.002 UJ

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. Field duplicate sample results are shown in brackets.
4. Bolded values indicate detections.
5. Concentrations of PFOS and PFOA that exceed the Office of the Secretary of Defense (OSD) residential tap water risk screening level of 40 ng/L (OSD 2021) are highlighted gray.

Qualifiers:
J = The analyte was positively identified; however the associated numerical value is an estimated concentration only.
R = The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Rejection of the data was decided by the project team and USACE chemist.
U = The analyte was analyzed for, but was not detected above the limit of quantitation (LOQ).

0 50 100
Feet

Installation Boundary
AOPI
Inferred Groundwater Flow Direction

Sample Locations

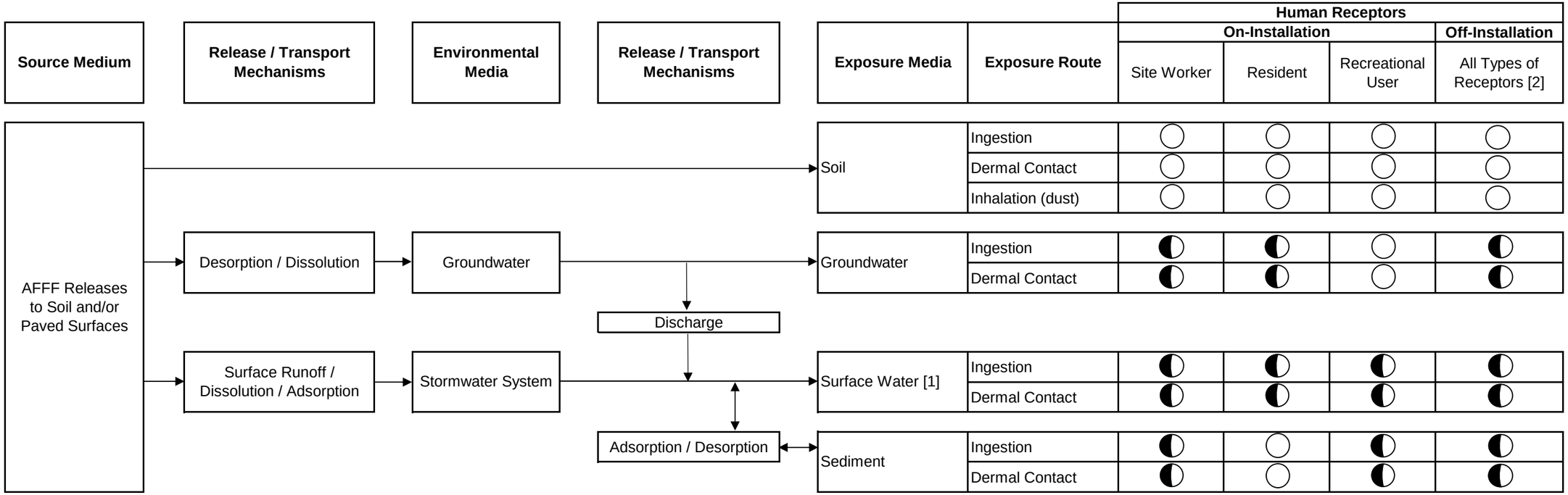
Surface Soil - Hand Auger
Grab Groundwater
Soil and Groundwater

AOPI = area of potential interest

Data Sources:
Arcadis, AOPIs, 2021
Arcadis, Groundwater Flow Direction, 2021
Arcadis, Sample Locations, 2021
Fort Drum, Installation Boundary, 2019
Google Earth, Aerial Imagery, Accessed 2016

Coordinate System:
WGS 1984, UTM Zone 18 North

OSD 2021:
Office of the Secretary of Defense. 2021. Memorandum: Investigating Per- and Polyfluoroalky Substances within the Department of Defense Cleanup Program. October.



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Hangar 2049 AFFF Suppression System and Hangar 19710 AFFF Suppression System
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-24

Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors			
						On-Installation			Off-Installation
						Site Worker	Resident	Recreational User	All Types of Receptors [2]
AFFF Releases to Soil and/or Paved Surfaces				Soil	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯
					Inhalation (dust)	◯	◯	◯	◯
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯
			Discharge						
				Surface Water [1]	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯
			Adsorption / Desorption	Sediment	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

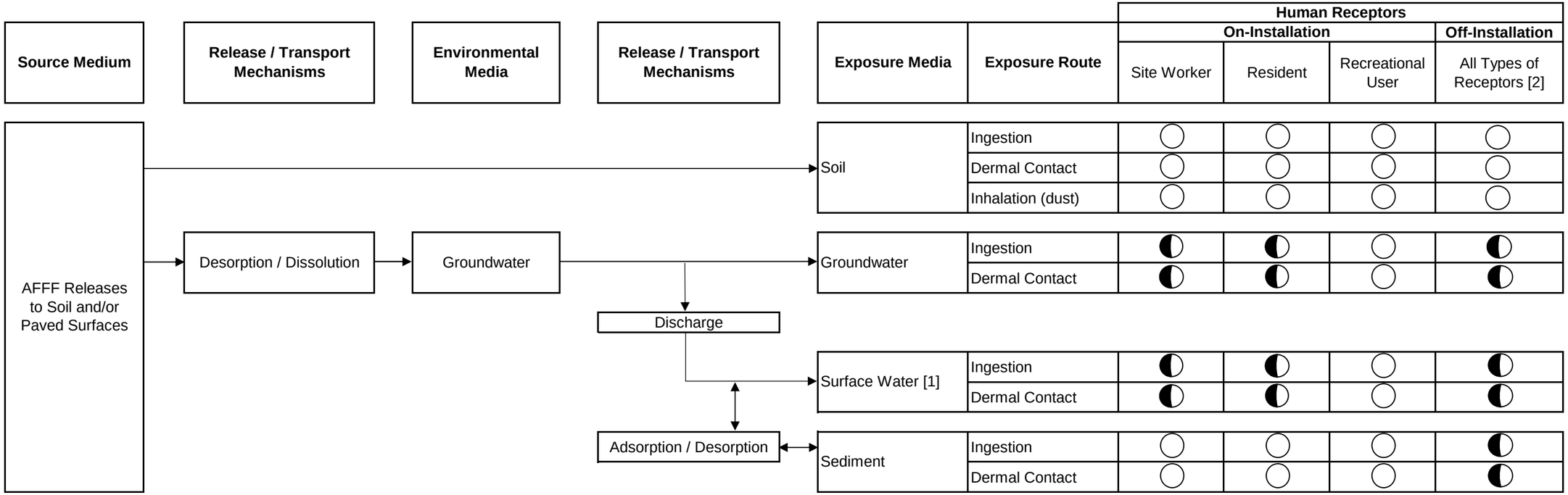
◯ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Building 2725
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-25



Legend:

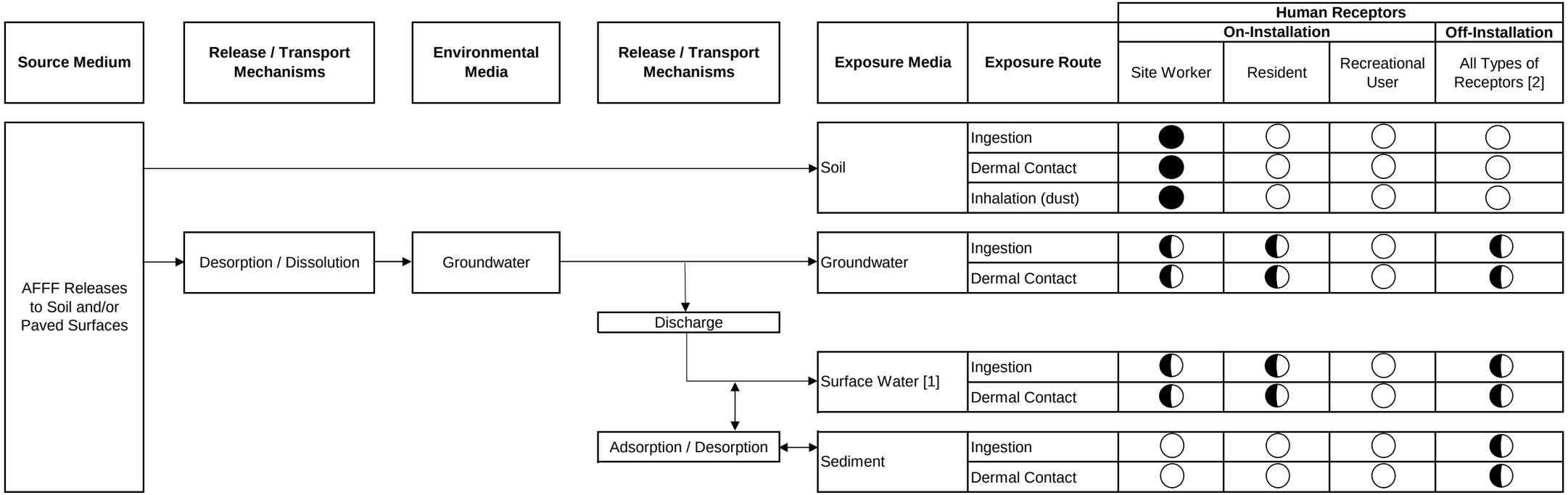
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Former Building 1131 AFFF Storage and Spill
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-26



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

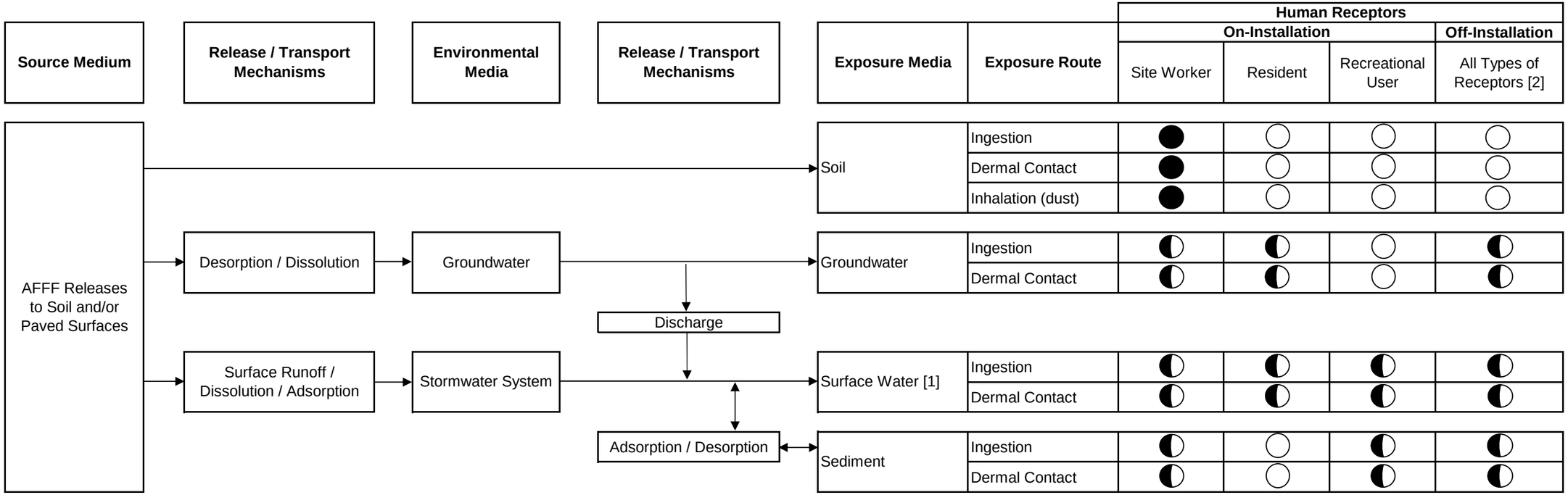
○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Former Army Fire Station (Kennedy & Dunn, Building 2419), Former Fire Station 3, and Former Fire Station (Building T-2330)
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-27



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

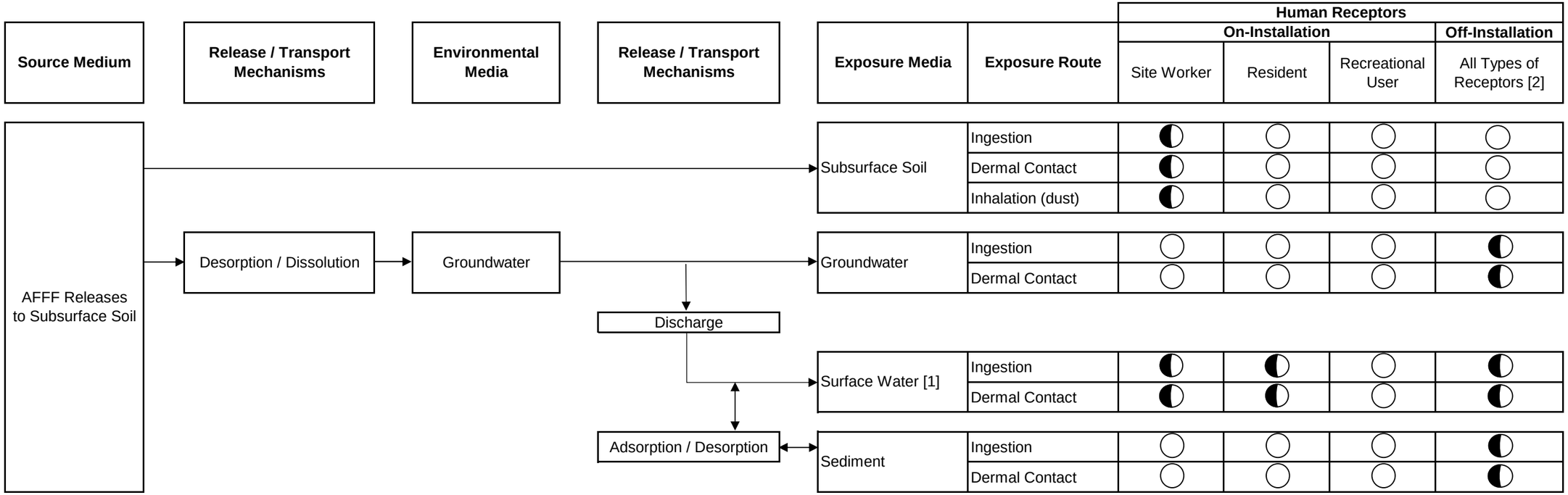
○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Hangar 2050 AFFF Suppression System and Hangar 2060 Fire Suppression System
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-28



Legend:

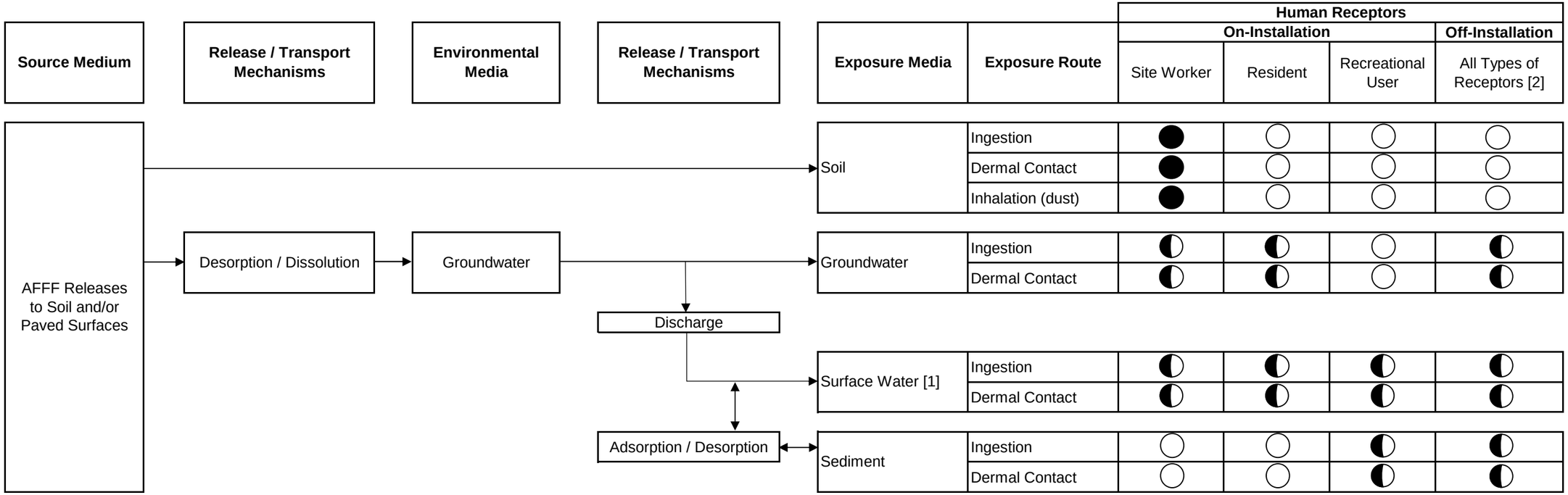
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam
WWTP - wastewater treatment plant

ARCADIS

Conceptual Site Model - Former WWTP and Former WWTP Sludge Drying Beds
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-29



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam
OSL - Old Sanitary Landfill

ARCADIS

Conceptual Site Model - Building 19855 Fire Suppression System, Fire Station #1, Former Army Fire Station (George & Cannon, Building 3828), Sludge Pile Near OSL, Building 2018 Soil Barn, Fire Station #3 and Nozzle Testing Area, Mountain Ramp Nozzle Testing Area, and Fire Station #2 (Building 1585)

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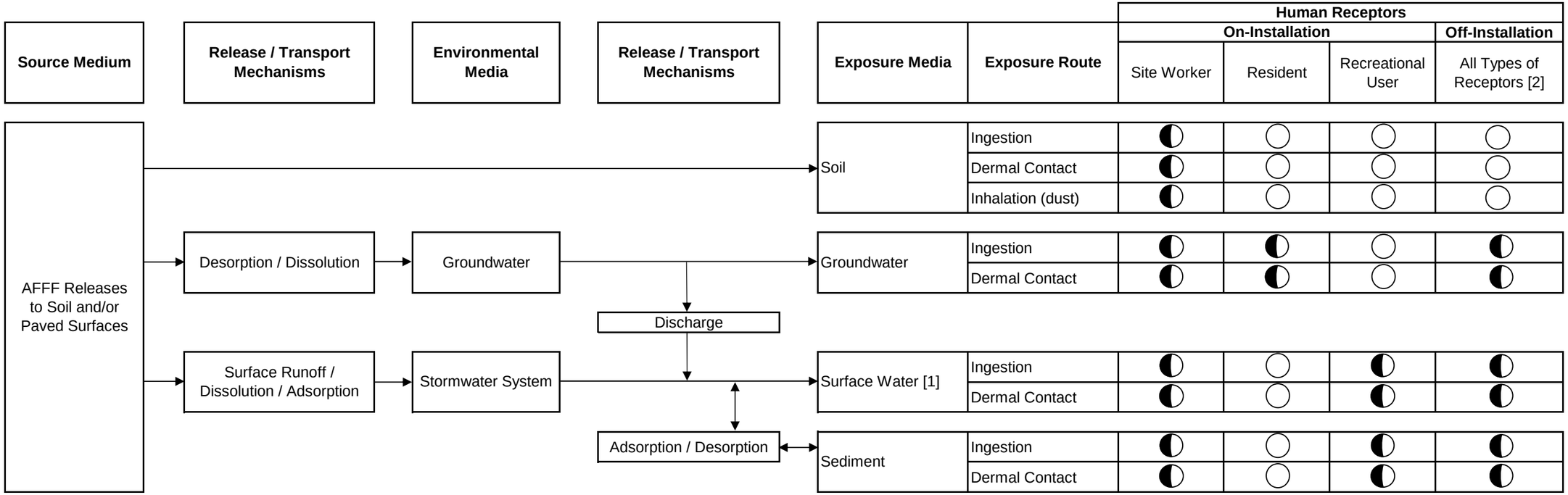
Fort Drum, New York

Figure 7-30



Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

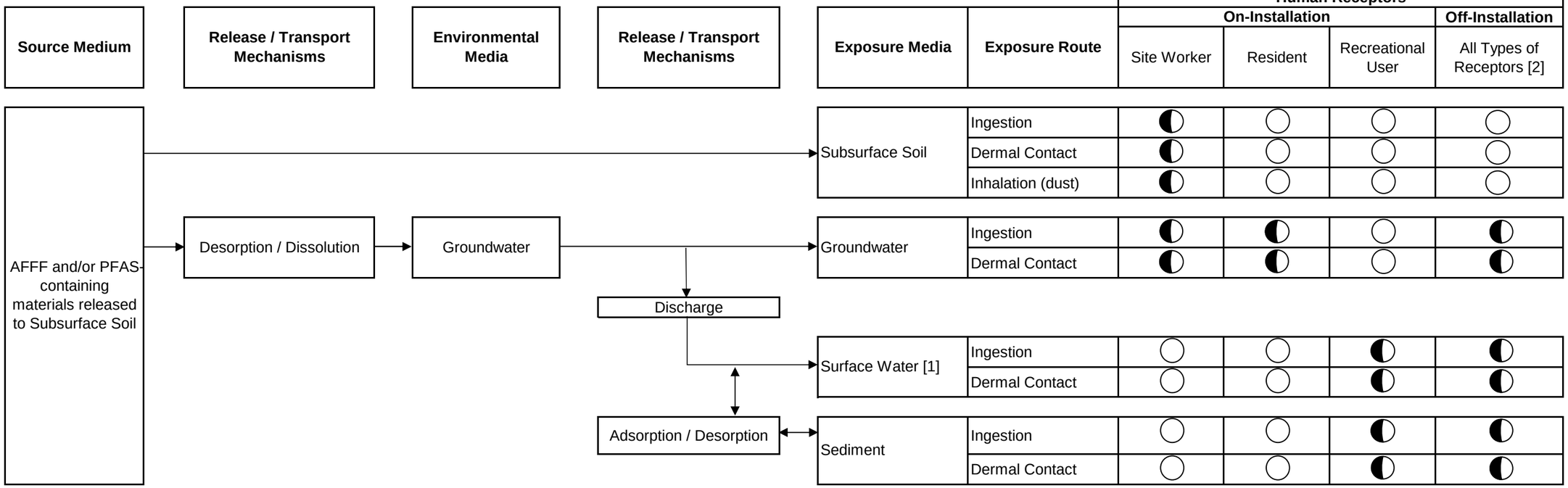
ARCADIS

Conceptual Site Model - Former Army Fire Station (Building 1860), Hangar 2070 Fire Suppression System, Hangar 2072 Fire Suppression System, Hangar 2074 Fire Suppression System, and Historical Tank Repair/Vehicle Maintenance Shop

USAEC PFAS Preliminary Assessment / Site Inspection

Fort Drum, New York

Figure 7-31



Legend:

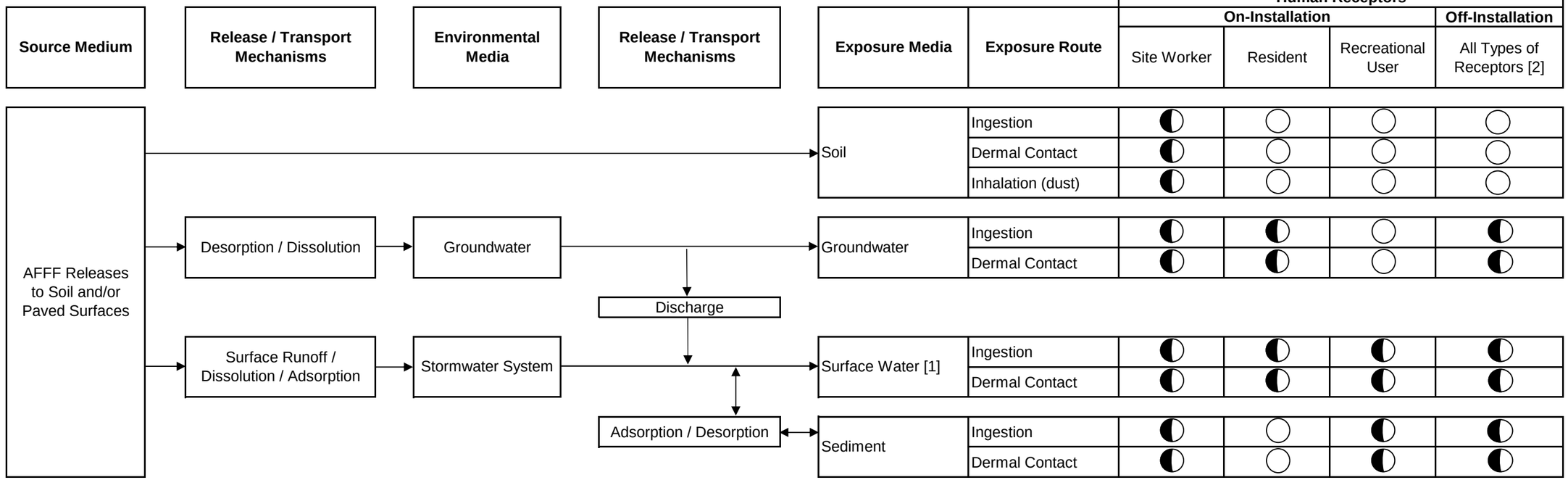
- ● = Complete Exposure Pathway
- ◐ = Potentially Complete Exposure Pathway
- ○ = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam
OSL - Old Sanitary Landfill
OWS - oil water separator
PFAS - per- and polyfluoroalkyl substances

ARCADIS

Conceptual Site Model - Storm Sewer AFFF Deployment, OSL, Building 3829 OWS, and Former Building 1943 OWS
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-32



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario. Surface water and sediment exposure pathways for Site Workers also describe incidental ingestion and dermal contact during outdoor work activities, and for Recreational Users describe incidental ingestion and dermal contact during outdoor recreational activities.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF - aqueous film forming foam

ARCADIS

Conceptual Site Model - Former Airfield Fire Station (Building 2041) and Route 26 Car Crash
USAEC PFAS Preliminary Assessment / Site Inspection
Fort Drum, New York

Figure 7-33