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

Tooele Army Depot - North, Utah

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

Tooele Army Depot - North, Utah

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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 U.S. Army installations (installations) nationwide. The PA identifies areas of potential interest (AOPIs) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The SI includes multi-media sampling at AOPIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. This Tooele Army Depot – North (TEAD-N) PA/SI was completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), National Oil and Hazardous Substances Pollution Contingency Plan, and Army/Department of Defense (DoD) policy and guidance.

The Tooele Army Depot (TEAD) collectively refers to two geographic areas: TEAD-N and Tooele Army Depot - South. TEAD-N is located in the Tooele Valley in Tooele County, Utah, approximately 30 miles southwest of Salt Lake City, Utah and just southwest of the city of Tooele, Utah (population 35,000). TEAD-N encompasses 23,473 acres and is the portion of the installation covered by this PA/SI report. Originally, it included an additional 1,700 acres, which were transferred to the Redevelopment Agency of Tooele City in December 1998 under the Base Realignment and Closure Early Transfer Authority. A separate PA/SI was conducted at TEAD – South for PFAS; the results are reported under a separate cover for that installation.

The TEAD-N PA identified 20 AOPIs for investigation during the SI phase. SI sampling results from the 20 AOPIs were compared to risk-based screening levels calculated by the Office of the Secretary of Defense (OSD) for PFOS, PFOA, and PFBS. PFOS, PFOA, and/or PFBS were detected in soil, groundwater, and/or sediment at fifteen AOPIs; however, only one of the 20 AOPIs had PFOS, PFOA, and/or PFBS present at concentrations greater than the risk-based screening levels. The TEAD-N PA/SI identified the need for further study in a CERCLA remedial investigation. **Table ES-1** below summarizes the PA/SI sampling results and provides recommendations for further study in a remedial investigation or no action at this time at each AOPI.

Table ES-1. Summary of AOPIs Identified During the Preliminary Assessment, PFOS, PFOA, and PFBS Sampling at Tooele Army Depot-North, and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SE	
Fire Station #1 (Building 8)	No[1]	No	NS	No action at this time
Fire Department Storage (Building 18)	No[1]	No	NS	No action at this time
Parking Lot FFTA	No[1]	No	NS	No action at this time
FFTA East of Current Building 400	No[1]	No	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SE	
Cottonwood Tree FFTA	No[1]	No	NS	No action at this time
West Headquarters Loop Parking Lot Tank Flush	No[1]	No	NS	No action at this time
South End of Commander's Circle FFTA	No[1]	No	NS	No action at this time
Car Wash (Building 16)	No[1]	ND	NS	No action at this time
Maple Street Hydrants Tank Flushes	No[1]	No	NS	No action at this time
Fire Truck Maintenance (Building 507)	No[1]	ND	NS	No action at this time
Drafting Pit	No[1]	No	NS	No action at this time
RAP Greasewood and Sagebrush Roads	No[1]	ND	NS	No action at this time
RAP Ammo Gate/Railroad Classification Yard	NS	ND	NS	No action at this time
RAP TV Site Road Loop (Building 1376 Area)	NS	No	NS	No action at this time
Former IWL and Ditches (SWMU 30 and SWMU 2)	No	No	NS	No action at this time
Former Sewage Lagoons (SWMU 14)	ND	No	NS	No action at this time
Former North Area Sanitary Landfill (SWMU 12/15)	ND	NS	No	No action at this time
Stormwater Evaporation/ Percolation Basin (SWMU 45)	**Yes**	No	NS	Further study in a remedial investigation
Building 1400 Area Tank Flush	NS	ND	NS	No action at this time
Demo Pit Range Dumpster Fire	ND	ND	NS	No action at this time

Footnotes:
[1] Groundwater assessed through the sampling of potable well WW1, located downgradient of all Southeastern Cantonment AOPIs. Detections in groundwater at WW1 may be attributed to more than one AOPI, however no exceedances of the OSD risk screening level were observed.

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

Three downgradient monitoring wells were also sampled along the northern border of TEAD-N as part of the SI to assess possible off-post migration of potential PFOS, PFOA, and/or PFBS. Groundwater samples from all three wells had no detections of PFOS, PFOA, and PFBS, indicating no obvious potential that PFOS, PFOA, and/or PFBS-impacted groundwater is flowing off-post to the north of the installation.

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 as the lead agency, 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 areas of potential interest (AOPIs) at Tooele Army Depot-North (TEAD-N) based on the use, storage and/or disposal of PFAS-containing materials, in accordance with the 2018 Army Guidance for Addressing Releases of PFAS (Army 2018). The SI included multi-media sampling at AOPIs to determine whether or not a release has occurred, and the PFOS, PFOA, and PFBS results were compared to the Office of the Secretary of Defense (OSD) PFOS, PFOA, and PFBS risk screening levels to determine whether further investigation is warranted. This report documents the PA/SI for TEAD-N 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 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 U.S. 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 groundwater (tap water) or soil, calculated using the USEPA's Regional Screening Level (RSL) calculator for residential and industrial/commercial worker receptor scenarios. Following the issuance of the 2019 OSD memo, on 08 April 2021, USEPA published an updated toxicity assessment for PFBS (USEPA 2021). Based on the updated toxicity assessment for PFBS, the OSD issued a memorandum on 15 September 2021 to include updated PFBS risk screening levels. The September 2021 Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program is provided for reference as **Appendix A**. The OSD risk screening levels for tap water (also used to evaluate groundwater) 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) and 1.6 mg/kg,

respectively. The PFBS soil screening levels for the residential and industrial/commercial scenarios are 1.9 mg/kg and 25 mg/kg, respectively. 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 to the SI phase in accordance with CERCLA. Consequently, this report provides the combined objectives of both PA and SI reports.

1.2.1 PA Objectives

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

1.2.2 SI Objectives

An SI is conducted when the PA determines an AOPI exists based probable on 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 TEAD-N, PA/SI development followed the process as described below. **Section 3** provides a summary of the PA activities completed, and **Section 6** provides a summary of the SI activities completed for TEAD-N. 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 U.S. Army Environmental Command (USAEC), U.S. Army Corps of Engineers (USACE), TEAD-N, Tooele Army Depot-South (TEAD-S), and Arcadis U.S., Inc. (Arcadis). The Tooele Army Depot (TEAD) collectively refers to two geographic areas: TEAD-N and TEAD-S. A separate PA/SI was conducted at TEAD – South for PFAS; the results are reported under a separate cover for that installation. The kickoff call occurred on 11 March 2019, 6 to 7 months before the site visit to discuss the goals and scope of the PA, project scheduling, installation access, timeline for the site visit, access to installation-specific databases, and to request available records.

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

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

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

1.3.2 Preliminary Assessment Site Visit

The site visit was conducted on 23 to 26 September 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 TEAD-N. The interviews focused on confirming information discussed in historical documents, collecting information that may have not been in historical documents, corroborating other interviewees' information.

Site reconnaissance included visual surveys that assessed the points of potential use, storage, and/or disposal of PFAS-containing materials, as well as potential secondary impacts, and the migration potential from each AOPI (e.g., stormwater drains, building drains and sumps, cracks in the floor/pavement). Physical attributes of the preliminary locations were documented, including local slope and ground and floor conditions (i.e., paved, unpaved, visual staining), surface water bodies and surface flow, potential receptors, and the distance to the installation boundary. Access to existing groundwater monitoring wells and on-post supply wells, if present, were also noted during the site reconnaissance in case the monitoring or on-post supply 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 installation declined an exit briefing.

1.3.3 Post-Site Visit

Information collected before, during, and after the site visit was reviewed and corroborated by cross-referencing records and reviewing interview details and observations noted during site visit reconnaissance. A site visit trip report was completed and provided to the installation POC, applicable USAEC POCs, and USACE regional POCs following the site visit. The information collected during the pre-site visit and site visit activities was compiled to develop the installation-specific PA portion of the PA/SI report (**Section 4**). Site data obtained during the PA were used to develop preliminary conceptual site models (CSMs) for each AOPI, which serve as the basis for developing the SI scope of work presented in an installation-specific Quality Assurance Project Plan (QAPP) Addendum.

1.3.4 Site Inspection Planning and Field Work

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

The objectives of the SI kickoff teleconference were to:

- Discuss and review the AOPIs selected for sampling and the project status for the SI phase of work.
- Gauge regulatory involvement requirements or preferences.
- Discuss general SI deliverable and field work schedule information and logistics.

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

- Discuss the AOPIs selected for sampling and the proposed sampling plan for each AOPI.
- Identify overlapping unexploded ordnance (UXO) or cultural resource areas.
- Discuss the plan for investigation derived waste (IDW) handling and disposal.
- Identify specific installation access requirements and potential schedule conflicts.
- Provide an updated SI deliverable and field work schedule.

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

and provide qualifications for project personnel. The SI field work was completed in accordance with the PQAPP (Arcadis 2019) and the approved installation-specific QAPP Addendum. A Site Safety and Health Plan (SSHP) was also developed as an attachment to the QAPP Addendum to identify specific health and safety hazards that may be encountered at the installation during sampling. The SSHP was designed to supplement the Accident Prevention Plan (Arcadis 2018), which was developed for installations nationwide. The QAPP Addendum and SSHP were submitted to the installation and finalized before commencement of field work.

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

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

1.3.5 Data Analysis, Validation, and Reporting

Environmental samples collected during the SI were submitted to a laboratory which is DoD Environmental Laboratory Accreditation Program (ELAP)-accredited for PFOS, PFOA, and PFBS analysis by liquid chromatography with tandem mass spectrometry and compliant with the DoD Quality Systems Manual (QSM) 5.3 (DoD and Department of Energy 2019). Laboratory analytical results were then validated and verified by a project chemist to assess the usability of the data collected. The project chemist submitted a Data Usability Summary Report (DUSR) for the 2020 sampling event. 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 TEAD-N, 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

TEAD-N is located in the Tooele Valley in Tooele County, Utah, approximately 30 miles southwest of Salt Lake City, Utah, and just west of the city of Tooele, Utah (population 35,000). The location of TEAD-N is shown on **Figure 2-1**. It encompasses approximately 23,500 acres. Originally, it included an additional 1,700 acres, which were transferred to the Redevelopment Agency of Tooele City in December 1998 under the Base Realignment and Closure (BRAC) Early Transfer Authority (USACE 2018). The working population of TEAD-N is approximately 500 civilians and approximately 100 tenants and contractors. TEAD-N is bounded by cultivation and rangeland grazing to the west; rangeland grazing, a gravel pit operation, and the Tooele County Landfill to the south; rangeland grazing and the city of Tooele to the east; and rangeland grazing, a concrete/asphalt batch-plant, and a closed Tooele County Municipal Landfill to the north (USACE 2018). An overview of the TEAD-N layout is shown on **Figure 2-2**.

2.2 Mission and Brief Site History

Information in this section is excerpted from the Installation Action Plans for TEAD (USAEC 2001; USAEC 2016) and the Fourth Five-year Review Report for TEAD Superfund Site (USACE 2018). In recent years, TEAD-N's mission has been twofold: the installation's first mission is to support DoD needs worldwide. Installation capabilities include storage, inspection, maintenance, and testing of training stocks as well as war reserve ammunition. Additionally, TEAD-N has an extensive demilitarization capability for a variety of conventional ammunition. The installation's second mission is to serve as a life cycle management installation wherein the Ammunition Equipment Directorate provides the design, development, manufacture, and fielding of ammunition-related equipment under the ammunition peculiar equipment program. This equipment is used in the maintenance and demilitarization of munitions throughout the world.

TEAD-N is currently an active Army Joint Munitions Command facility and has functioned as a major ammunition storage and equipment maintenance installation that supports other installations throughout the western U.S. TEAD-N's past maintenance missions have included the repair of tactical wheeled vehicles, power generation equipment, and secondary components of these items. In 1993, the installation's maintenance mission was placed on the BRAC list and the realignment of the maintenance mission was completed in 1995. The excess BRAC property was transferred to the Tooele City Redevelopment Agency in 1998.

2.3 Current and Projected Land Use

Information in this section is excerpted from the Integrated Natural Resources Management Plan (Tetra Tech 2015). TEAD-N has two primary land use designations: minimal use areas and administration /

community support areas. The minimal use areas account for approximately 93 percent (%) of TEAD-N and include firing ranges as well as igloo munitions and ammunition storage, maintenance, and demolition. Buffer zones around the main ammunition activity areas provide for public safety and weapons security considerations. The remaining area is designated for administration/community support areas and includes the TEAD-N's main entrance, headquarters, communication facilities, fire department, administrative buildings, and recreational facilities.

The BRAC area along the eastern boundary of the installation was previously an industrial vehicle maintenance area and has been sold to private owners. It is currently operated as a commercial business and industrial park. As most of the acreage at TEAD-N is designated for munitions storage and demolition activities, an unexploded ordnance escort is required across the installation to address potential hazards that may be posed by encountering munitions. The future land use is projected to remain consistent with the current industrial/commercial use. There are no residential housing units, schools, or daycare centers on TEAD-N; all TEAD employees reside off-post (Tetra Tech 2015).

2.4 Climate

Information in this section is excerpted from the Integrated Natural Resources Management Plan (Tetra Tech 2015). TEAD lies primarily in the semidesert climatic zone, with a climate that is characterized by hot, dry summers and cool, moderate winters. Average mean annual temperatures in Tooele range from 80 degrees Fahrenheit (°F) in the summer to 30 °F in the winter, but temperature extremes from -3 °F in the winter to 106 °F in the summer are on record (National Weather Service 2014, as cited in Tetra Tech 2015). The north-central part of TEAD-N averages 8 inches of precipitation annually, while the annual average in the northeast corner is 16 inches of precipitation (Tetra Tech 2015). Most precipitation occurs during the winter and early spring months as snow.

In the TEAD-N area, the Great Salt Lake Basin and surrounding major mountain ranges form a large, generally enclosed air basin of approximately 7,500 square miles. The Great Salt Lake generates a classic sea breeze air circulation caused by uneven heating and cooling of land and water surfaces. Wind direction for TEAD-N tends to flow down and out of Tooele Valley north towards the lake at night when the land surface is warmer than the water, and south away from the lake during the day when the water is warmer than the land. Although these wind speeds rarely exceed 10 miles per hour, enough constant interchange of air and low humidity prevents fog and smog from developing. Strong high-pressure systems follow winter storm fronts and can persist for several weeks, which can trap cold air in the valley and produce temperature inversions, leading to fog and smog problems (Tetra Tech 2015).

2.5 Topography

Information in this section is excerpted from the Integrated Natural Resources Management Plan (Tetra Tech 2015) and the Fourth Five-year Review Report for TEAD Superfund Site (USACE 2018). The TEAD-N facility is located in the Great Salt Lake Basin at approximately 4,700 feet above mean sea level (amsl; ranging 4,430 feet amsl along the northern boundary to 5,250 feet amsl along the southern boundary) (USACE 2018). The Tooele Valley is bounded by the north-trending Stansbury and Oquirrh Mountains. The Great Salt Lake Basin is characterized by large fault blocks that trend north-south and form a series of interior basins bounded by fault-block mountain ranges. The surface topography of

TEAD-N is generally flat with a gradual and gentle slope toward the center of the installation and the north (USACE 2018). The average slope of the land surface at the Depot ranges from about 3% near the base of the Oquirrh Mountains to the east and flattens to about 1% at the north-central boundary of the installation (Tetra Tech 2015). **Figure 2-3** shows the topography of the area.

2.6 Geology

Information in this section is excerpted from the Summary and Integration of Geophysical Investigations of the Tooele Army Depot (U.S. Geological Survey [USGS] 2005), Fourth Five-year Review Report for TEAD Superfund Site (USACE 2018), and Tooele Army Depot Groundwater Flow and Contaminant Transport Model Report (USACE and Tetra Tech 2019).

TEAD-N lies within the south end of Tooele Valley, a structural depression filled with unconsolidated and semi-consolidated basin fill sediments covering nearly 300 square miles. Mountains border the valley to the east, west, and south, with the Great Salt Lake forming the northern boundaries of Tooele Valley. Tooele Valley is filled with Tertiary and Quaternary age basin sediments. These deposits range from clays to coarse gravels, and represent a variety of depositional environments, including alluvial fan, near shore, lacustrine, and fluvial (USGS 2005).

Coarse-grained alluvial fan sediments are the main component of the basin fill material in the vicinity of TEAD-N. The most notable geologic feature is a shallow but largely buried bedrock block within the eastern portion of the installation. The block is composed of Paleozoic interbedded quartzite, sandstone, and limestone (USGS 2005).

The depth to the bedrock ranges from the surface layer at 0 feet below ground surface (bgs; outcrops in the northeastern corner of the facility and along the southern boundary of the installation) to more than 2,000 feet bgs in the south-central portion of the installation (USACE 2018). Fractures and weathered rock makeup the groundwater aquifer where the bedrock is shallow. The rate of groundwater movement is primarily controlled by the size and density of fractures within the bedrock, while the orientation of the fracture in the bedrock affects the direction of groundwater movement. The alluvial aquifer, which is more than 750 feet thick near the northern boundary of TEAD-N, is a single aquifer consisting of various sedimentary layers. Localized perched water zones are present at various depths in the alluvial aquifer and appear to be more prevalent in the central portion of the Tooele Valley (USACE and Tetra Tech 2019).

2.7 Hydrogeology

Information in this section is excerpted from the Tooele Army Depot Groundwater Flow and Contaminant Transport Model Report (USACE and Tetra Tech 2019) and Integrated Natural Resources Management Plan (Tetra Tech 2015).

Groundwater at TEAD is part of a larger regional groundwater flow system that includes Rush and Tooele Valleys. The valley is filled with several thousand feet of unconsolidated alluvial sediment underlain by bedrock. Groundwater in Tooele Valley is primarily found in the alluvial valley fill deposits and to a lesser extent in the underlying bedrock. Groundwater beneath TEAD-N occurs under confined, unconfined, perched, and mounded conditions in either the bedrock or the alluvial aquifers (USACE and Tetra Tech

2019). The alluvial aquifer beneath TEAD-N is generally unconfined but becomes confined toward the center of the basin north of TEAD-N (Tetra Tech 2015).

Recharge of groundwater primarily occurs along the Tooele Valley margins from either snow melt runoff, from losing streams, or from direct precipitation (USACE and Tetra Tech 2019). Approximately 40% of total annual loss from the groundwater system in the Tooele Valley is through water supply wells. The remaining discharge is attributed to discharge at springs, evapotranspiration, and outflow to Great Salt Lake (USACE and Tetra Tech 2019). A large groundwater discharge area, marked by springs, wetlands, and artesian wells, is in the area that is roughly between Utah State Route 138 and the margin of the Great Salt Lake, about 4 miles north of TEAD-N's northern boundary (Tetra Tech 2015).

Groundwater at TEAD-N generally flows from southeast to northwest, toward the center of the valley and eventually toward the Great Salt Lake. Groundwater levels across TEAD-N range from approximately 4,500 feet amsl in the southeastern (upgradient) portion of the site, to approximately 4,300 feet amsl in the northwestern (downgradient) portion of the site. Depth to groundwater varies from approximately 700 feet bgs in the southwestern portion of the TEAD-N, to 400 feet bgs at the eastern edge of the installation and less than 300 feet bgs along its northern boundary (USACE and Tetra Tech 2019).

2.8 Surface Water Hydrology

Surface water resources are limited at TEAD-N due to the arid nature of the region. **Figure 2-2** shows several "connector" features in the area, which, according to the USGS's National Hydrology Dataset, are known but nonspecific invisible connections between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow. There are no major surface water bodies in Tooele Valley, and surface water is not used as a drinking water source at TEAD-N. There are five predominant perennial streams in Rush Valley which originate in the mountains and dissipate as they flow towards the valley floor. Four of the streams originate in the Stansbury Mountains and one flows out of the central Oquirrh Mountains. Precipitation that lands on the valley floor is typically consumed by evapotranspiration. Excess runoff either infiltrates into the subsurface soil or becomes overland runoff in the streams that drain from the mountain (Gardner and Kirby 2011). Water from these streams is usually diverted for irrigation.

Drainage at TEAD-N typically flows from south to north along natural stream beds and drainage courses during periods of heavy rainfall or rapid snow melt. Water is generally absorbed by soil or vegetation and rarely leaves the depot. South Willow Creek, which is on the northwestern boundary of TEAD-N, is the largest of the ephemeral streams in the Tooele Valley with an annual discharge of approximately 4,820 acre-feet (Montgomery Watson 1993). The Box Elder Wash (an intermittent stream draining from Box Elder Canyon) is near TEAD-N's southwestern boundary and has an annual discharge of approximately 900 acre-feet (Montgomery Watson 1993). A small, earthen dam was built on Box Elder Wash to help control flash flooding; however, the flood gates of the dam are inoperable (Tetra Tech 2015). Surface water flow from the South Willow and Box Elder Canyons rarely reach TEAD-N except during rare periods of heavy rain or rapidly melting snowpack (Montgomery Watson 1993).

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 TEAD-N.

2.9.1 Stormwater Management System Description

The administrative/community support area of TEAD-N consists primarily of impervious surfaces. Therefore, stormwater runs off quickly into storm sewer collectors and is routed to an area north of the administrative/community support area, where water is discharged and allowed to percolate into the soil. No stormwater management infrastructure is present in the minimal use areas (Tetra Tech 2015).

2.9.2 Sewer System Description

Maintenance operations at TEAD-N required the handling of large amounts of hazardous materials, including chlorinated organic solvents. From 1942 to 1965, the liquid waste from operations in the maintenance area was drained into four unlined drainage ditches, which led to a land-spreading / evaporation area known as the Old Industrial Waste Lagoon (IWL; solid waste management unit [SWMU] 30). After 1965, this waste was diverted via a 1.5-mile-long interceptor ditch to an abandoned gravel quarry, known as the current IWL, located in the eastern portion of TEAD-N (URS Group, Inc. 2007). It was an unlined 400 foot by 200 foot evaporation pond that received waste via unlined conveyance ditches, used from 1965 to 1988. A significant percentage of the total flow in the system was lost to percolation, and to a lesser extent, evaporation (URS Group, Inc. 2007).

The industrial wastewater system cleanup included excavations of soil along the unlined ditches, installing clay and impermeable synthetic liners in the ditches, and emplacing clean soil fill. Wastewater disposal at the Old IWL and IWL has resulted in environmental contamination of groundwater and soil (U.S. Department of Health and Human Services Public Health Service 2003). Wastewater from maintenance shops is treated at the industrial wastewater treatment plant (WWTP) west of the maintenance area.

2.10 Potable Water Supply and Drinking Water Receptors

TEAD-N obtains its water supply from groundwater and operates its own water supply and distribution system, which is located on the eastern side of Tooele Valley. The natural slope of the valley in the area maintains a gravity-based pressure in the supply system. There are three active potable supply wells (WW1, WW3, and WW4) and two inactive supply wells (WW5 and WW6, stock watering wells) at TEAD-N; the wells are installed in a confined aquifer (Tetra Tech 2015). The construction details for the on-post supply wells were not available. Well WW2 is now located off-post; this well, which supplies water to the Utah Industrial Depot/Peterson Industrial Depot former BRAC parcel, and its associated water rights were transferred to Tooele City.

Groundwater beneath TEAD-N flows off-installation through the installation's northern boundary. An overview of the on-post supply and monitoring wells is shown on **Figure 2-2**. Additionally, several large irrigation and livestock supply wells are located north of TEAD-N. These wells are pumped during the

summer months and may locally affect the groundwater flow system near TEAD-N (Montgomery Watson 1993).

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 TEAD-N (**Appendix E**) which, along with data provided by the installation, identified several off-post public and private wells within 5 miles of the installation boundary (**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, as excerpted from the Integrated Natural Resource Management Plan (Tetra Tech 2015), is provided for future reference should the Army decide to evaluate exposure pathways relevant to the ecological receptors.

TEAD-N lies within the Sagebrush Basins and Slopes ecoregion of the Central Basin and Range. The region is semi-arid and is dominated by Wyoming big sagebrush, mountain big sagebrush, and pinyon-Utah juniper vegetation. Perennial bunchgrasses also occur in the region and become increasingly common northward as available moisture increases. Invasive plant species of concern on TEAD-N include yellow star thistle, Scotch thistle, and hemlock. TEAD-N has no forested areas, wetlands, or major riparian areas. The area is used for livestock grazing, feedlots, dairy operations, and irrigated cropland (Tetra Tech 2015).

Nearly 70 species of mammals have been observed at TEAD-N, and approximately 20 more are expected to inhabit the area. Large mammal species that have been found at TEAD-N include the pronghorn, mule deer, coyote, porcupine, weasel, racoon, striped skunk, and spotted skunk. Small mammal species existing onsite include shrews, bats, squirrels and chipmunks, ground squirrels, white-tailed antelope squirrel, rabbits and hares, gophers, kangaroo rats, pocket mice, voles, and woodrats. In addition, elk are known to move on to TEAD-N from the neighboring Oquirrh Mountains during most winters. TEAD-N supports a modest population of mule deer; however, TEAD-N does not have a hunting program, and game species are not actively managed at the installation (Tetra Tech 2015).

No fish species have been recorded at TEAD-N. Six species of reptiles and more than 60 species of birds have been observed at TEAD-N. TEAD-N has habitat for species of concern, including the bald eagle, golden eagle, ferruginous hawk, and peregrine falcon; however, there are no known endangered, threatened, or rare species inhabiting TEAD-N (Tetra Tech 2015).

The area surrounding TEAD-N consists of desert shrublands. Property west and south of TEAD-N is managed by the U.S. Forest Service, the Bureau of Land Management (which leases parcels of land for livestock grazing), and Tooele County (Tetra Tech 2015).

2.12 Previous PFAS Investigations

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

Sampling for PFAS was conducted in January 2015 from potable water supplies in communities near TEAD-N in response to the USEPA's third Unregulated Contaminant Monitoring Rule. Post-treatment drinking water samples were analyzed for six PFAS constituents including PFOS, PFOA, and PFBS. Additional samples were collected at TEAD-N in November 2016 for analysis of PFOS and PFOA only. Post-treatment drinking water samples were collected from potable water supply wells WW1, WW3, and WW4 and at Buildings 501 and 1335. All sample results were non-detect; however, the laboratory detection limits at the time were 0.04 micrograms per liter for PFOS (equal to the current OSD risk screening level) and 0.02 micrograms per liter for PFOA (Tetrahedron 2018; **Table 2-1**). These historical analytical results were not validated as part of this PA/SI and were not used to make recommendations for further investigation. The laboratory which analyzed samples under UCMR3 met the USEPA's UCMR3 Laboratory Approval Program application and Proficiency Testing criteria for USEPA Method 537 Version 1.1.

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 TEAD-N, data was collected from three principal sources of information:

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

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. 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 TEAD-N is presented in **Section 4**. Further discussion regarding rationale for not retaining areas for further investigation is presented in **Section 5.1**, and further discussion regarding categorizing areas as AOPIs is presented in **Section 5.2**.

3.1 Records Review

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

3.2 Personnel Interviews

Interviews were conducted during the site visit. The list of roles for the installation personnel interviewed during the PA process for TEAD-N is presented below (affiliation is with TEAD or TEAD-N unless otherwise noted).

- IRP Manager
- Range Control Specialist
- Environmental Protection Specialist
- Environmental Chief
- Fire Chief
- Assistant Fire Chief
- Fire Captain

- Firefighters (current and former)
- Facilities Construction Representative
- Contractor for Vehicle Maintenance for TEAD-N and TEAD-S (Alliance Worldwide Distributing)

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

3.3 Site Reconnaissance

Site reconnaissance and visual surveys were conducted at the preliminary locations identified at TEAD-N during the records review process, the installation in-brief meeting, and during the installation personnel interviews. A photo log from the site reconnaissance is provided in **Appendix H**; photos were used to assist in verification of qualitative data collected in the field. The site reconnaissance logs are provided in **Appendix I**.

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

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

4.1 AFFF Use, Storage, and Disposal Areas

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

In association with fire department activities, firefighting foams have historically been stored at the installation, have been used during training exercises, fire responses, nozzle and pump testing, fire truck tank and hose flushing, and fire truck washing, and have been disposed at the installation. Across most of the installation, it is unknown if class A or class B (AFFF containing) firefighting foams were used, stored, or disposed at the installation based on the information provided. Therefore, to be conservative, where the use, storage, or disposal of firefighting foams was identified, it is assumed that the foams were class B.

For emergency preparedness, installation and fire department personnel were trained to perform nozzle testing with firefighting foams to ensure optimal flow and release of the foam mixture. Nozzle testing involved spraying firefighting foams through fire equipment, which could release 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 firefighting foams in an emergency response. The total number of trainings that occurred and the amount of foam used, stored, or disposed at the trainings, testing, and storage areas are unknown. Additionally, in some cases, the exact locations of potential use of foam are unknown.

Historical foam use, storage, and disposal in association with fire department activities were identified during the PA as follows:

- Storage: Inventory documents provided by the Army before the PA site visit indicated that cumulative volume 50 gallons of 3% AFFF were stored at TEAD-N and TEAD-S, but did not specify the quantity

of AFFF stored at each of the two installations. PA site reconnaissance and personnel interviews provided information about AFFF storage at TEAD-N and TEAD-S, but the total quantity stored at each installation could not be established for comparison to the Army-provided inventory information. It is assumed that the entire 50 gallons of AFFF is accounted for at the storage areas identified at TEAD-N and TEAD-S. During the PA site visit at TEAD-N, interviewees reported AFFF storage in containers and in truck tanks at Fire Station #1 (Building 8) and Fire Department Storage (Building 18). AFFF storage in containers was also confirmed during site reconnaissance at Fire Station #1 (Building 8)..

- Nozzle/hose and pump testing: These activities, which involved firefighting foam use, occurred at Fire Station #1 (Building 8), Fire Truck Maintenance (Building 507), and the Drafting Pit. AFFF use was confirmed at Fire Station #1 (Building 8).
- Training exercises: Firefighting foams were used at various firefighting training areas (FFTAs) from approximately the 1990s to the present at the Fire Station #1 (Building 8), Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, and South End of Commander's Circle FFTA AOPIs. AFFF use was confirmed at the Fire Station #1 (Building 8), Parking Lot FFTA, and South End of Commander's Circle FFTA AOPIs.
- Fire responses: Firefighting foams were used in a response to a dumpster fire at the Demo Pit Range.
- Tank and hose flushing: These firefighting foam use and disposal activities occurred at the Fire Station #1 (Building 8), Fire Department Storage (Building 18), Parking Lot FFTA, West Headquarters Loop Parking Lot Tank Flush area, Maple Street Hydrants Tank Flush areas, Fire Truck Maintenance (Building 507), and the Building 1400 Area Tank Flush. AFFF use was confirmed at the Fire Station #1 (Building 8), Parking Lot FFTA, Maple Street Hydrants Tank Flush area, and Building 1400 Area Tank Flush AOPIs.
- Fire truck washing: These activities have been conducted at Fire Station #1 (Building 8) and at the Car Wash (Building 16) and may have resulted in release of residual firefighting foams from the trucks. AFFF use was confirmed at Fire Station #1 (Building 8).
- Disposal: Runoff and/or wastewater containing AFFF may have been received from the various foam use areas at the Former IWL and Ditches (SWMU 30 and SWMU 2), Former Sewage Lagoons (SWMU 14), and at the Stormwater Evaporation/Percolation Basin (SWMU 45).

It is uncertain based on the information provided if class A or B firefighting foams were used during the historical activities at many of the on-post sources. Further discussion regarding areas retained as AOPIs based on the use, storage, and disposal of AFFF is presented in **Section 5.2**.

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

Following document research, personnel interviews, and site reconnaissance at TEAD-N, areas related to material reuse, wastewater treatment, and metals plating operations were also identified as preliminary locations for use, storage, and/or disposal of PFAS-containing materials. A summary of information gathered in the PA for each of these preliminary locations is described below. Specific discussion

regarding areas not retained for further investigation is presented in **Section 5.1** and specific discussion regarding areas retained as AOPIs is presented in **Section 5.2**.

Three reuse asphalt project (RAP) areas were identified at TEAD-N. In approximately 2011, asphalt from areas where firefighting foams had been used (including the South End of Commander's Circle FFTA, Fire Station #1 [Building 8], and Fire Truck Maintenance [Building 507]) was removed, crushed, mixed with other material, and used for repaving at the RAP Greasewood and Sagebrush Roads, RAP Ammo Gate/Railroad Classification Yard, and RAP TV Road Loop (Building 1376 Area) areas.

Additionally, according to historical reports, the Former IWL and Ditches (SWMU 30 and SWMU 2), Former Sewage Lagoons (SWMU 14), and the Former North Area Sanitary Landfill (SWMU 12/15) potentially received waste from former metals plating operations in the industrial area (now on BRAC property). During metal plating operations, a metal surface may be treated with a layer of electrochemically deposited metals in an acid bath. PFAS, specifically PFOS, have been used in metal plating operations as surface tension-reducing wetting agents to mitigate the release of aerosolized chemicals into a working environment. Hard chromium plating is one type of metal plating operation where PFAS-containing mist suppressants were commonly used. Historically, it was common for spent plating baths from metal plating operations to be disposed of in a lined or unlined pit or into a sanitary or storm sewer. Therefore, PFAS present in mist suppressants during the metal plating process could be released to the environment. It is unknown if the metal plating operations in the industrial area (now on BRAC property) involved use, storage, or disposal of PFAS-containing materials.

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

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 TEAD-N) is not part of the PA/SI. However, potential off-post PFAS sources within a 5-mile radius of TEAD-N that were identified during the records search and site visit, along with the identifiers of any overlapping IRP and/or Headquarters Army Environmental System (HQAES) sites, are described in **Table 4-1**, below. It is uncertain, based on the information provided, if firefighting foam use during the historical activities at any of the off-post sources are related to class A or class B firefighting foams.

Table 4-1. Potential Off-Post Sources of PFAS

Site Identifier	Date(s) of Relevant Use/Storage/Disposal of Potentially PFAS-Containing Materials	Relevant Site History
Off-Post Asphalt Disposal	Approximately 2015	According to fire department personnel interviews, asphalt from Fire Station #1 (Building 8; at which AFFF storage and use was confirmed) was removed from the front apron and sent for disposal off-post (disposal facility is unknown, removed by contractor). Note: This is a separate asphalt removal from that completed in approximately 2011 (the asphalt removed in 2011 was reused as part of the RAP).
Building 637 (BRAC)	Unknown	Building 637 operated as an electroplating, spray-painting, and sandblasting/engine rebuild facility for an unknown period (U.S. Army Toxic and Hazardous Materials Agency [USATHAMA] 1988). This facility was likely connected to the Industrial Wastewater Piping System (SWMU 49).
Building 600 (BRAC)	Unknown	Building 600 operated as an electroplating, plating waste, spray-painting, and sandblasting facility for an unknown period of time (USATHAMA 1988). The facility was likely connected to the Industrial Wastewater Piping System (SWMU 49).
Building 614 (BRAC)	Unknown	The building operated as a metals plating (etching and rinsing of plates) facility for an unknown period (USATHAMA 1988). This facility was likely connected to the Industrial Wastewater Piping System (SWMU 49).
Building 615 (BRAC)	Unknown	The building operated as an electroplating, metals stripping/cleaning/anodizing, spray painting and sandblasting facility for an unknown period (USATHAMA 1988). This facility was likely connected to the Industrial Wastewater Piping System (SWMU 49).
Building 620 (BRAC)	Unknown	The building operated as an electroplating facility for an unknown period (USATHAMA 1988). This facility was likely connected to the Industrial Wastewater Piping System (SWMU 49).
Defense Reutilization and Marketing Office (DRMO) Storage Yard (BRAC) (SWMU 26, 49575.1019)	Mid-1950s to unknown	The DRMO Storage Yard (SWMU 26) historically served as a hazardous waste storage yard starting in the mid-1950s. The facility is on BRAC property. A corrective measures study was conducted in 2000 and it resulted in the implementation of deed restrictions limiting the BRAC property to industrial use only. The TEAD fire chief recalled that expired AFFF was turned in to the DRMO in the early 1990s. It is unknown if other PFAS-containing waste material was stored here.

Site Identifier	Date(s) of Relevant Use/Storage/Disposal of Potentially PFAS-Containing Materials	Relevant Site History
Industrial Wastewater Piping System (BRAC) (SWMU 49, 49575.1051)	Unknown	The Industrial Wastewater Piping System is located in the BRAC area adjacent to the TEAD-N boundary and received stormwater/industrial wastewater discharges from former industrial activities, including electroplating waste and spray-painting waste (Rust Environment and Infrastructure 1998). Chrome plating is known to have taken place in the BRAC area, so PFAS-containing metal plating waste discharges were likely received.
Former Industrial WWTP (BRAC) (SWMU 38, 49575.1030)	1988 to Approximately 2015	Located in the BRAC area, the Former Industrial WWTP received wastewater from the industrial activities located in the BRAC area, including wastewater from metals plating and spray-painting facilities. The Industrial WWTP was constructed to treat and allow the reuse of wastewater after closure of the Former IWL and Ditches (Montgomery Watson 1993; Rust Environment and Infrastructure 1998). It is unknown where reuse water went or how it was used. Chrome plating is known to have taken place in the BRAC area, so PFAS-containing metal plating waste discharges may have been received by the Former Industrial WWTP.
Former IWL and Ditches (BRAC) (SWMU 30 and SWMU 2, 49575.1023, 49575.1024, 49575.1013)	Approximately 1967 to 1988	The former IWL and associated ditches (SWMU 2, HQAES 49575.1013) and the older spreading areas, unlined lagoons, and old gravel pit (Old IWL) (SWMU 30, HQAES 49575.1023 and 49575.1024) received hazardous waste disposed as wastewater from the industrial area (now on BRAC property), including from former metals plating operations, according to historical reports. A portion of the Former IWL and Ditches is also within the installation boundary and is an AOPI. From 1942 to 1966, waste chemicals were piped into four unlined drainage ditches that ended in land-spreading areas and gravel pits used as evaporation/infiltration areas. In 1966, a 1.5-mile-long collector ditch was constructed to intercept the four existing ditches and discharged to an abandoned gravel quarry (known as the IWL). This gravel pit was used as an evaporation/infiltration pond until 1988 when it was closed and capped and an industrial WWTP was brought online (demolished in 2015). This area is associated with a trichloroethylene groundwater plume.
Wildfire Responses	Unknown	There are numerous wildfires each year, both on- and off-post, and foam is often used to extinguish the fires. The TEAD Fire Department does not keep records of when and where they have used foam in wildfire responses, both on-post and during off-post mutual-aid responses (e.g., with county and city fire departments), nor the type of foam used.

In addition, several potential PFAS sources exist in the community surrounding the installation, including fire stations, airports, and autobody and paint shops. Facilities which may have used, stored, or disposed of PFAS during their operations within a 5-mile radius of TEAD-N include Tooele Valley Airport, Erda Fire Station, Grantsville Fire Department, and the Tooele Fire Department. The use, storage, or disposal of PFAS-containing materials at these facilities is unknown.

5 SUMMARY AND DISCUSSION OF PA RESULTS

The preliminary locations evaluated for potential use, storage, and/or disposal of PFAS-containing materials at TEAD-N 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, 20 areas have been identified as AOPIs. The process used for refining these areas is presented on **Figure 5-1**, below.

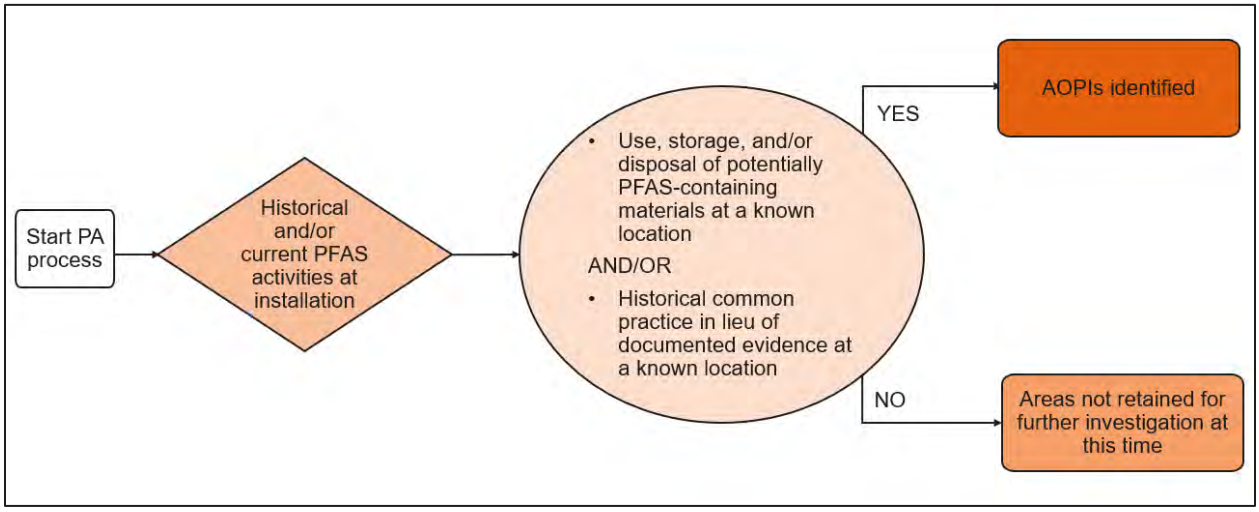

Figure 5-1: AOPI Decision Flowchart

The areas not retained for further investigation are presented in **Section 5.1**. The areas retained as AOPIs are presented in **Section 5.2** and on **Figure 5-2**. Data limitations for this PA/SI at TEAD-N 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 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
Polychlorinated Biphenyl Spill Site Fire (SWMU 5, 49575.1009)	Approximately 1976	Fire occurred in a pole-mounted electrical transformer and released polychlorinated biphenyl-contaminated oil onto surrounding soil. At the time of the release, several drums of contaminated soil were removed from the site (USAEC 2016). None of the installation personnel interviewed during the PA were present at the time of the incident, and therefore could not confirm whether AFFF was used to extinguish the fire. However, it is not standard practice to use AFFF in polychlorinated biphenyl fire response.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Loading Dock AFFF Spill (Building 520)	Unknown	Based on an interview with a former TEAD firefighter, the loading dock at either Building 520 or Building 519 was suspected to have been the location of an AFFF spill. Building 520 is currently a machine shop and was remodeled a few years ago, but the original exterior walls were kept and used as the interior walls. During the PA site visit in September 2019, no loading dock was noted on the blueprint for the original building (prior to remodeling), so the location of the spill is uncertain.	Location of incident occurrence is unknown
Loading Dock AFFF Spill (Building 519)	Unknown	Based on an interview with a former TEAD firefighter, the loading dock at either Building 520 or Building 519 was suspected to have been the location of an AFFF spill. Other personnel interviewed could not recall a loading dock having ever existed at Building 519, so the location of the spill is uncertain.	Location of incident occurrence is unknown
October 2016 Wildfire	2016	In 2016, an on-post wildfire burned approximately 60 to 80 acres. No structural damage had been reported and TEAD Fire Department personnel could not recall the exact location of the fire, or if AFFF was used to extinguish the fire.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
Burn Pad (SWMU 1B)	Prior to 1959 to 1977	The Burn Pad consisted of a 300- by 100-foot cleared pad where propellant was burned in four open trenches and projectiles were flashed. Activities commenced sometime prior to 1959 and ceased in 1977. Though no specific evidence was identified confirming if firefighting foams (either Class A or Class B) were used to extinguish the fires, it is unlikely, as the intent of a burn pit is to let the fires burn out to achieve disposal of the waste materials. The area has since been re-graded, revegetated and is no longer used for demilitarization activities (USAEC 2016).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Old Burn Area (SWMU 6, 49575.1004)	Unknown to 1970s	The Old Burn Area was used for testing munitions and burning boxes and wooden crates on the ground surface and in shallow trenches. The location was regraded, filled, and revegetated sometime after operations ceased (USAEC 2016). Though no specific evidence was identified confirming if firefighting foams (either Class A or Class B) were used to extinguish the fires, it is unlikely, as the intent of a burn pit is to let the fires burn out to achieve disposal of the waste materials.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Pesticide Mixing (Building 518) (SWMU 34, 49575.1040)	Approximately 1942 to 1990s	Building 518 has been used for storing and mixing pesticides and herbicides since approximately 1942. It contained a bermed concrete pad which was used to load sprayer trucks with these mixtures, and to rinse containers. From the early-1980s to 1989 pesticide waste from operational activities at the site was disposed of at an off-site treatment, storage and disposal facility (USAEC 2016; Montgomery Watson 1993). It is unknown where wastes were disposed of prior to the 1980s. No PFAS-containing pesticides were identified in the 2015 pesticide management plan.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
Pesticide Mixing (Building 501)	Unknown	The building was reportedly used for mixing and dispensing of insecticides (USATHAMA 1998). No PFAS-containing pesticides were identified in the 2015 pesticide management plan.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Pesticide Mixing (Building 532)	Unknown	Building activities included pesticide mixing and dispensing (USATHAMA 1988). No PFAS-containing pesticides were identified in the 2015 pesticide management plan.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Current Medical Facility (Building 400)	Approximately 1980s to present	The current medical facility likely has (or had) x-ray-processing facilities. The size and scale of the x-ray-processing facilities was not investigated. Sanitary wastewater from this building drains to the sanitary WWTP. It is not known whether x-ray processing fluids would have gone to the WWTP or been disposed/recycled off-post.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Hazardous Waste Storage (Building 528) (SWMU 27)	Approximately 1986 to present	Building 528 was used to store hazardous waste needing treatment prior to disposal, including industrial wastewater sludge, fuels, solvents, paint waste, solvents, among others. Wastes were stored inside the building in segregated areas to contain potential spills (Montgomery Watson 1993; USAEC 2001).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
90-Day Drum Storage (SWMU 28)	Approximately 1983 to unknown	Sealed drums containing hazardous waste were temporarily stored here for up to 90 days before storage in Building 528 or before being transported off-post to a hazardous waste management facility by a contractor (Montgomery Watson 1993).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Vehicle Maintenance (Building 119)	Unknown	Building 119 was used for vehicle maintenance and repair (USATHAMA 1988). Location of the	No evidence of PFOS, PFOA, or PFBS containing

Area Description	Dates of Operation	Relevant Site History	Rationale
		building is not known and it is not listed in the current assets list.	materials used, stored, and/or disposed of at this location
Laundry Pond and Waste Pile Areas (SWMU 11, 49575.1031)	1947 to 1990	The site consists of an unlined laundry effluent pond that was constructed in 1947 for the collection of laundry and shower water from Building 1267 and boiler water from Building 1237, along with an associated sewage pond, sand pit, septic tank, leach field, and waste pile area. Discharge to the laundry effluent pond was discontinued in 1990 (USAEC 2016).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Open Burn/Open Detonation Area (SWMU 1, 49575.1001)	Approximately 1959 to 1980s	Historical demilitarization/disposal sites include a burn pad (active prior to 1959, discontinued in 1977, since regraded); a pad where propellant was burned in open trenches and projectiles were flashed; and trash burn pits (which were reportedly several hundred feet long, 8- to 10-feet wide, and 4- to 6-feet deep) where disposal and waste burning activities occurred from 1959 to 1980s. The open burn/open detonation area has since been graded and vegetated (USAEC 2016; Montgomery Watson 1993). Though no specific evidence was identified confirming if firefighting foams (either Class A or Class B) were used to extinguish the fires, it is unlikely, as the intent of a burn pit is to let the fires burn out to achieve disposal of the waste materials.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Contaminated Waste Processor Area (Building 1325) (SWMU 37, 49575.1029)	Approximately 1980 to 1990	The contaminated waste processor was a batch-type basket furnace that was not used for demilitarization of munitions. The facility was primarily used for flashing scrap metal and incinerating pentachlorophenol treated wooden crates, and fabric contaminated with explosives (USAEC 2016; Montgomery Watson 1993).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Bomb Fire (Building 1376)	Approximately 2017 or 2018	Building 1376 burned down when a 500-pound bomb caught fire during saw cutting. The	No evidence of PFOS, PFOA, or

Area Description	Dates of Operation	Relevant Site History	Rationale
		TEAD Fire Department indicated that AFFF was not used to extinguish the fire.	PFBS containing materials used, stored, and/or disposed of at this location
Vehicle Paint Shop (Building 522)	Unknown to present	Personnel interviews indicated that operations at the building include vehicle painting, sand blasting, and paint mixing. Paint types used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Morale Welfare and Recreation Photo Lab	Unknown	Personnel interviews indicated that Morale Welfare and Recreation potentially had a photo lab in the past. However, the location and types of processing fluids are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Spray Painting (Building 533)	Unknown	Operations at the building historically included spray painting (USATHAMA 1988). Timeframe and paint types used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Spray Painting (Building 513)	Unknown	Operations at the building historically included spray painting (USATHAMA 1988). Timeframe and paint types used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Spray Painting (Building 520)	Unknown	Operations at the building historically included spray painting (USATHAMA 1988). Timeframe and paint types used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or

Area Description	Dates of Operation	Relevant Site History	Rationale
			disposed of at this location
Spray Painting (Building TL-23)	Unknown	Operations at the building historically included spray painting (USATHAMA 1988). Timeframe and paint types used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Laundry Facility (Building T-37)	Unknown	Operations at the building historically included laundering (USATHAMA 1988). Timeframe or types of laundering/laundering chemicals used here are unknown.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Metals Plating (Building S-33)	Unknown	Historical metals plating and painting operations were reportedly conducted at Building S-33, though the location of Building S-33 was not described (USATHAMA 1988). It is unknown if PFAS-containing mist suppressants were used in the metals plating process at this location, however no evidence to corroborate the existence of the facility was identified. A metals plating facility was identified at TEAD-S at Building 4533. It is suspected the Building S-33 metals plating facility identified in the USATHAMA 1988 report may be the same as TEAD-S Building 4533.	Location is unknown and there is no evidence of PFAS-containing materials being used, stored, and/or disposed during historical operations
Wastewater Outfall and Drainage Area (Building 1345) (SWMU 23, 49575.1012)	Late 1950s to unknown	The site consists of a wastewater outfall and drainage area associated with Building 1345. Historical discharge to the outfall and drainage area consisted primarily of boiler blowdown water and floor drains in the building. Operations in Building 1345 began in the late-1950s and have consisted of external work on large munitions, primarily sandblasting and	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
		painting (USAEC 2016). Paint types used are unknown.	
Ammunition Equipment Directorate Demilitarization Facility Test Site (SWMU 19, 49575.1017)	1993 to present	Operations include experimental or pilot testing for new design demilitarization equipment functionality and for developing operational procedures and techniques. Live ammunition and propellants frequently used during testing, which has included propagation tests, barricade testing for explosive lines, and burning in pans (USAEC 2016; Montgomery Watson 1993).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
X-ray Lagoon (SWMU 3, 49575.1011)	1974 to 1990	This former lagoon received rinse water from film washing, and diluted spent developer and fixer solutions from the film processing facility (Building 1223). During its operational period, the x-ray lagoon was estimated to receive a total of 252,000 gallons of wastewater and 1,800 gallons of developer and fixer solutions. No evidence that PFAS-containing materials were used in the x-ray processes at this facility was identified. Wastes were discharged to the lagoon via an underground 8-inch ceramic pipe. The lagoon was lined with 100-mil plastic-sheeting covered by a few inches of gravel (USAEC 2016; USATHAMA 1988). During IRP investigations, no groundwater impacts were identified in relation to the x-ray lagoon (indicating that the liner was intact), and the IRP site was closed in 2005 (USACE 2008).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Helipad	Unknown to present	A helipad is located approximately 0.2 mile east-southeast of the administrative area. No evidence was identified that firefighting agents were stored or used there.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Wastewater Spreading	Approximately 1988	Runoff and wastewater from a former housing area, now part of the horse stable complex,	No evidence of PFOS, PFOA, or

Area Description	Dates of Operation	Relevant Site History	Rationale
Area (SWMU 35, 49575.1027)		was discharged through two culverts into two unlined ditches. The ditches discharged to a relatively flat spreading area (USAEC 2016; USATHAMA 1988).	PFBS containing materials used, stored, and/or disposed of at this location
Building 1200 Explosion	Approximately Early 2000s	According to personnel interviews, there was an explosion at Building 1200 in the early 2000s. No evidence was identified that AFFF was used to extinguish the fire.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Washout Pond (Building 1303) (SWMU 22, 49575.1034)	Unknown	High-explosive bombs and projectiles were dismantled, and shell casings were washed for reuse or disposal.in Building 1303. The wastewater drained from the building into an unlined ditch and flowed to the Washout Pond (a shallow depression) (USAEC 2001).	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location
Old Dispensary (Former Building 400) (SWMU 48, 49575.1050)	After 1945 to early 1980s	The Old Dispensary (Former Building 400) was constructed in 1945 to serve as the installation's administrative building. It was later converted at an unknown date to a dispensary/medical facility which operated until the building was demolished in the early 1980s and the medical facilities moved to the new Building 400 approximately 300 feet to the south. The Old Dispensary included x-ray rooms and a dental office. Wastewater containing x-ray development solutions was reportedly discharged from the Old Dispensary into the stormwater collection system located on the property (SWMU 48), though the point of discharge location could not be identified (USAEC 2016). No evidence was identified that PFAS-containing materials were used in the x-ray development process at this location.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location

Area Description	Dates of Operation	Relevant Site History	Rationale
Wildfire Responses (On-post)	Unknown	There are numerous wildfires each year, both on- and off-post, and foam is often used to extinguish the fires. The TEAD Fire Department does not keep records of when and where they have used foam in wildfire responses, both on-post or during off-post mutual aid responses (e.g., with county and city fire departments), nor the type of foam used.	Incident occurrence location is unknown
Electrical Fire (Building 1231)	Unknown	Installation personnel interviews indicated that an electrical fire occurred on-post at a building referred to as the Sugar Shack. Firefighting foams were not used in the response to this fire.	No evidence of PFOS, PFOA, or PFBS containing materials used, stored, and/or disposed of at this location

In addition to installation areas not retained for further investigation, the PA identified three off-installation potential releases of PFAS-containing material.

- Railroad Ties Fire (located approximately 1 mile to the east of TEAD-N): In approximately the 2010s, the TEAD fire department and county/city fire departments responded to a railroad ties fire on/near the Base Realignment and Closure as part of a mutual aid agreement. Firefighters had to refill the foam tank with 1 or 2 5-gallon buckets of foam (unknown if Class A or Class B) and refilled the water reservoir two to three times to extinguish the fire. Latitude/Longitude of fire: 40.530573, -112.331913.
- Garbage Dump Fire (located approximately 1 mile to the east of TEAD-N): In 2018, the TEAD fire department and county/city fire departments responded to help extinguish a garbage dump fire as part of a mutual aid agreement. Fire trucks applied foam (unknown if Class A or Class B) multiple times because the fire continued to burn below the surface. Latitude/Longitude of fire: 40.476541, -112.356312.
- Stockton Hay Bale Fire (located approximately 4.5 miles south of TEAD-N): In approximately 2017, the TEAD fire department and county/city fire departments responded to a hay bale fire near/in the town of Stockton as part of a mutual age agreement. The firefighters used approximately 1.5, 5-gallon buckets of foam (unknown if Class A or Class B) to extinguish the fire. Latitude/Longitude of fire: 40.426113, -112.346541.

5.2 AOPIs

Overviews for each AOPI identified during the PA process are presented in this section. Four of the AOPIs overlap with TEAD-N IRP sites and/or 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. At the time of this PA, none of the TEAD-N IRP sites had historically been investigated for the possible presence of PFOS, PFOA, or PFBS.

The AOPI locations are shown on **Figure 5-2**. Aerial photographs of each AOPI that also show the approximate extent of firefighting foam use (unknown if class A or class B), if applicable are presented on **Figures 5-3** through **5-14** and include monitoring wells in the vicinity of each AOPI. The Southeastern Cantonment AOPIs are located upgradient of the active potable water well WW1, and cross gradient to the active potable well WW3, and include the following 12 AOPIs: Drafting Pit, Parking Lot FFTA, FFTA East of Current Building 400, Fire Dept Storage (Building 18), Fire Station #1 (Building 8), South End of Commander's Circle FFTA, West Headquarters Loop Parking Lot Tank Flush, Cottonwood Tree FFTA, Car Wash (Building 16), Maple Street Hydrants Tank Flushes, Fire Truck Maintenance (Building 507), and RAP Greasewood and Sagebrush Roads. Additionally, the Stormwater Evaporation/Percolation Basin (SWMU 45) and the RAP Ammo Gate/Railroad Classification Yard are located cross gradient to WW3. The Demo Pit Range Dumpster Fire is located upgradient of the active potable well WW4. The remaining AOPIs are located downgradient of the active potable wells at the installation. Groundwater originating at the AOPIs flows off-installation through the installation's northern boundary. The future land use of the AOPIs is projected to remain consistent with the current industrial/commercial use.

5.2.1 Fire Station #1 (Building 8)

The Fire Station #1 (Building 8) AOPI is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use and storage (**Figure 5-3**). Fire Station #1 (Building 8) was constructed in 1942 and has operated as a fire station since. AFFF has historically been stored both at the station and on fire trucks parked at the station. Empty AFFF containers would be disposed of in the dumpster. Truck washing, nozzle testing, hose flushing, and training with AFFF frequently occurred on the front and back aprons. Testing with protein foam (which may have contained PFAS compounds) also historically occurred on the aprons. At least one AFFF spill has been documented on the station bay floor (with visible bubbles); the spill was cleaned by sweeping the AFFF out the bay door into the trench drain on the apron. Annual hose pressure testing often occurred in the street in front of the station (Commander's Loop Road), and trucks were often flushed around the hydrant and east onto the grass across the street. Since approximately 2015, annual pump testing has been conducted in front of the station. Personal protective equipment was often rinsed outside the station.

In approximately 2011, asphalt from the back apron was removed, crushed, and mixed with other material as part of a RAP. The RAP material was used in the Ammo Gate/Railroad Classification Yard roadway repaving project. Asphalt from the front apron was replaced in and disposed off-post.

The Fire Station #1 (Building 8) AOPI does not overlap with IRP sites and consists of the fire station (Building 8), a parking lot, and vegetated area (**Figure 5-3**).

5.2.2 Fire Department Storage (Building 18)

The Fire Department Storage (Building 18) area is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF storage and use. Fire Station #1 (Building 8) used this location for general storage, including firefighting foam, trailers, and extra equipment. Spills of foam (unknown if class A or class B) likely occurred here. Fire trucks were periodically flushed on the front apron of building; some foam would reportedly get inside the truck's water reservoir during these flushing events. Firefighting training was conducted in 2018 behind the building using foams, and the spray was directed to the northwest. Approximately half of the foam tank reservoir (which was reportedly up to 45 gallons of AFFF concentrate) was used during the training.

The Fire Department Storage (Building 18) AOPI does not overlap with IRP sites and consists of the storage building (Building 18) and parking lot. The parking lot generally slopes away from the building towards the west (**Figure 5-3**).

5.2.3 Parking Lot FFTA

The Parking Lot FFTA is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF and protein foam use in the area. AFFF and protein foam have been used at this parking lot during firefighting training exercises since at least the 1990s. The fire department periodically flushed fire truck tanks and conducted AFFF inductor system and hose pressure testing here. A fire hydrant is located near the grassy area at the west end of the parking lot and was often used during training. Firefighters interviewed during the PA indicated that spray likely went in all directions, including to the grassy areas. The asphalt slopes to the south-southwest, and runoff likely would have pooled in the southwest corner of the parking lot or flowed via the driveways onto Commander's Boulevard. In 2017, asphalt from Commander's Boulevard was excavated, crushed, and mixed with other material for reuse elsewhere as part of the RAP.

The Parking Lot FFTA AOPI does not overlap with IRP sites and consists of the paved parking lot and grassy areas. The area generally slopes towards the southwest (**Figure 5-3**).

5.2.4 FFTA East of Current Building 400

The FFTA East of Current Building 400 is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) use in the area. Firefighting training using firefighting foams occurred once in the mid-to-late 2000s at this location for fire engine pumper operations. The training occurred on the east side of the road east of current Building 400. The area is a former grassy ball field.

The FFTA East of Current Building 400 AOPI does not overlap with IRP sites and consists of the grassy area (**Figure 5-3**).

5.2.5 Cottonwood Tree FFTA

The Cottonwood Tree FFTA is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) use. One-time firefighting training using firefighting foams occurred here in approximately 2017 or 2018. The fire truck parked in the

grassy area and sprayed west onto and around the former cottonwood trees (only stumps remained during the PA site reconnaissance in 2019). A full fire brush truck foam reservoir was used (estimated 45 gallons).

The Cottonwood Tree FFTA AOPI does not overlap with IRP sites and consists of the grassy area (**Figure 5-4**).

5.2.6 West Headquarters Loop Parking Lot Tank Flush

The West Headquarters Loop Parking Lot Tank Flush area is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) use. A fire truck containing foam was flushed here sometime between 2017 and 2018 using the fire hydrant located in the rocky island between the two driveway entrances to the parking lot. All valves on the truck were opened and contents were sprayed in all directions, including towards the hydrant, the parking lot entrance, and the grassy area to the north. The parking lot entrances slope to the southeast. Runoff also likely flowed to the stormwater drain located on Headquarters Loop, which discharges to SWMU 45, 49575.1049 (latter number is the HQAES site identifier). Additionally, sometime prior to 2008, the fire department used AFFF to control the burning demolition of the former housing units located southeast of the headquarters area.

The West Headquarters Loop Parking Lot Tank Flush AOPI does not overlap with IRP sites and consists of paved areas (**Figure 5-4**).

5.2.7 South End of Commander's Circle FFTA

The South End of Commander's Circle FFTA is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use. Firefighting training using AFFF occurred at the South End of Commander's Circle FFTA over the course of a week in approximately 2017 using a brush truck when fire department staff were instructed to dispose of the AFFF in its reservoir. Spray was directed south-southwest.

The South End of Commander's Circle FFTA AOPI does not overlap with IRP sites and consists of paved and grassy areas (**Figure 5-4**).

5.2.8 Car Wash (Building 16)

The Car Wash (Building 16) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) tank flushing activities. Building 16 has been used as a car wash facility since it was built (date unknown). Vehicles exiting the car wash, including fire trucks containing foams, would drip water and potentially foam residue onto the apron. The system uses soap and wax and has two oil/water separators that are pumped periodically and waste is disposed of off-installation. Fire trucks containing foams are periodically washed here. Drains inside the car wash bays currently discharge off installation to the Tooele City Sanitary System, but historically (dates unknown) discharged to the Former Sewage Lagoons (SWMU 14).

The Car Wash (Building 16) AOPI does not overlap with IRP sites and consists of Building 16 and paved surfaces (**Figure 5-5**).

5.2.9 Maple Street Hydrants Tank Flushes

The Maple Street Hydrants Tank Flushes area is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF tank flushing. Each of the fire hydrants along Maple Street near Teak Road has been used to flush fire trucks that contained AFFF. The hydrant in front of Building 17 was used after a wildfire response in 2017 to flush a fire truck tank containing AFFF; the tank was then refilled with AFFF at the same location. A stormwater drain (which discharges to SWMU 45, 49575.1049) at the corner of Teak Road and Maple Street likely received runoff. Since 2014 a hydrant further uphill on Maple Street (across from Building 510) was used multiple times for flushing/filling truck reservoirs with AFFF.

The Maple Street Hydrants Tank Flushes AOPI does not overlap with IRP sites and consists of paved surfaces. The surface generally slopes towards the west to the stormwater drain (**Figure 5-5**).

5.2.10 Fire Truck Maintenance (Building 507)

The Fire Truck Maintenance (Building 507) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) tank flushing and equipment testing. Fire trucks, along with other vehicles, are maintained in Building 507. Fire trucks containing foam performed nozzle and hose tests here after off-installation maintenance was performed. Foam was sprayed out of the bay door, onto the asphalt and towards Maple Street and stormwater drains (stormwater drains discharge to SWMU 45, 49575.1049). Occasionally, the valves were cleaned of foam residue in the sink (leading to the Former Sewage Lagoons [SWMU 14] or the Tooele City Sanitary System). The building drains currently discharge off-installation to the Tooele City Sanitary System, but historically (dates unknown) discharged to the on-installation sewage lagoons (SWMU 14, 49575.1046). Prior to 1995, a ladder truck foam tank reservoir was drained prior to sealing a crack in the tank; the tank was drained out the building door.

The Fire Truck Maintenance (Building 507) AOPI does not overlap with IRP sites and consists of Building 507 and paved areas (**Figure 5-5**).

5.2.11 Drafting Pit

The Drafting Pit is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to firefighting foam (unknown if class A or class B) use. Drafting is the process of raising water from a static source of water to supply a pumper. A drafting pit is an underground cistern with two return chutes; the pit can be used by firefighters for draft training, pump test, and pump operations testing with their fire equipment. The fire department performed pump operations at the drafting pit located adjacent to Buildings 540 and 541 (likely prior to 2010, and before these buildings were constructed). The drafting pit was believed to have been destroyed according to personnel interviews, but it was discovered intact adjacent to a fire hydrant during the PA site reconnaissance in September 2019 (**Appendix H**). The PA team observed water in the cistern and heard running water but could not identify an outlet location in the structure. Construction details of the drafting pit were not provided.

The Drafting Pit AOPI does not overlap with IRP sites and consists of grassy and graveled areas (**Figure 5-6**).

5.2.12 RAP Greasewood and Sagebrush Roads

The RAP Greasewood and Sagebrush Roads area is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to use of potentially PFAS-impacted asphalt in the area. In 2017, asphalt was removed from Commander's Boulevard. The asphalt, in place since 1994, received AFFF-impacted runoff from the Parking Lot FFTA and Fire Station #1 (Building 8) AOPIs, and asphalt from the south side of Fire Truck Maintenance (Building 507) AOPI (where fire trucks containing firefighting foams [unknown if class A or class B] were serviced and nozzle, hose, and tank tests were performed). This asphalt was crushed, mixed with other material, and stockpiled for RAP at the lot west of Building 400 (Parking Lot FFTA AOPI) and the lot north of Greasewood Road and west of Building 527. The stockpile west of Building 527 also received crushed asphalt that was removed from Fire Station #1's (Building 8's) apron. Some of the RAP material was used for repaving Greasewood and Sagebrush Roads.

The RAP Greasewood and Sagebrush Roads AOPI does not overlap with IRP sites and consists of paved and grassy areas. Potable well WW1 is located within the boundary of the RAP Greasewood and Sagebrush Roads AOPI (**Figure 5-6**).

5.2.13 RAP Ammo Gate/Railroad Classification Yard

The RAP Ammo Gate/Railroad Classification Yard is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to use of potentially PFAS-impacted asphalt in the area. In 2011, asphalt potentially impacted by AFFF was removed from the Fire Station #1 (Building 8) AOPI, and possibly from the Fire Truck Maintenance (Building 507) AOPI. Asphalt removed from Fire Station #1 (Building 8) was collected from the back apron. Asphalt possibly removed from Fire Truck Maintenance (Building 507) was collected from the south side of the AOPI, where fire trucks containing firefighting foams (unknown if class A or class B) were serviced and nozzle, hose, and tank tests were performed. The removed asphalt was crushed, mixed with new asphalt, and used for repaving in the Railroad Classification Yard at an area located inside the Ammo Gate, along the roadway adjacent to the railroad tracks.

The RAP Ammo Gate/Railroad Classification Yard AOPI does not overlap with IRP sites and consists of paved areas (**Figure 5-7**).

5.2.14 RAP TV Site Road Loop (Building 1376 Area)

The RAP TV Site Road Loop (Building 1376 Area) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to use of potentially PFAS-impacted asphalt in the area. In 2017, asphalt from Commander's Boulevard (which had received AFFF runoff from the Parking Lot FFTA and Fire Station #1 [Building 8] AOPIs) and asphalt from the south side of the Fire Truck Maintenance (Building 507) AOPI (where fire trucks containing firefighting foams [unknown if class A or class B] were serviced and nozzle, hose, and tank tests were performed) was excavated, crushed, mixed with other material, and used for repaving the TV Site Road Loop in the Building 1376 Area.

The RAP TV Site Road Loop (Building 1376 Area) AOPI does not overlap with IRP sites and consists of Building 1376, paved areas, and vegetated areas (**Figure 5-8**).

5.2.15 Former IWL and Ditches (SWMU 30 and SWMU 2; 49575.1023, 49575.1024, and 49575.1013)

The Former IWL and Ditches area is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to receipt of potentially PFAS-impacted wastewater. The Former IWL and Ditches (SWMU 2, 49575.1013) and the older spreading areas, unlined lagoons, and Old IWL (SWMU 30, 49575.1023 and 49575.1024) received hazardous waste disposed as wastewater from the industrial area (now on BRAC property). According to historical reports, the wastewater potentially included PFAS constituents from former metals plating operations. The Former IWL and Ditches AOPI covers the portion of the Former IWL and Ditches that is inside the installation boundary; the area extends into BRAC property.

From 1942 to 1966, waste chemicals were piped into four unlined drainage ditches, ending in land-spreading areas and gravel pits used as evaporation/infiltration areas. In 1966, a 1.5-mile-long collector ditch was constructed to intercept flow from the four existing ditches and discharge to an abandoned gravel quarry (known as the IWL). This gravel quarry was used as an evaporation/infiltration pond until 1988 when it was closed and capped. This area is associated with a trichloroethylene groundwater plume.

The Former IWL and Ditches (SWMU 30 and SWMU 2) overlaps with IRP sites SWMU 30 and SWMU 2, identified by HQAES 49575.1023 and 49575.1024, and 49575.1013, respectively. SWMU 30 received a no further action declaration in 2001 (USAEC 2016). The corrective measures at the Former IWL and Ditches (SWMU 30 and SWMU 2) AOPI includes soil vapor extraction and air sparging at several groundwater contaminant sources (USAEC 2016). The area is largely vegetated with several paved roads traversing the area (**Figure 5-9**).

5.2.16 Former Sewage Lagoons (SWMU 14; 49575.1046)

The Former Sewage Lagoons (SWMU 14) are identified as an AOPI following records research, personnel interviews, and site reconnaissance due to receipt of potentially PFAS-containing material. Sewage lagoons received sanitary waste from housing, warehouses, and maintenance and administrative areas, including from the Fire Station #1 (Building 8), Car Wash (Building 16), and Fire Truck Maintenance (Building 507) AOPIs. The sewage lagoons also received sanitary waste from the current and former hospital (with x-ray operations), paint facilities, pesticide mixing facilities, and potentially from the metals plating facilities in the industrial area (now on BRAC property). Sanitary waste disposal in the lagoons ceased sometime between 2011 and 2015, and waste currently goes to the Tooele City Sanitary System. A groundwater mound beneath the lagoons was identified as having trichloroethylene impacts, and the site was identified as IRP site SWMU 14. The trichloroethylene impacts were later attributed to both the Former IWL and Ditches (SWMU 30 and SWMU 2) and the Former North Area Sanitary Landfill (SWMU 12/15), and in 1997, the Former Sewage Lagoons IRP site (SWMU 14) was closed with no further action. The lagoons are lined with native clay, but based on historical reports, the liner was suspected to have leaked, and waste frequently overflowed the clay lined area and discharged into unlined areas.

The Former Sewage Lagoons (SWMU 14) overlap with IRP site SWMU 14, identified by HQAES 49575.1046. Corrective actions at this site have ceased following site closeout (USAEC 2016). The Former Sewage Lagoons (SWMU 14) are largely vegetated (**Figure 5-10**).

5.2.17 Former North Area Sanitary Landfill (SWMU 12/15; 49575.1008)

The Former North Area Sanitary Landfill (SWMU 12/15) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to receipt of potentially PFAS-containing material. The Former North Area Sanitary Landfill (SWMU 12/15) was operational from 1942 until 1995 and consisted of three waste disposal areas: the pre-1960s landfill and inactive evaporation ponds, a post-1960s sanitary landfill, and a construction debris area. The post-1960s sanitary landfill received metals plating waste, including from historical chromium metals plating activities on the BRAC property. This landfill also received untreated paint sludge, paint thinner/stripper containers, and insecticide and herbicide containers.

Hazardous waste disposal ceased in approximately 1980, sanitary waste disposal ceased in 1994, and construction debris waste disposal ceased in 1995. Implemented corrective measures include debris consolidation, soil and vegetation cover improvements, and land use controls (North Wind, Inc. 2006).

The Former North Area Sanitary Landfill (SWMU 12/15) overlaps with IRP site SWMU 12/15, identified by HQAES 49575.1008. Direct exposure to contaminants at the site identified in the IRP (metals, semivolatile organic compounds, and volatile organic compounds) have been addressed through the corrective actions described above. Contaminated groundwater underlying the site will be addressed through the IRP program in conjunction with groundwater originating from SWMU 2 and BRAC (USAEC 2016).The area is largely vegetated with some paved areas (**Figure 5-11**).

5.2.18 Stormwater Evaporation/Percolation Basin (SWMU 45; 49575.1049)

The Stormwater Evaporation/Percolation Basin (SWMU 45) is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to receipt of potentially PFAS-impacted stormwater. Stormwater runoff from the administration area (including from Fire Station #1 [Building 8], the Maple Street Hydrants Tank Flushes, Fire Truck Maintenance [Building 507], and the West Headquarters Loop Parking Lot Tank Flush AOPIs) discharges to an unlined basin situated in a dry wash via an underground concrete piping system for evaporation and/or percolation.

The Stormwater Evaporation/Percolation Basin (SWMU 45) overlaps with IRP site SWMU 45, identified by HQAES 49575.1049. Long term monitoring is conducted at the AOPI, including semiannual land use control inspections to ensure that the corrective measures remain protective (USAEC 2016). The area is predominantly vegetated (**Figure 5-12**).

5.2.19 Building 1400 Area Tank Flush

The Building 1400 Area Tank Flush is identified as an AOPI following records research, personnel interviews, and site reconnaissance due to AFFF use. The TEAD fire department flushed AFFF from a fire truck onto the ground adjacent to the fire hydrant in the Ammo Area near Building 1400. Runoff on the pavement likely flowed downslope to the east or onto the grassy, gravelly area near the hydrant.

The Building 1400 Area Tank Flush AOPI does not overlap with IRP sites and consists of Building 1400 and paved areas. The AOPI is predominantly paved, with some areas of gravel and grass. The paved areas generally slope to the east (**Figure 5-13**).

5.2.20 Demo Pit Range Dumpster Fire

The Demo Pit Range Dumpster Fire area is identified as an AOPI following records research and personnel interviews due to firefighting foam (unknown if class A or class B) use during a fire response. In 2017, the TEAD fire department responded to a dumpster fire at the Demo Pit Range. The entire brush truck foam tank was used to extinguish the fire. The Demo Pit Range Dumpster Fire AOPI is located on an active range and was not visited during the PA site visit in 2019. The location was identified on a map by TEAD fire department personnel.

The Demo Pit Range Dumpster Fire AOPI does not overlap with IRP sites. The area is part of an active range and is predominantly dirt and vegetation (**Figure 5-14**).

6 SUMMARY OF SI ACTIVITIES

Based on the results of the PA at TEAD-N, an SI for PFOS, PFOA, and PFBS was conducted in accordance with CERCLA. SI sampling was completed at TEAD-N at the 20 AOPIs to evaluate presence or absence of PFOS, PFOA, and PFBS in comparison with the OSD risk screening levels. As such, an installation-specific QAPP Addendum (Arcadis 2020) was developed to supplement the general information provided in the PQAPP (Arcadis 2019) and to detail the site-specific proposed scopes of work for the SI. A preliminary CSM was prepared for each of the installation's AOPIs in accordance with the USACE Engineer Manual on Conceptual Site Models, Engineer Manual 200-1-12 (USACE 2012). The preliminary CSMs identified potential human receptors and chemical exposure pathways based on current and/or reasonably anticipated future land uses. The preliminary CSMs identified soil, groundwater, surface water, and/or sediment pathways as potentially complete which guided the SI sampling design and rationale. The QAPP Addendum details the sampling design and rationale based on each AOPI's preliminary CSM. The SI scope of work was completed in October 2020 through the collection of field data and analytical samples.

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

6.1 Data Quality Objectives

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

6.2 Sampling Design and Rationale

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

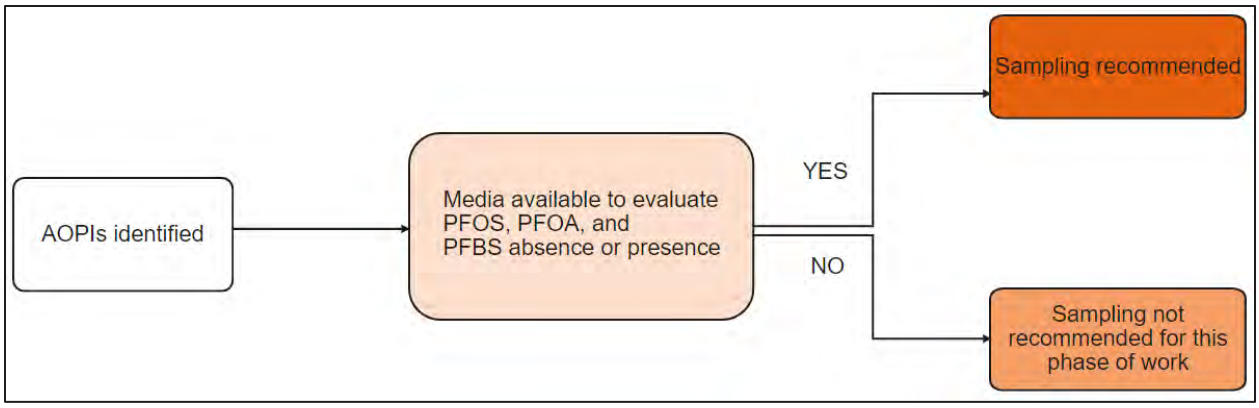

Figure 6-1: AOPI Sampling Decision Tree

The sampling design for SI sampling activities at TEAD-N is detailed in Worksheet #17 of the QAPP Addendum (Arcadis 2020). Sampling locations were selected at areas closest to, or downgradient from, known use, storage, and/or disposal of AFFF or receipt of potentially PFAS-containing material or waste at AOPIs. Groundwater samples were collected from existing downgradient monitoring wells within the vicinity of select AOPIs and at the installation boundary. Due to the significant depth to water (greater than 200 feet bgs [Parsons Corporation 2017]) across the installation, where downgradient on-post monitoring wells did not exist in proximity to an AOPI, soil samples were assessed in place of groundwater sampling, as agreed upon during the SI scoping call with USAEC, USACE, and TEAD-N personnel. Two to five soil samples were collected at 19 of the 20 AOPIs, based on known or suspected use, storage, or disposal of PFAS-containing materials in the areas, as indicated by installation personnel and during interviews and site reconnaissance. If areas of potential PFAS-containing material use, storage, and/or disposal were unknown, soil sample locations were distributed across the AOPI. One sediment sample was collected at the Former North Sanitary Landfill (SWMU 12/15) to evaluate presence or absence of PFOS, PFOA, and PFBS at the AOPI.

The sampling depths at existing monitoring wells were at approximately the center of the saturated screened interval. **Table 6-1** includes the monitoring well construction detail for the wells sampled during the SI (if available).

6.3 Sampling Methods and Procedures

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

special considerations were made regarding PFAS-containing materials and equipment and cross-contamination potential.

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

6.3.1 Field Methods

Composite soil samples were collected via hand auger from the top 2 feet of surface soil at each sampling location. Where necessary, a decontaminated electric coring drill was used to remove concrete and asphalt above soil sampling locations. Soil descriptions were documented on field forms. Once sampling was complete, these locations were repaired using cold patch.

Groundwater samples were collected at existing monitoring wells from approximately the center of the saturated screened interval using no-purge collection methods (i.e., because the wells sampled were deep and lift could not be achieved with a portable pump). PFAS-free disposable Hydrasleeves™ were used; the Hydrasleeves™ were set in the middle of the saturated screened interval and left overnight to reduce turbidity of the samples before collection the following day.

One sediment sample was collected from the upper 10 centimeters of sediment using a decontaminated stainless-steel trowel. The sample included notation of sediment samples in the sample identification (i.e., “-SE”) based on the hydrography data available from the USGS, which indicated that a surface water feature was present in the area. However, it is understood that these features are intermittent and most precipitation at TEAD-N is evaporated; therefore, these sediment samples may be more accurately described as soil samples. Sediment descriptions were documented on the field forms.

Coordinates for each sampling location were recorded using a handheld global positioning system device. Decontamination procedures for non-dedicated equipment used during sampling are described in **Section 6.3.4**.

6.3.2 Quality Assurance/Quality Control

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

QA/QC samples were collected at the frequencies specified in the QAPP Addendum (Arcadis 2020), typically at a rate of one per 20 parent samples. Field duplicates and matrix spike/matrix spike duplicate samples were collected for media sampled for PFOS, PFOA, and PFBS only. Equipment blanks were collected for media sampled for PFOS, PFOA, and PFBS at a frequency of one per piece of relevant equipment for each sampling event, as specified in the QAPP Addendum (Arcadis 2020). The decontaminated reusable equipment from which equipment blanks were collected include hand augers, stainless-steel trowels, coring bits, water level meter, tubing, tubing weights, and rope as applicable to the sampled media. Analytical results for blank samples are discussed in **Section 7.24**.

6.3.3 Field Change Reports

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

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

- Field parameters could not be collected in association with groundwater samples TEADN-C-57-103020 (collected at monitoring well C-57) or TEADN-C-64-103020 (collected at monitoring well C-64) due to insufficient sample volumes.
- Two groundwater samples at monitoring wells P-03S and P-28S could not be collected due to field conditions. Alternative groundwater monitoring wells in the vicinity of the originally proposed locations were sampled instead.
- The Hydrasleeve™ at groundwater monitoring well N-111-88 was only deployed for 5.25 hours due to insufficient sample volume concerns.
- Two originally proposed surface water samples were not collected during the SI event because no water was flowing in the intermittent streams during the field event. No other surface water bodies exist at either area; therefore, no alternative sampling locations were identified.
- A planned groundwater sample at supply well WW5 was not collected as it was capped and inaccessible. There were no other monitoring wells in the vicinity to sample alternatively.
- Liquid IDW was stored in a 5-gallon plastic bucket and labeled with a non-hazardous label instead of a 55-gallon drum. This change was approved by the installation due to smaller than anticipated IDW volumes.

These field modifications were communicated with the PA/SI team in daily summary emails during the field event.

6.3.4 Decontamination

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

6.3.5 Investigation-Derived Waste

Per the Final QAPP Addendum for the PFAS SI at TEAD-N (Arcadis 2020), all liquid IDW (i.e., excess groundwater extracted from the wells in the Hydrasleeve™ samplers and water from decontamination of sampling equipment) and solid IDW (i.e., soil cuttings from hand augering) that may potentially contain

PFAS was temporarily containerized separately (i.e., liquid and solid). The IDW was properly labeled and stored at the installation at the Former North Area Sanitary Landfill (SWMU 12/15) per the installation's request and pending the composite waste characterization results. The PFAS analytical results for the IDW and final disposal actions are discussed in detail in **Section 7.22**.

Equipment waste, including personal protective equipment and other disposable materials (e.g., gloves, Lexan tubes, plastic sheeting, and high-density polyethylene and silicon tubing) that may have come in contact with sampling media, was drained of water, bagged, and disposed in the waste receptacles on post. Non-IDW wastes were removed from the site upon completion of each day's field activities.

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). The full validated analytical results are provided in **Appendix M**.

6.4.1 Laboratory Analytical Methods

Analytical samples collected during the SI were submitted to Pace South Carolina (formerly Shealy Environmental Services, Inc.), an ELAP-accredited laboratory for PFAS analysis, including PFOS, PFOA, and PFBS, by liquid chromatography with tandem mass spectrometry. Laboratory analyses associated with the SI were completed in accordance with Worksheets #12.1 through #12.5 in the PQAPP (Arcadis 2019). Eighteen PFAS-related constituents, including PFOS, PFOA, and PFBS, were analyzed for in groundwater, soil, and sediment samples using an analytical method that is ELAP-accredited and compliant with QSM 5.3 (DoD and Department of Energy 2019), Table B-15. Copies of laboratory analytical reports generated during the SI are included as attachments to the Data Usability Summary Report (DUSR) in **Appendix N**.

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

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 DUSR (**Appendix N**).

6.4.2 Data Validation

All analytical data generated during the SI, except grain size and data generated from IDW profiling, were verified and validated in accordance with the data verification procedures described in Worksheets #34 through #36 of the PQAPP (Arcadis 2019). Each laboratory data package/sample delivery group underwent Stage 3 data validation in accordance with DoD QSM 5.3 (DoD and Department of Energy 2019). 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 N**. The Level IV analytical reports are included within **Appendix N** 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 TEAD-N. Documentation generated during the data usability assessments, which were compiled into a DUSR (**Appendix N**), 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.

Additional factors potentially affecting the overall completeness of the data set, as outlined in the QAPP (Arcadis 2019), include the inability to collect samples and/or field parameters due to unforeseen field conditions, as described in the Field Change Reports discussed in **Section 6.3.3**, and included in **Appendix L**. At locations where surface water (and field parameters) could not be collected at the planned locations, sediment samples were collected to evaluate presence or absence and meet the DQOs. Additionally, the turbidity meter used to collect field parameters was calibrated using expired calibration solutions (**Appendix J**). Calibration expiration dates are provided to ensure calibration standards don't drift so far out of range as to cause an instrument to fail calibration. If a unit were to fail calibration, data collected after the calibration expiration date would be considered suspect. However, if a unit successfully calibrates, then the data collected are likely reliable, even if the calibration standard has expired. The equipment passed the calibration check, and the use of the expired calibration solutions did not affect analytical data quality.

Based on the Stage 3 and Stage 4 data validation and final data usability assessment, the environmental data collected at TEAD-N 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 N**), and as indicated in the full analytical tables (**Appendix M**) provided for the SI results. These data are of sufficient quality to meet the objectives and requirements of the PQAPP (Arcadis 2019) and TEAD-N QAPP Addendum (Arcadis 2020). Data qualifiers applied to laboratory analytical results for samples collected during the SI at TEAD-N are provided in the data tables, data validation reports, and the Data Usability Summary Table located at the end of DUSR. Qualifiers for data shown on figures are defined in the notes of figures.

6.5 Office of the Secretary of Defense Risk Screening Levels

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

Table 6-2. OSD Risk Screening Levels Calculated for PFOS, PFOA, 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 DoD 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, regardless of the current and projected land use of the AOPI.

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

The OSD residential tap water risk screening levels will be used to compare all groundwater data for this Army PFAS PA/SI. While the current and most likely future land uses of the AOPIs at TEAD-N are industrial/commercial, both residential and industrial/commercial soil risk screening levels for PFOS, PFOA, and PFBS will be used to evaluate detected soil and sediment concentrations. The sediment data are compared to the soil risk screening levels because the sediment samples collected at TEAD-N were from dry streambeds/drainageways, and the exposure scenario is therefore similar to that of soil. The data from the SI sampling event are compared to the OSD risk screening levels in **Section 7**. If concentrations of PFOS, PFOA, or PFBS are detected greater than the applicable OSD risk screening levels, further study in a remedial investigation is recommended in **Section 8**.

7 SUMMARY AND DISCUSSION OF SI RESULTS

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

Tables 7-1 through **7-3** provide a summary of the groundwater, soil, and sediment analytical results for PFOS, PFOA, and PFBS. **Table 7-4** summarizes AOPIs and whether their SI results exceed the OSD risk screening levels. **Appendix M** includes the full suite of analytical results for these media, as well as for the QA/QC samples. An overview of AOPIs at TEAD-N with OSD risk screening level exceedances is depicted on **Figure 7-1**. **Figures 7-2** through **7-14** show the PFOS, PFOA, and PFBS analytical results in groundwater, soil, and/or sediment for each AOPI. Non-detected results are reported as less than the LOQ. Detections of PFOS, PFOA, and/or PFBS greater than the applicable OSD risk screening levels are highlighted in summary tables and on figures. Final qualifiers applied to the data by the laboratory and the project chemist (as defined in **Section 6.4.3**) are presented on the analytical tables. Groundwater 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 ppm.

Field parameters measured for groundwater during low-flow purging and sample collection are provided on the field forms in **Appendix K**. Soil and sediment descriptions are provided on the field forms in **Appendix K**. The results of the SI are grouped by AOPI and discussed for each medium as applicable. Groundwater was generally first encountered in monitoring wells at depths of approximately 100 to 360 feet bgs throughout the installation.

Table 7-4 – AOPIs and OSD Risk Screening Level Exceedances

AOPI Name	OSD Exceedances (Yes/No)
Fire Station #1 (Building 8)	No
Fire Department Storage (Building 18)	No
Parking Lot FFTA	No
FFTA East of Current Building 400	No
Cottonwood Tree FFTA	No
West Headquarters Loop Parking Lot Tank Flush	No
South End of Commander's Circle FFTA	No
Car Wash (Building 16)	No
Maple Street Hydrants Tank Flushes	No
Fire Truck Maintenance (Building 507)	No
Drafting Pit	No
RAP Greasewood and Sagebrush Roads	No

AOPI Name	OSD Exceedances (Yes/No)
RAP Ammo Gate/Railroad Classification Yard	No
RAP TV Site Road Loop (Building 1376 Area)	No
Former IWL and Ditches (SWMU 30 and SWMU 2)	No
Former Sewage Lagoons (SWMU 14)	No
Former North Area Sanitary Landfill (SWMU 12/15)	No
Stormwater Evaporation/ Percolation Basin (SWMU 45)	Yes
Building 1400 Area Tank Flush	No
Demo Pit Range Dumpster Fire	No

7.1 Fire Station #1 (Building 8)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Station #1 (Building 8) AOPI.

7.1.1 Soil

Five shallow soil samples (TEADN-01-01-SO through TEADN-01-05-SO) were collected from 0 to 2 feet bgs at the Fire Station #1 (Building 8) AOPI. PFOA was detected in four out of the five soil samples (TEADN-01-01-SO through TEADN-01-04-SO) at concentrations ranging from 0.00097 J mg/kg to 0.0018 mg/kg (the "J" qualifier indicates that the analyte was positively identified, but the reported concentration is an estimated quantity). PFOS was detected in four out of the five soil samples (TEADN-01-01-SO through TEADN-01-04-SO) at concentrations ranging from 0.0039 J+ mg/kg to 0.040 mg/kg. PFOA and PFOS were not detected in sample TEADN-01-05-SO. PFBS was not detected in any of the five soil samples (**Figure 7-2**, **Table 7-2**). None of the PFOS, PFOA, or PFBS soil concentrations detected at the Fire Station #1 (Building 8) exceeded the residential OSD risk screening levels.

7.1.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from the existing potable water well WW1 located downgradient of the Fire Station #1 (Building 8) and other Southeastern Cantonment AOPIs, including the Cottonwood Tree FFTA, Drafting Pit, FFTA East of Current Building 400, Fire Department Storage (Building 18), Parking Lot FFTA, RAP Greasewood and Sagebrush Roads, South End of Commander's Circle FFTA, Maple Street Hydrants Tank Flushes, West Headquarters Loop Parking Lot Tank Flushes, Car Wash (Building 16), and the Fire Truck Maintenance (Building 507). PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L (PFBS was not detected in the parent sample), less than the OSD risk screening level. PFOS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.2 Fire Department Storage (Building 18)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Department (Building 18) AOPI.

7.2.1 Soil

Two shallow soil samples (TEADN-02-01-SO and TEADN-02-02-SO) were collected from 0 to 2 feet bgs at the Fire Department Storage (Building 18) AOPI. PFOS was detected in both soil sample locations at concentrations of 0.00076 J mg/kg and 0.00083 J mg/kg, respectively. PFBS and PFOA were not detected in either soil sample (**Figure 7-2**, **Table 7-2**). None of the PFOS, PFOA, or PFBS soil concentrations detected at the Fire Department (Building 18) exceeded the residential OSD risk screening levels.

7.2.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from the existing potable water well WW1 located downgradient of the Fire Department Storage (Building 18) and other Southeastern Cantonment AOPIs, as described above in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFOS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.3 Parking Lot FFTA

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Parking Lot FFTA AOPI.

7.3.1 Soil

Four shallow soil samples (TEADN-03-01-SO through TEADN-03-04-SO) were collected from 0 to 2 feet bgs at the Parking Lot FFTA AOPI. PFOS was detected at three sample locations (TEADN-03-01-SO, TEADN-0-02-SO, and TEADN-03-03-SO) at concentrations of 0.0014 mg/kg, 0.0047 mg/kg, and 0.00068 J mg/kg, respectively, less than the OSD risk screening levels. PFOA and PFBS were not detected in any of the four soil samples (**Figure 7-2**, **Table 7-2**).

7.3.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the Parking Lot FFTA and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFOS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.4 FFTA East of Current Building 400

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the FFTA East of Current Building 400 AOPI.

7.4.1 Soil

Four shallow soil samples (TEADN-04-01-SO through TEADN-04-04-SO) were collected from 0 to 2 feet bgs at the FFTA East of Current Building 400 AOPI. PFOS was detected in one soil sample (TEADN-04-01-SO) at a concentration of 0.0081 J mg/kg, less than the OSD risk screening level. PFOS was not detected in the other three soil samples. PFBS and PFOA were not detected in any of the four soil samples (**Figure 7-2**, **Table 7-2**).

7.4.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the FFTA East of Current Building 400 and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFOA and PFOA were not detected in the parent or field duplicate groundwater sample (**Figure 7-14**, **Table 7-1**).

7.5 Cottonwood Tree FFTA

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Cottonwood Tree FFTA AOPI.

7.5.1 Soil

Two shallow soil samples (TEADN-05-01-SO and TEADN-05-02-SO) were collected from 0 to 2 feet bgs at the Cottonwood Tree FFTA AOPI. PFOS was detected in both soil samples at concentrations of 0.00048 J mg/kg and 0.00051 J mg/kg, respectively, less than the OSD risk screening level. PFBS and PFOA were not detected in either of the soil samples (**Figure 7-3**, **Table 7-2**).

7.5.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of Cottonwood Tree FFTA and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater sample (**Figure 7-14**, **Table 7-1**).

7.6 West Headquarters Loop Parking Lot Tank Flush

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the West Headquarters Loop Parking Lot Tank Flush AOPI.

7.6.1 Soil

Three shallow soil samples (TEADN-06-01-SO through TEADN-06-03-SO) were collected from 0 to 2 feet bgs at the West Headquarters Loop Parking Lot Tank Flush AOPI. PFOS was detected in two soil samples (TEADN-06-01-SO and TEADN-06-02-SO) at concentrations of 0.013 mg/kg and 0.017 mg/kg, respectively, less than the OSD risk screening level. PFOS was not detected in soil sample TEADN-06-03-SO. PFBS and PFOA were not detected in any of the three soil samples (**Figure 7-3**, **Table 7-2**).

7.6.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of West Headquarters Loop Parking Lot Tank Flush and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater sample (**Figure 7-14**, **Table 7-1**).

7.7 South End of Commander's Circle FFTA

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the South End of Commander's Circle FFTA AOPI.

7.7.1 Soil

Five shallow soil samples (TEADN-07-01-SO through TEADN-07-05-SO) were collected from 0 to 2 feet bgs at the South End of Commander's Circle FFTA AOPI. PFOS was detected in all five soil samples at concentrations ranging from 0.00073 J to 0.0012 mg/kg, respectively, less than the OSD risk screening level. PFBS and PFOA were not detected in any of the five soil samples (**Figure 7-3**, **Table 7-2**).

7.7.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the South End of Commander's Circle FFTA and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.8 Car Wash (Building 16)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Car Wash (Building 16) AOPI.

7.8.1 Soil

Three shallow soil samples (TEADN-08-01-SO through TEADN-08-03-SO) were collected from 0 to 2 feet bgs at the Car Wash (Building 16) AOPI. PFBS, PFOA, and PFOS were not detected in any of the three soil samples (**Figure 7-4**, **Table 7-2**).

7.8.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the Car Wash (Building 16) and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.9 Maple Street Hydrants Tank Flushes

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Maple Street Hydrants Tank Flushes AOPI.

7.9.1 Soil

Three shallow soil samples (TEADN-09-01-SO through TEADN-09-03-SO) were collected from 0 to 2 feet bgs at the Maple Street Hydrants Tank Flushes AOPI. PFOS was detected in soil sample TEADN-09-03-SO at a concentration of 0.00082 J mg/kg, less than the OSD risk screening level. PFOS was not detected in the other two soil samples. PFBS and PFOA were not detected in any of the three soil samples (**Figure 7-4**, **Table 7-2**).

7.9.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the Maple Street Hydrants Tank Flushes and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.10 Fire Truck Maintenance (Building 507)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Fire Truck Maintenance (Building 507) AOPI.

7.10.1 Soil

Two shallow soil samples (TEADN-10-01-SO and TEADN-10-02-SO) were collected from 0 to 2 feet bgs at the Fire Truck Maintenance (Building 507) AOPI. PFBS, PFOA, and PFOS were not detected in either of the soil samples (**Figure 7-4**, **Table 7-2**).

7.10.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the Fire Truck Maintenance (Building 507) and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1

at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.11 Drafting Pit

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Drafting Pit AOPI.

7.11.1 Soil

Two shallow soil samples (TEADN-11-01-SO and TEADN-11-02-SO) were collected from 0 to 2 feet bgs at the Drafting Pit AOPI. PFOS was detected in soil sample TEADN-11-01-SO at a concentration of 0.00072 J mg/kg, less than the OSD risk screening levels. PFOS was not detected in soil sample TEADN--11-02-SO. PFBS and PFOA were not detected in either of the soil samples (**Figure 7-5**, **Table 7-2**).

7.11.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the Drafting Pit and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.12 RAP Greasewood and Sagebrush Roads

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the RAP Greasewood and Sagebrush Roads AOPI.

7.12.1 Soil

Three shallow soil samples (TEADN-12-01-SO through TEADN-12-03-SO) were collected from 0 to 2 feet bgs at the RAP Greasewood and Sagebrush Roads AOPI. PFBS, PFOA, and PFOS were not detected in any of the three soil samples (**Figure 7-5**, **Table 7-2**).

7.12.2 Groundwater

One groundwater sample (TEADN-WW1) was collected from existing potable water well WW1 located downgradient of the RAP Greasewood and Sagebrush Roads and other Southeastern Cantonment AOPIs, as described in **Section 7.1.2**. PFBS was detected in the duplicate sample associated with TEADN-WW1 at a concentration of 2.1 J ng/L, less than the OSD risk screening level. PFBS and PFOA were not detected in the parent or field duplicate groundwater samples (**Figure 7-14**, **Table 7-1**).

7.13 RAP Ammo Gate/Railroad Classification Yard

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the RAP Ammo Gate/Railroad Classification Yard AOPI.

7.13.1 Soil

Three shallow soil samples (TEADN-13-01-SO through TEADN-13-03-SO) were collected from 0 to 2 feet bgs at the RAP Ammo Gate/Railroad Classification Yard AOPI. PFBS, PFOA, and PFOS were not detected in any of the three soil samples (**Figure 7-6**, **Table 7-2**).

7.13.2 Groundwater

No downgradient existing monitoring wells were identified in proximity to the RAP Ammo Gate/Railroad Classification Yard AOPI. Due to the significant depth to water (greater than 200 feet bgs [Parsons Corporation 2017]) across the installation, it was determined by the Army PA/SI team during the scoping teleconference that soil samples would be assessed first, and additional investigation may be pursued based on the soil analytical results. As no exceedances of the OSD risk screening level were observed in soil, and based on the depth to groundwater and arid climate in the region, additional SI investigation to obtain groundwater samples was not pursued.

7.14 RAP TV Site Road Loop (Building 1376 Area)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the RAP TV Site Road Loop (Building 1376 Area) AOPI.

7.14.1 Soil

Three shallow soil samples (TEADN-14-01-SO through TEADN-14-03-SO) were collected from 0 to 2 feet bgs at the RAP TV Site Road Loop (Building 1376 Area) AOPI. PFOS was detected in soil sample TEADN-14-02-SO at a concentration of 0.00047 J mg/kg, less than the OSD risk screening levels. PFOS was not detected at the other two soil sample locations. PFBS and PFOA were not detected in any of the three soil samples (**Figure 7-7**, **Table 7-2**).

7.14.2 Groundwater

No downgradient existing monitoring wells were identified in proximity to the RAP TV Site Road Loop (Building 1376 Area) AOPI. Due to the significant depth to water (greater than 200 feet bgs [Parsons Corporation 2017]) across the installation, it was determined during the scoping call that soil samples would be assessed first, and additional investigation may be pursued based on the soil analytical results. As no exceedances of the OSD risk screening level were observed in soil, and based on the depth to groundwater and arid climate in the region, additional SI investigation to obtain groundwater samples was not pursued.

7.15 Former IWL and Ditches (SWMU 30 and SWMU 2; 49575.1023, 49575.1024, and 49575.1013)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Former IWL and Ditches (SWMU 30 and SWMU 2) AOPI.

7.15.1 Soil

Two shallow soil samples (TEADN-15-01-SO and TEADN-15-02-SO) were collected from 0 to 2 feet bgs at the Former IWL and Ditches (SWMU 30 and SWMU 2) AOPI. PFOS was detected in soil sample TEADN-15-01-SO at a concentration of 0.0025 mg/kg, less than the OSD risk screening levels. PFOS was not detected in the other soil sample. PFBS and PFOA were not detected in either sample (**Figure 7-8**, **Table 7-2**).

7.15.2 Groundwater

Two groundwater samples were collected downgradient of the Former IWL and Ditches (SWMU 30 and SWMU 2) AOPI at existing monitoring wells A-07A and T-04 and one groundwater sample was collected from within the footprint of the Former IWL and Ditches (SWMU 30 and SWMU 2) AOPI at existing monitoring well C-09. PFOA was detected in the sample collected from monitoring well C-09 at a concentration of 3.1 J ng/L, less than the OSD risk screening level. PFOS was detected at both groundwater sample locations at concentrations of 2.5 J ng/L and 3.4 J ng/L from monitoring wells A-07A and C-09, respectively (both less than the OSD risk screening level). PFBS was not detected in any of the three samples (**Figure 7-8**, **Table 7-1**).

7.16 Former Sewage Lagoons (SWMU 14; 49575.1046)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Former Sewage Lagoons (SWMU 14) AOPI.

7.16.1 Soil

Two shallow soil samples (TEADN-16-01-SO and TEADN-16-02-SO) were collected from 0 to 2 feet bgs at the Former Sewage Lagoons (SWMU 14) AOPI. PFOS was detected in soil sample TEADN-16-01-SO at a concentration of 0.0051 mg/kg, less than the OSD risk screening level. PFOS was not detected in the other sample. PFBS and PFOA were not detected in either sample (**Figure 7-9**, **Table 7-2**).

7.16.2 Groundwater

Two groundwater samples were collected downgradient of the Former Sewage Lagoons (SWMU 14) AOPI at existing monitoring wells B-01 and N-134-90. PFBS, PFOA, and PFOS were not detected in either groundwater sample (**Figure 7-9**, **Table 7-1**).

7.17 Former North Area Sanitary Landfill (SWMU 12/15; 49575.1008)

The subsections below summarize the groundwater and sediment PFOS, PFOA, and PFBS analytical results associated with the Former North Area Sanitary Landfill (SWMU 12/15) AOPI.

7.17.1 Sediment

One sediment sample (TEADN-17-01-SE) was collected downgradient of the Former North Area Sanitary Landfill (SWMU 12/15) AOPI along the ephemeral stream feature to the northwest. PFOS was detected

at a concentration of 0.00064 J mg/kg, with a duplicate result of 0.00068 J mg/kg (both less than the soil OSD risk screening level, which was used for comparison since the exposure route is the same as soil for the sediment in the dry streambed). PFBS and PFOA were not detected in the sediment sample (**Figure 7-10**, **Table 7-3**).

7.17.2 Groundwater

Four groundwater samples were collected downgradient and within the footprint of the Former North Area Sanitary Landfill (SWMU 12/15) AOPI at existing monitoring wells C-64, C-57, N-117-88, and N-150-97. PFBS, PFOA, and PFOS were not detected in any of the four groundwater samples (**Figure 7-10**, **Table 7-1**).

7.18 Stormwater Evaporation/Percolation Basin (SWMU 45; 49575.1049)

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Stormwater Evaporation/Percolation Basin (SWMU 45) AOPI.

7.18.1 Soil

Two soil samples (TEADN-18-01-SO and TEADN-18-02-SO) were collected from within the basin structure, and one soil sample (TEADN-18-03-SO) was collected upgradient of the Stormwater Evaporation/Percolation Basin (SWMU 45) along the ephemeral ponding feature to the southeast. PFOA was detected in soil sample TEADN-18-01-SO at a concentration of 0.00079 J mg/kg (less than the OSD risk screening levels) but was not detected in the other two soil samples. PFOS was detected in soil samples TEADN-18-01-SO and TEADN-18-02-SO at concentrations of 0.0032 mg/kg and 0.0027 mg/kg, respectively, less than the OSD risk screening levels. PFOS was not detected in soil sample TEADN-18-03-SO. PFBS was not detected in any of the three soil samples (**Figure 7-11**, **Table 7-2**).

7.18.2 Groundwater

Three groundwater sample were collected upgradient, within, and downgradient of the Stormwater Evaporation/Percolation Basin (SWMU 45) AOPI at existing monitoring wells N-142-93, N-143-93, and N-111-88, respectively.

PFBS, PFOA, and PFOS were not detected in upgradient monitoring well N-142-93. PFOA was detected at a concentration of 2.7 J ng/L, less than the OSD risk screening level, at the downgradient monitoring well N-111-88. PFBS and PFOS were not detected in the groundwater sample collected from this well.

Within the inferred AOPI footprint, PFOA and PFBS were detected at concentrations of 180 ng/L and 80 ng/L, respectively, in monitoring well N-143-93. The PFOA concentration observed in well N-143-93 is greater than the OSD risk screening level of 40 ng/L. PFOS was not detected in the groundwater sample collected from this well (**Figure 7-11**, **Table 7-1**).

7.19 Building 1400 Area Tank Flush

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Building 1400 Area Tank Flush AOPI.

7.19.1 Soil

Two shallow soil samples (TEADN-19-01-SO and TEADN-19-02-SO) were collected from 0 to 2 feet bgs at the Building 1400 Area Tank Flush AOPI. PFBS, PFOA, and PFOS were not detected in either soil sample (**Figure 7-12**, **Table 7-2**).

7.19.2 Groundwater

No downgradient existing monitoring wells were identified in proximity to the Building 1400 Area Tank Flush AOPI. Due to the significant depth to water (greater than 200 feet bgs [Parsons Corporation 2017]) across the installation, it was determined during the scoping call that soil samples would be assessed first, and additional investigation may be pursued based on the soil analytical results. As no exceedances of the OSD risk screening level were observed in soil, and based on the depth to groundwater and arid climate in the region, additional SI investigation to obtain groundwater samples was not pursued.

7.20 Demo Pit Range Dumpster Fire

The subsections below summarize the groundwater and soil PFOS, PFOA, and PFBS analytical results associated with the Demo Pit Range Dumpster Fire AOPI.

7.20.1 Soil

Five soil samples (TEADN-20-01-SO and TEADN-20-05-SO) were collected within the suspected footprint of the AOPI. PFBS, PFOA, and PFOS were not detected in the five soil samples (**Figure 7-13**, **Table 7-2**).

7.20.2 Groundwater

One groundwater sample (TEADN-WW4) was collected from existing potable well WW4 downgradient of the Demo Pit Range Dumpster Fire AOPI. PFBS, PFOA, and PFOS were not detected in the groundwater sample (**Figure 7-14**, **Table 7-1**).

7.21 Downgradient Boundary Monitoring Wells

Three groundwater samples were collected along the downgradient installation boundary at existing monitoring wells B-19, P-28D, and C-01. PFBS, PFOA, and PFOS were not detected in any of the three groundwater samples (**Figure 7-14**, **Table 7-1**).

7.22 Investigation Derived Waste

Composite samples were collected from both the liquid and solid IDW for waste characterization. PFOS was detected in the solid IDW at a concentration of 0.0015 mg/kg, less than the OSD risk screening level. Neither PFOA nor PFBS were detected in the solid IDW. PFOS, PFOA, and PFBS were detected in the liquid IDW at concentrations of 5.5 ng/L, 16 ng/L, and 4.5 ng/L, respectively, less than their respective OSD risk screening levels. The full analytical results (i.e., for all constituents analyzed) for IDW samples collected during the SI are included in **Appendix M**.

As the analytical results indicate, the PFOS, PFOA, and PFBS concentrations in both the liquid and solid IDW did not exceed the OSD risk screening level. The IDW was disposed in compliance with the IDW disposal plan detailed in the Final QAPP Addendum (Arcadis 2020). However, at the request of the installation, the IDW generated at TEAD-N was disposed at TEAD-S. The liquid IDW (approximately 5 gallons) was poured into a wastewater drain that leads to the active sewage lagoon at TEAD-S. The solid IDW (approximately 5 gallons) was returned to the ground surface at the TEAD-S Former WWTP (SWMU 27). The final IDW disposal was completed in Spring 2021 (**Appendix K**).

7.23 TOC, pH, and Grain Size

In addition to sampling soil for PFOS, PFOA, and PFBS, one soil sample per AOPI was analyzed for TOC, pH, moisture content, and grain size data, as they may be useful in future fate and transport studies. The TOC in the soil samples ranged from 4,450 mg/kg at the Demo Pit Range Dumpster Fire to 41,400 mg/kg at the Drafting Pit. The TOC at TEAD-N was generally within range of the typical organic content for topsoil (5,000 to 30,000 mg/kg).

The combined percentage of fines in soils at TEAD-N ranged from 2.9% to 85.7% with an average of 37.9%. In general, PFAS constituents tend to be more mobile in soils with less than 20% fines (silt and clay) and lower TOC. The percent moisture of the soil (7.3% on average) was typical for sandy soils (0% to 10%) and loamy soils (0% to 12%). The average pH of the soil (8.7 standard units) was slightly alkaline (7 to 9 standard units). Based on these geochemical and physical soil characteristics (i.e., high percentage fines and TOC) observed underlying the installation during the SI, PFAS constituents are expected to be relatively less mobile at TEAD-N than in soils with lower percentages of fines (i.e., less than 20%) and lower TOC.

7.24 Blank Samples

PFOS, PFOA, and/or PFBS were not detected in any of the blank samples collected during the SI work. The full analytical results for blank samples collected during the SI are included in **Appendix M**.

7.25 Conceptual Site Models

The preliminary CSMs presented in the QAPP Addendum (Arcadis 2020) were re-evaluated and updated, if necessary, based on the SI sampling results. The CSMs presented on **Figures 7-15** through **7-23** and in this section therefore represent the current understanding of the potential for human exposure. For some AOPIs, the CSM is the same and thus shown on the same figure.

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

Based on the use, storage, and/or disposal of PFAS-containing materials at the AOPIs, affected media are likely to consist of soil and groundwater, and could include surface water and sediment at some AOPIs. Release and transport mechanisms include dissolution/desorption from soil to groundwater, transport via sediment carried in and dissolution to stormwater and surface water, groundwater recharge, 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.

Following the SI sampling, 15 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

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 multiple CSMs:

- There are no residents or recreational users at TEAD-N. Therefore, all exposure pathways for on-installation residents and recreational users are incomplete.
- The AOPIs are wholly located within the installation boundaries. Therefore, on the CSM figures that include soil as a potential exposure medium, the soil exposure pathways for off-installation receptors are incomplete.

- Groundwater originating at the AOPIs flows off-installation through the installation's northern boundary. PFAS were not detected in groundwater samples collected from each of three monitoring wells at the installation's northern boundary. Based on the SI sampling data from the northern boundary wells, the groundwater exposure pathway for off-installation drinking water receptors is incomplete.

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

Figure 7-15 shows the CSM for a subset of the Southeastern Cantonment AOPIs, where surface water is not present and PFOS, PFOA, and/or PFBS were detected in soil. This CSM includes the Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, South of Commander's Circle FFTA, and Drafting Pit AOPIs. AFFF is known or likely to have been used and released to soil and paved surfaces during firefighting training exercises.

- PFOS, PFOA, and/or PFBS were detected in soil, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway (via ingestion, dermal contact, and dust inhalation) for on-installation site workers is complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater from the potable well WW1 located downgradient or cross-gradient to all Southeastern Cantonment AOPIs (addressed by **Figures 7-15** through **7-18**). The confirmed presence of PFOS, PFOA, and/or PFBS in soil at these AOPIs and in downgradient groundwater indicates the potential for PFOS, PFOA, and/or PFBS presence in groundwater at the AOPIs. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is potentially complete.

Figure 7-16 shows the CSM for the RAP Greasewood and Sagebrush Roads AOPI, which is one of the Southeastern Cantonment AOPIs where surface water is not present and PFOS, PFOA, and/or PFBS were not detected in soil. The asphalt used to create the roads at this AOPI was collected and repurposed from areas where AFFF is known or likely to have been used and released to paved surfaces during firefighting training exercises.

- PFOS, PFOA, and/or PFBS were not detected in soil at the RAP Greasewood and Sagebrush Roads. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater from the potable well WW1 located downgradient or cross-gradient to all Southeastern Cantonment AOPIs (addressed by **Figures 7-15** through **7-18**). However, as PFOS, PFOA, and PFBS were not detected in soil samples from the RAP Greasewood and Sagebrush Roads AOPI addressed by **Figure 7-16**, and PFAS were detected in soil samples from the AOPIs addressed by **Figures 7-15** and **7-17**, it is less likely that the RAP Greasewood and Sagebrush Roads AOPI is the source of PFAS observed in groundwater. Therefore, the groundwater exposure pathway for on-installation site workers is incomplete.

Figure 7-17 shows the CSM for a subset of the Southeastern Cantonment AOPIs, where surface water is present and PFOS, PFOA, and/or PFBS were detected in the soil. This CSM includes the Fire Station #1 (Building 8), Maple Street Hydrants Tank Flushes, and West Headquarters Loop Parking Lot Tank Flush AOPIs. AFFF is known or likely to have been used and released to soil, paved surfaces, and the stormwater drainages from associated firefighting training, testing, flushing, and maintenance activities.

- PFOS, PFOA, and/or PFBS were detected in soil, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- PFOS, PFOA, and/or PFBS were detected in groundwater from the potable well WW1 located downgradient or cross-gradient to all Southeastern Cantonment AOPIs (addressed by **Figures 7-15** through **7-18**). The confirmed presence of PFOS, PFOA, and/or PFBS in soil at these AOPIs and in downgradient groundwater indicates the potential for PFOS, PFOA, and/or PFBS presence in groundwater at the AOPIs. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is potentially complete.
- Runoff from these AOPIs could drain via the stormwater system to the stormwater evaporation/percolation basin. The stormwater evaporation/percolation basin is a separate AOPI and is addressed by the CSM on **Figure 7-22**.

Figure 7-18 shows the CSM for a subset of the Southeastern Cantonment AOPIs, where surface water is present and PFOS, PFOA, and/or PFBS were not detected in soil. This CSM includes the Fire Truck Maintenance (Building 507) and Car Wash (Building 16) AOPIs. AFFF is known or likely to have been used or released to soil, paved surfaces, and the stormwater drainages from associated firefighting training, testing, flushing, and maintenance activities.

- PFOS, PFOA, and/or PFBS were not detected in soil. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were detected in groundwater from the potable well WW1 located downgradient or cross-gradient to all Southeastern Cantonment AOPIs (addressed by **Figures 7-15** through **7-18**). However, as PFOS, PFOA, and/or PFBS were not detected in soil samples from the Fire Truck Maintenance (Building 507) and Car Wash (Building 16) AOPIs addressed by **Figure 7-18**, and PFOS and/or PFOA were detected in soil samples from the AOPIs addressed by **Figures 7-15** and **7-17**, it is less likely that the Fire Truck Maintenance (Building 507) and Car Wash (Building 16) AOPIs are the source of PFOS, PFOA, and/or PFBS observed in groundwater. Therefore, the groundwater exposure pathway for on-installation site workers is incomplete.
- Runoff from these AOPIs could drain via the stormwater system to the stormwater evaporation/percolation basin. The stormwater basin is a separate AOPI and is addressed by the CSM on **Figure 7-22**.

Figure 7-19 shows the CSM for the RAP TV Site Road Loop (Building 1376 Area) AOPI. The asphalt used to create the roads at this AOPI was collected and repurposed from areas where AFFF is known or likely to have been released to paved surfaces during firefighting training exercises.

- PFOS, PFOA, and/or PFBS were detected in soil, and site workers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for on-installation site workers is complete.
- Groundwater samples associated with the RAP TV Site Road Loop (Building 1376 Area) AOPI were not collected during the SI as no existing downgradient monitoring wells were identified in proximity to them. However, the confirmed presence of PFAS in the soil at the RAP TV Site Road Loop (Building 1376 Area) indicates the potential for groundwater impacts. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers remains potentially complete.

Figure 7-20 shows the CSM for the Building 1400 Area Tank Flush, RAP Ammo Gate/Railroad Classification Yard, and Demo Pit Range Dumpster Fire AOPIs. AFFF is known or likely to have been released to soil and paved surfaces during firefighting training exercises, and potentially PFOS-, PFOA-, and/or PFBS-impacted asphalt from the training areas was reused.

- PFOS, PFOA, and/or PFBS were not detected in soil. Therefore, the soil exposure pathway for on-installation site workers is incomplete.
- PFOS, PFOA, and/or PFBS were not detected in groundwater samples located downgradient of the Demo Pit Range Dumpster Fire AOPI. Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is incomplete.
- Groundwater samples associated with the Building 1400 Area Tank Flush and RAP Ammo Gate/Railroad Classification Yard AOPIs were not collected during the SI as no existing downgradient monitoring wells were identified in proximity to them. However, given the non-detect soil sample results, it can be inferred there is no source of PFOS, PFOA, and/or PFBS to groundwater at the AOPIs and the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers are incomplete.

Figure 7-21 shows the CSM for the Former North Area Sanitary Landfill (SWMU 12/15) AOPI. The Former North Area Sanitary Landfill (SWMU 12/15) historically received potentially PFOS, PFOA, and PFBS-containing hazardous and sanitary waste and construction debris materials.

- All potentially impacted soil at the Former North Area Sanitary Landfill (SWMU 12/15) has been covered with a cap, preventing human contact. Therefore, the soil exposure pathway for on-installation workers is incomplete.
- PFOS, PFOA, and PFBS were not detected in groundwater samples located within the footprint of the Former North Area Sanitary Landfill (SWMU 12/15). Therefore, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is incomplete.
- Surface runoff to a nearby intermittent stream may have occurred prior to soil and vegetation cover improvements. PFOS, PFOA, and/or PFBS were detected in a sediment sample collected downgradient from the AOPI. Site workers are not likely to contact constituents in the stream; therefore, the surface water and sediment exposure pathways for on-installation site workers are incomplete.
- Intermittent surface water bodies may flow off-installation through the northern boundary. Off-installation receptors could contact constituents, if present, in downstream water bodies through incidental ingestion and dermal contact; therefore, the surface water and sediment exposure pathways for off-installation receptors are potentially complete.

Figure 7-22 shows the CSM for the Stormwater Evaporation/Percolation Basin (SWMU 45) and Former IWL and Ditches (SWMU 30 and SWMU 2) AOPIs. Potentially PFOS, PFOA, and PFBS-containing stormwater runoff, wastewater, and sanitary waste from FFTA areas, pesticide mixing facilities, and potentially metals plating facilities were historically released to these AOPIs via stormwater discharge, wastewater, or sanitary wastewater.

- PFOS, PFOA, and/or PFBS were detected in groundwater collected from monitoring wells within the footprint and downgradient of the Stormwater Evaporation/Percolation Basin (SWMU 45) and Former IWL and Ditches (SWMU 30 and SWMU 2). The AOPIs are downgradient of drinking water wells

used to supply potable water at TEAD-N. However, the groundwater exposure pathway (via drinking water ingestion and dermal contact) for on-installation site workers is potentially complete to account for potential future use of the downgradient on-post groundwater.

- The stormwater evaporation/percolation basin, the former drainage ditches, and former sewage lagoon are typically dry. PFOS, PFOA, and/or PFBS were detected in sediment/soil samples from the former depositional areas at these AOPIs. Site workers could contact constituents in the basin, ditch, or lagoon sediment/soil and in intermittent stormwater/surface water via incidental ingestion and dermal contact. Therefore, the sediment exposure pathway is complete, and the surface water exposure pathway is potentially complete, for on-installation site workers. The stormwater evaporation/percolation basin and former drainage ditches are not connected to downgradient, off-installation surface waters; therefore, the surface water and sediment exposure pathways for off-installation receptors are incomplete.

Figure 7-23 shows the CSM for the Former Sewage Lagoons (SWMU 14) AOPI. Potentially PFOS, PFOA, and/or PFBS-containing sanitary waste from Fire Station #1 (Building 8), the Car Wash (Building 16), the Fire Truck Maintenance (Building 507), pesticide mixing facilities, x-ray operations, paint facilities, and potentially metals plating facilities were historically released to the Former Sewage Lagoons (SWMU 14) via sanitary wastewater.

- PFOS, PFOA, and PFBSS were not detected in groundwater collected at the Former Sewage Lagoons (SWMU 14). Therefore, the groundwater exposure pathways (via drinking water ingestion and dermal contact) for on-installation site workers are incomplete.
- The former sewage lagoon is typically dry. PFOS, PFOA, and/or PFBS were detected in sediment/soil samples from the former sewage lagoons. Site workers could contact constituents in the lagoon sediment/soil and in intermittent stormwater/surface water via incidental ingestion and dermal contact. Therefore, the sediment exposure pathways are complete, and the surface water exposure pathways are potentially complete, for on-installation site workers.
- The former sewage lagoons are not connected to downgradient, off-installation surface waters; therefore, the surface water and sediment exposure pathways for off-installation receptors are incomplete.

Following the SI sampling, 15 out of the 20 AOPIs were considered to have complete or potentially complete exposure pathways. Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**).

8 CONCLUSIONS AND RECOMMENDATIONS

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

The OSD provided residential risk screening levels based on the USEPA oral reference dose for PFOS, PFOA, and PFBS in soil and groundwater (tap water) and industrial/commercial risk screening levels for PFOS, PFOA, and PFBS in soil (**Appendix A**). A combination of document review, internet searches, interviews with installation personnel, and an installation site visit were used to identify specific areas of suspected PFOS, PFOA, and PFBS use, storage, and/or disposal at TEAD-N. Following the evaluation, 20 AOPIs were identified.

TEAD-N obtains its water supply from groundwater and operates its own water supply and distribution system, which is located on the eastern side of the Tooele Valley. The natural slope of the valley in the area maintains a gravity-based pressure in the supply system. There are three potable supply wells (WW1, WW3, and WW4) and two non-potable supply wells (WW5 and WW6, stock watering wells) at TEAD-N; the wells are installed in a confined aquifer (Tetra Tech 2015). Well WW2 is now located off-post; this well, which supplies water to the Utah Industrial Depot/Peterson Industrial Depot former BRAC parcel, and its associated water rights were transferred to Tooele City.

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

Fifteen AOPIs had detections of PFOS, PFOA, and/or PFBS in groundwater, soil, and/or sediment, and an exceedance of the OSD risk screening level was observed in groundwater at one AOPI (i.e., the Stormwater Evaporation/Percolation Basin [SWMU 45]). Below is a summary of the SI sampling event and results.

Groundwater

For this evaluation, the residential OSD risk screening levels used to evaluate the groundwater data were 40 ng/L for PFOS and PFOA and 600 ng/L for PFBS.

- PFOS was detected in two of the 17 primary groundwater samples. Both detections occurred at the Former IWL and Ditches (SWMU 30 and SWMU 2), with a maximum detected concentration of 3.4 J ng/L, less than the corresponding OSD risk screening level.
- PFOA was detected in three of the 17 primary groundwater samples collected, with detections at the Former IWL and Ditches (SWMU 30 and SWMU 2) and Stormwater Evaporation/Percolation Basin (SWMU 45) AOPIs. The maximum concentration detected, and only exceedance of the OSD risk screening level, occurred at the Stormwater Evaporation/Percolation Basin (SWMU 45), at a concentration of 180 ng/L.
- PFBS was detected in one primary sample collected at the Stormwater Evaporation/Percolation Basin (SWMU 45), and in a field duplicate sample collected at the RAP Greasewood and Sagebrush Roads

AOPI. PFBS was not detected in the parent sample to the field duplicate. Both detected concentrations were below the corresponding OSD risk screening level, with the maximum concentration detected at the Stormwater Evaporation/Percolation Basin (SWMU 45) at a concentration of 80 ng/L.

Shallow Soil (0 to 2 feet):

For this evaluation, the residential OSD risk screening levels used to evaluate the soil data were 0.13 mg/kg for PFOS and PFOA and 1.9 mg/kg for PFBS.

- PFOS was detected in 26 of the 58 primary soil samples. PFOS detections occurred at the following AOPIs: Fire Station #1 (Building 8), Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, West Headquarters Loop Parking Lot Tank Flush, South End of Commander's Circle FFTA, Maple Street Hydrants Tank Flushes, Drafting Pit, RAP TV Site Road Loop (Building 1376 Area), Former IWL and Ditches (SWMU 30 and SWMU 2), Former Sewage Lagoons (SWMU 14), and Stormwater Evaporation/Percolation Basin (SWMU 45). All detected concentrations were below the corresponding OSD risk screening level, with the maximum detected concentration at Fire Station #1 (Building 8) at a concentration of 0.040 mg/kg.
- PFOA was detected in five of the 58 primary soil samples. PFOA was detected at Fire Station #1 (Building 8) and the Stormwater Evaporation/Percolation Basin (SWMU 45). All detected concentrations were below the corresponding OSD risk screening level, with the maximum detected concentration occurring at Fire Station #1 (Building 8), at a concentration of 0.0018 mg/kg.
- PFBS was not detected in any of the 58 primary soil samples collected across the installation.

Sediment:

For this evaluation, the residential OSD risk screening levels used to compare sediment data are 0.13 mg/kg for PFOS and PFOA and 1.9 mg/kg for PFBS.

- PFOS was detected in the one primary sediment sample collected. The detection occurred in sediment collected from the Former North Area Sanitary Landfill (SWMU 12/15) and was less than the OSD risk screening level.
- Neither PFOA nor PFBS were detected in the sediment sample.

Following the SI sampling, the 15 AOPIs with confirmed PFOS, PFOA, and/or PFBS presence were considered to have complete or potentially complete exposure pathways.

Complete exposure pathways include:

- Soil exposure pathways for site workers at the Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, South of Commander's Circle FFTA, Drafting Pit, Fire Station #1 (Building 8), Maple Street Hydrant Tank Flushes, West Headquarters Loop Parking Lot Tank Flush, and RAP TV Site Road Loop (Building 1376 Area) AOPIs.
- Sediment pathways for site workers at the Stormwater Evaporation/Percolation Basin (SWMU 45), Former IWL and Ditches (SWMU 30 and SWMU 2), and Former Sewage Lagoons (SWMU 14) AOPIs.

Potentially complete exposure pathways include:

- Groundwater exposure pathways for site workers at the Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, South of Commander's Circle FFTA, Drafting Pit, Fire Station #1 (Building 8), Maple Street Hydrant Tank Flushes, West Headquarters Loop Parking Lot Tank Flush, RAP TV Site Road Loop (Building 1376 Area), Stormwater Evaporation/Percolation Basin (SWMU 45), and Former IWL and Ditches (SWMU 30 and SWMU 2) AOPIs.
- Surface water and sediment pathways for off-installation receptors downgradient from the Former North Area Sanitary Landfill (SWMU 12/15) AOPI
- Surface water pathways for site workers at the Stormwater Evaporation/Percolation Basin (SWMU 45), Former IWL and Ditches (SWMU 30 and SWMU 2), and Former Sewage Lagoons (SWMU 14) AOPIs

Although the CSMs indicate complete or potentially complete exposure pathways may exist, the recommendation for remedial investigation is based on the comparison of analytical results for PFOS, PFOA, and PFBS to the OSD risk screening levels (**Table 6-2**). **Table 8-1** below summarizes the AOPIs identified at TEAD-N, PFOS, PFOA, and PFBS sampling, and recommendations for each AOPI; further investigation is warranted at TEAD-N. In accordance with CERCLA, site-specific risk will be assessed during a future phase to evaluate whether remedial actions are required.

Table 8-1. Summary of AOPIs Identified during the Preliminary Assessment PFOS, PFOA, and PFBS Sampling at Tooele Army Depot-North and Recommendations

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SE	
Fire Station #1 (Building 8)	No[1]	No	NS	No action at this time
Fire Department Storage (Building 18)	No[1]	No	NS	No action at this time
Parking Lot FFTA	No[1]	No	NS	No action at this time
FFTA East of Current Building 400	No[1]	No	NS	No action at this time
Cottonwood Tree FFTA	No[1]	No	NS	No action at this time
West Headquarters Loop Parking Lot Tank Flush	No[1]	No	NS	No action at this time
South End of Commander's Circle FFTA	No[1]	No	NS	No action at this time
Car Wash (Building 16)	No[1]	ND	NS	No action at this time
Maple Street Hydrants Tank Flushes	No[1]	No	NS	No action at this time
Fire Truck Maintenance (Building 507)	No[1]	ND	NS	No action at this time
Drafting Pit	No[1]	No	NS	No action at this time
RAP Greasewood and Sagebrush Roads	No[1]	ND	NS	No action at this time
RAP Ammo Gate/Railroad Classification Yard	NS	ND	NS	No action at this time

AOPI Name	PFOS, PFOA, and/or PFBS Detected Greater than OSD Risk Screening Levels? (Yes/No/ND/NS)			Recommendation
	GW	SO	SE	
RAP TV Site Road Loop (Building 1376 Area)	NS	No	NS	No action at this time
Former IWL and Ditches (SWMU 30 and SWMU 2)	No	No	NS	No action at this time
Former Sewage Lagoons (SWMU 14)	ND	No	NS	No action at this time
Former North Area Sanitary Landfill (SWMU 12/15)	ND	NS	No	No action at this time
Stormwater Evaporation/ Percolation Basin (SWMU 45)	**Yes**	No	NS	Further study in a remedial investigation
Building 1400 Area Tank Flush	NS	ND	NS	No action at this time
Demo Pit Range Dumpster Fire	ND	ND	NS	No action at this time

Footnotes:
[1] Groundwater assessed through the sampling of potable well WW1, located downgradient of all Southeastern Cantonment AOPIs. Detections in groundwater at WW1 may be attributed to more than one AOPI, however no exceedances of the OSD risk screening level were observed.

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

Three downgradient monitoring wells were also sampled along the northern border of TEAD-N as part of the SI to assess the potential for off-post migration of PFOS, PFOA, and PFBS. All three wells were non-detect for PFOS, PFOA, and PFBS, indicating no obvious potential for PFOS, PFOA, and PFBS off-post migration to the north of the installation.

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

Records gathered for the use storage and/or disposal of PFAS-containing materials were reviewed during the PA process. Documentation specific to AFFF may have been limited (e.g., each AFFF use; procurement records, documentation of AFFF used during crash responses or fire training activities) due to lack of record keeping requirements for the full timeline of common AFFF practices. Anecdotal accounts of AFFF use (and therefore likely PFOS, PFOA, and PFBS release) 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.

Though site reconnaissance and interviews with site personnel indicated areas where firefighting foams were used or stored, interviewees were uncertain in many cases if these foams were class A or class B. To be conservative, the PA assumed that all reports of firefighting foam use, storage, and disposal may

have been class B foams (i.e., AFFF which contains PFAS). Estimates of the volume of AFFF were provided in some cases; however, other specifics such as AFFF brand and mixture concentrations and overall volume of AFFF released per event or collectively are uncertain.

The location of the Demo Pit Range Dumpster Fire AOPI was inferred based on discussions with site personnel; however, the exact location is uncertain.

Groundwater sampling locations were limited to existing monitoring and potable water wells during the SI. In some cases, the wells were used to assess multiple AOPIs and/or were not within the immediate vicinity of the associated AOPI.

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

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

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

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ACRONYMS

°F	degrees Fahrenheit
%	percent
AFFF	aqueous film-forming foam
amsl	above mean sea level
AOPI	area of potential interest
Arcadis	Arcadis U.S., Inc.
Army	United States Army
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSM	conceptual site model
DoD	Department of Defense
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
FFTA	firefighting training area
GIS	geographic information system
GW	groundwater
HQAES	Headquarters Army Environmental System
IDW	investigation-derived waste
installation	United States Army or Reserve installation
IRP	Installation Restoration Program
IWL	industrial waste lagoon
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram (parts per million)
ND	non-detect

ng/L	nanograms per liter (parts per trillion)
NS	not sampled
OSD	Office of the Secretary of Defense
PA	preliminary assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POC	point of contact
ppm	parts per million
ppt	parts per trillion
PQAPP	Programmatic Uniform Federal Policy-Quality Assurance Project Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RAP	reuse asphalt project
RSL	Regional Screening Level
SI	site inspection
SE	sediment
SO	soil
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SWMU	solid waste management unit
TEAD	Tooele Army Depot
TEAD-N	Tooele Army Depot - North
TEAD-S	Tooele Army Depot - South
TGI	technical guidance instruction
TOC	total organic carbon
U.S.	United States
USACE	United States Army Corps of Engineers

USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UXO	unexploded ordnance
WWTP	wastewater treatment plant

TABLES

Table 2-1
Historical PFOS and PFOA Analytical Results
USAEC PFAS Preliminary Assessments/Site Inspections
Tooele Army Depot - North, Utah

Sample Location	Sample ID	Sample Date	Analytical Results (USEPA Method 537)	
			PFOS	PFOA
			µg/L	µg/L
Building 501	TEADN-GW-501-FW	11/7/2016	<0.04	<0.02
Building 1335	TEADN-GW-1335-FW	11/7/2016	<0.04	<0.02
Well 1	TEADN-GW-WELL1-FW	11/7/2016	<0.04	<0.02
Well 3	TEADN-GW-WELL3-FW	11/7/2016	<0.04	<0.02
Well 4	TEADN-GW-WELL4-FW	11/7/2016	<0.04	<0.02

Acronyms:
< = Not detected above the listed minimum reportable level
µg/L = micrograms per liter (as reported by the laboratory)
ID = identification
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctane sulfonate
USEPA = United States Environmental Protection Agency

Notes:
1. Samples were collected post-chlorination treatment
2. The laboratory reporting limits convert to 40 nanograms per liter (ng/L) for PFOS and 20 ng/L for PFOA.

References:

Tetrahedron. 2018. Updated Drinking Water Quality Assessment Related to Perfluorinated Compounds at U.S. Army Materiel Command Installations. January.

Table 6-1 - Monitoring Well Construction Details
USAEC PFAS Preliminary Assessment/Site Inspection
Tooele Army Depot - North, Utah

ARCADIS

Well ID	Well Installation Date	TOC Elevation	TOC Stick Up	Ground Surface Elevation	Total Depth Installed	Depth to Top of Screen	Depth to Bottom of Screen	Screen Length	Depth to Water in October 2016	Well Diameter
		ft amsl	ft	ft amsl	ft bgs	ft bgs	ft bgs	ft	ft bgs	inches ICD
A-07A	NA	4757.98	NA	NA	NA	302.00	322.00	20.00	314.53	NA
B-01	8/1/1986	4680.26	2.37	4677.89	297.89	288.00	298.00	10.00	213.45	5
B-19	7/28/1986	4484.88	0.98	4483.90	269.90	256.00	266.00	10.00	188.20	5
C-01	NA	4471.32	NA	NA	NA	280.00	290.00	10.00	181.17	NA
C-09	12/3/1994	4658.54	2.02	4656.52	381.00	348.00	368.00	20.00	301.48	5
C-57	NA	4763.80	NA	NA	NA	285.00	310.00	25.00	293.90	NA
C-64	NA	4773.92	NA	NA	NA	294.00	319.00	25.00	305.24	NA
T-04	NA	4619.89	NA	NA	NA	165.08	195.08	30.00	171.42	NA
N-111-88	4/5/1988	4805.09	2.40	4802.69	338.00	317.00	337.30	20.30	335.34	4
N-117-88	7/12/1988	4704.46	2.50	4701.96	234.50	220.25	234.50	14.25	Dry	4
N-134-90	8/30/1990	4657.97	2.43	4655.54	207.00	183.60	203.60	20.00	193.04	4
N-142-93	NA	4829.22	NA	NA	NA	355.00	375.00	20.00	358.78	NA
N-143-93	NA	4798.22	NA	NA	NA	325.00	345.00	20.00	328.83	NA
N-150-97	5/15/1997	4748.48	2.94	4745.54	290.00	269.00	289.00	20.00	281.79	5
P-28D	10/5/1986	4454.45	2.08	4452.37	495.00	480.00	490.00	10.00	159.32	2
WW4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Acronyms:
amsl = above mean sea level
bgs = below ground surface
ft = feet
ICD = inner casing diameter
ID = identification
NA = not available
TOC = top of casing

References:
USACE and Tetra Tech. 2019. Tooele Army Depot Groundwater Flow and Contaminant Transport Model Report. October.
USACE. 2017. Annual Groundwater Monitoring Report for Tooele Army Depot - North, Tooele, Utah. October.

Table 7-1 - Groundwater PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Tooele Army Depot North, Utah

				Analyte	PFBS (ng/L)		PFOA (ng/L)		PFOS (ng/L)	
				OSD Tapwater Risk Screening Level	600		40		40	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Boundary Monitoring Wells[1]	TEADN-B-19	TEADN-B-19-103120	10/31/2020	N	4.2	U	4.2	U	4.2	U
	TEADN-P-28D	TEADN-P-28D-103120	10/31/2020	N	4.0	U	4.0	U	4.0	U
	TEADN-C-01	TEADN-C-01-103120	10/31/2020	N	3.7	U	3.7	U	3.7	U
Southeastern Cantonment AOPIs[2]	TEADN-WW1	TEADN-WW1-102820	10/28/2020	N	3.6	U	3.6	U	3.6	U
		TEADN-FD-1-GW-102820	10/28/2020	FD	**2.1**	J	3.8	U	3.8	U
Former IWL and Ditches (SWMU 30 and SWMU 2)	TEADN-C-09	TEADN-C-09-102820	10/28/2020	N	3.6	U	**3.1**	J	**3.4**	J
	TEADN-A-07A	TEADN-A-07A-102920	10/29/2020	N	3.7	U	3.7	U	**2.5**	J
	TEADN-T-04	TEADN-T-04-103020	10/30/2020	N	3.8	U	3.8	U	3.8	U
Former Sewage Lagoons (SWMU 14)	TEADN-B-01	TEADN-B-01-102820	10/28/2020	N	3.8	U	3.8	U	3.8	U
	TEADN-N-134-90	TEADN-N-134-90-102820	10/28/2020	N	3.8	U	3.8	U	3.8	U
Former North Area Sanitary Landfill (SWMU 12/15)	TEADN-C-57	TEADN-C-57-103020	10/30/2020	N	4.2	U	4.2	U	4.2	U
	TEADN-C-64	TEADN-C-64-103020	10/30/2020	N	4.3	U	4.3	U	4.3	U
	TEADN-N-117-88	TEADN-N-117-88-103020	10/30/2020	N	4.1	U	4.1	U	4.1	U
	TEADN-N-150-97	TEADN-N-150-97-103020	10/30/2020	N	3.8	U	3.8	U	3.8	U
Stormwater Evaporation/ Percolation Basin (SWMU 45)	TEADN-N-111-88	TEADN-N-111-88-103020	10/30/2020	N	3.9	U	**2.7**	J	3.9	U
	TEADN-142-93	TEADN-N-142-93-103120	10/31/2020	N	4.4	U	4.4	U	4.4	U
	TEADN-143-93	TEADN-N-143-93-103020	10/30/2020	N	**80**		**180**		4.2	U
Demo Pit Range Dumpster Fire	TEADN-WW4	TEADN-WW4-102820	10/28/2020	N	3.6	U	3.6	U	3.6	U

Acronyms/Abbreviations:
AOPI = area of potential interest
FD = field duplicate sample
ID = identification
IWL = industrial waste lagoon
N = primary sample
ng/L = nanograms per liter (parts per trillion)
OSD = Office of the Secretary of Defense
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RAP = Reuse Asphalt Project
Qual = qualifier
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

Footnotes:
[1] The Boundary Monitoring Wells are not related to a specific AOPI, but instead are selected to assess off-post migration of PFAS along the northern installation boundary.
[2] Southeastern Cantonment AOPIs include Drafting Pit, Parking Lot FFTA, FFTA East of Current Building 400, Fire Dept Storage (Building 18), Fire Station #1 (Building 8), South End of Commander's Circle FFTA, West Headquarters Loop Parking Lot Tank Flush, Cottonwood Tree FFTA, Car Wash (Building 16), Maple Street Hydrants Tank Flushes, Fire Truck Maintenance (Building 507), and RAP Greasewood and Sagebrush Roads.

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).
2. Gray shaded value indicates the detected concentration is greater than or equal to the Office of the Secretary of Defense (OSD) risk screening level for the residential tapwater exposure scenario (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Qualifier
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 the limit of quantitation (LOQ).

Table 7-2 - Soil PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Tooele Army Depot North, Utah

					Analyte		PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
					OSD Industrial/Commercial Risk Screening Level		25		1.6		1.6	
					OSD Residential Risk Screening Level		1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual		
Fire Station #1 (Building 8)	TEADN-01-01	TEADN-01-01-SO-102320	10/23/2020	N	0.0010	U	**0.00097**	J	**0.0039**	J+		
		TEADN-FD-1-SO-102320	10/23/2020	FD	0.0012	U	**0.00097**	J	**0.0053**			
	TEADN-01-02	TEADN-01-02-SO-102320	10/23/2020	N	0.0014	U	**0.0012**	J	**0.014**			
	TEADN-01-03	TEADN-01-03-SO-102320	10/23/2020	N	0.0014	U	**0.0018**		**0.040**			
	TEADN-01-04	TEADN-01-04-SO-102320	10/23/2020	N	0.0010	U	**0.0012**		**0.011**			
	TEADN-01-05	TEADN-01-05-SO-102320	10/23/2020	N	0.00090	U	0.00090	U	0.00090	U		
Fire Department Storage (Building 18)	TEADN-02-01	TEADN-02-01-SO-102320	10/23/2020	N	0.0011	U	0.0011	U	**0.00076**	J		
		TEADN-FD-2-SO-102320	10/23/2020	FD	0.0012	U	0.0012	U	**0.00070**	J		
	TEADN-02-02	TEADN-02-02-SO-102320	10/23/2020	N	0.0012	U	0.0012	U	**0.00083**	J		
Parking Lot FFTA	TEADN-03-01	TEADN-03-01-SO-102320	10/23/2020	N	0.0011	U	0.0011	U	**0.0014**			
		TEADN-FD-3-102320	10/23/2020	FD	0.0010	U	0.0010	U	**0.0016**			
	TEADN-03-02	TEADN-03-02-SO-102320	10/23/2020	N	0.0011	U	0.0011	U	**0.0047**			
	TEADN-03-03	TEADN-03-03-SO-102320	10/23/2020	N	0.00097	U	0.00097	U	**0.00068**	J		
	TEADN-03-04	TEADN-03-04-SO-102320	10/23/2020	N	0.00090	U	0.00090	U	0.00090	U		
FFTA East of Current Building 400	TEADN-04-01	TEADN-04-01-SO-102720	10/27/2020	N	0.00090	U	0.00090	U	**0.00081**	J		
	TEADN-04-02	TEADN-04-02-SO-102720	10/27/2020	N	0.00094	U	0.00094	U	0.00094	U		
	TEADN-04-03	TEADN-04-03-SO-102720	10/27/2020	N	0.0010	U	0.0010	U	0.0010	U		
	TEADN-04-04	TEADN-04-04-SO-102720	10/27/2020	N	0.00093	U	0.00093	U	0.00093	U		
Cottonwood Tree FFTA	TEADN-05-01	TEADN-05-01-SO-102720	10/27/2020	N	0.00095	U	0.00095	U	**0.00048**	J		
	TEADN-05-02	TEADN-05-02-SO-102720	10/27/2020	N	0.00098	U	0.00098	U	**0.00051**	J		

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
West Headquarters Loop Parking Lot Tank Flush	TEADN-06-01	TEADN-06-01-SO-102820	10/28/2020	N	0.00090	U	0.00090	U	**0.013**	
	TEADN-06-02	TEADN-06-02-SO-102820	10/28/2020	N	0.00092	U	0.00092	U	**0.017**	
	TEADN-06-03	TEADN-06-03-SO-102820	10/28/2020	N	0.0011	U	0.0011	U	0.0011	U
South End of Commander's Circle FFTA	TEADN-07-01	TEADN-07-01-SO-102820	10/28/2020	N	0.00085	U	0.00085	U	**0.00073**	J
	TEADN-07-02	TEADN-07-02-SO-102820	10/28/2020	N	0.0012	U	0.0012	U	**0.0012**	
	TEADN-07-03	TEADN-07-03-SO-102820	10/28/2020	N	0.0010	U	0.0010	U	**0.0011**	
	TEADN-07-04	TEADN-07-04-SO-102820	10/28/2020	N	0.00093	U	0.00093	U	**0.0010**	
	TEADN-07-05	TEADN-07-05-SO-102920	10/29/2020	N	0.0011	U	0.0011	U	**0.00093**	J
Car Wash (Building 16)	TEADN-08-01	TEADN-08-01-SO-102920	10/29/2020	N	0.0011	U	0.0011	U	0.0011	U
	TEADN-08-02	TEADN-08-02-SO-102920	10/29/2020	N	0.00089	U	0.00089	U	0.00089	U
	TEADN-08-03	TEADN-08-03-SO-102920	10/29/2020	N	0.00095	U	0.00095	U	0.00095	U
Maple Street Hydrants Tank Flushes	TEADN-09-01	TEADN-09-01-SO-102920	10/29/2020	N	0.0010	U	0.0010	U	0.0010	U
	TEADN-09-02	TEADN-09-02-SO-102920	10/29/2020	N	0.0011	U	0.0011	U	0.0011	U
	TEADN-09-03	TEADN-09-03-SO-102920	10/29/2020	N	0.00095	U	0.00095	U	**0.00082**	J
Fire Truck Maintenance (Building 507)	TEADN-10-01	TEADN-10-01-SO-102620	10/26/2020	N	0.0011	U	0.0011	U	0.0011	U
	TEADN-10-02	TEADN-10-02-SO-102620	10/26/2020	N	0.00099	U	0.00099	U	0.00099	U
Drafting Pit	TEADN-11-01	TEADN-11-01-SO-102920	10/29/2020	N	0.00087	U	0.00087	U	**0.00072**	J
	TEADN-11-02	TEADN-11-02-SO-102920	10/29/2020	N	0.00092	U	0.00092	U	0.00092	U

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
RAP Greasewood and Sagebrush Roads	TEADN-12-01	TEADN-12-01-SO-102920	10/29/2020	N	0.0010	U	0.0010	U	0.0010	U
	TEADN-12-02	TEADN-12-02-SO-102920	10/29/2020	N	0.00083	U	0.00083	U	0.00083	U
	TEADN-12-03	TEADN-12-03-SO-102920	10/29/2020	N	0.00099	U	0.00099	U	0.00099	U
RAP Ammo Gate/Railroad Classification Yard	TEADN-13-01	TEADN-13-01-SO-102820	10/28/2020	N	0.0011	U	0.0011	U	0.0011	U
	TEADN-13-02	TEADN-13-02-SO-102820	10/28/2020	N	0.00090	U	0.00090	U	0.00090	U
	TEADN-13-03	TEADN-13-03-SO-102820	10/28/2020	N	0.00083	U	0.00083	U	0.00083	U
RAP TV Site Road Loop (Building 1376 Area)	TEADN-14-01	TEADN-14-01-SO-102820	10/28/2020	N	0.00088	U	0.00088	U	0.00088	U
	TEADN-14-02	TEADN-14-02-SO-102820	10/28/2020	N	0.00094	U	0.00094	U	**0.00047**	J
	TEADN-14-03	TEADN-14-03-SO-102820	10/28/2020	N	0.00096	U	0.00096	U	0.00096	U
Former IWL and Ditches (SWMU 30 and SWMU 2)	TEADN-15-01	TEADN-15-01-SO-102720	10/27/2020	N	0.00093	U	0.00093	U	**0.0025**	
	TEADN-15-02	TEADN-15-02-SO-102720	10/27/2020	N	0.0010	U	0.0010	U	0.0010	U
Former Sewage Lagoons (SWMU 14)	TEADN-16-01	TEADN-16-01-SO-102820	10/28/2020	N	0.00096	U	0.00096	U	**0.0051**	
	TEADN-16-02	TEADN-16-02-SO-102820	10/28/2020	N	0.0012	U	0.0012	U	0.0012	U
Stormwater Evaporation/ Percolation Basin (SWMU 45)	TEADN-18-01	TEADN-18-01-SO-102920	10/29/2020	N	0.00094	U	**0.00079**	J	**0.0032**	
	TEADN-18-02	TEADN-18-02-SO-102920	10/29/2020	N	0.00088	U	0.00088	U	**0.0027**	
	TEADN-18-03	TEADN-18-03-SO-102920	10/29/2020	N	0.00096	U	0.00096	U	0.00096	U
Building 1400 Area Tank Flush	TEADN-19-01	TEADN-19-01-SO-102820	10/28/2020	N	0.00079	U	0.00079	U	0.00079	U
	TEADN-19-02	TEADN-19-02-SO-102820	10/28/2020	N	0.00085	U	0.00085	U	0.00085	U

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	Location	Sample ID	Sample Date	Sample Type	Result	Qual	Result	Qual	Result	Qual
Demo Pit Range Dumpster Fire	TEADN-20-01	TEADN-20-01-SO-102820	10/28/2020	N	0.00093	U	0.00093	U	0.00093	U
	TEADN-20-02	TEADN-20-02-SO-102820	10/28/2020	N	0.00079	U	0.00079	U	0.00079	U
	TEADN-20-03	TEADN-20-03-SO-102820	10/28/2020	N	0.0012	U	0.0012	U	0.0012	U
	TEADN-20-04	TEADN-20-04-SO-102820	10/28/2020	N	0.0010	U	0.0010	U	0.0010	U
	TEADN-20-05	TEADN-20-05-SO-102820	10/28/2020	N	0.00089	U	0.00089	U	0.00089	U

Acronyms/Abbreviations:
AOPI = Area of Potential Interest
FD = field duplicate sample
FFTA = firefighter training area
ID = identification
IWL = Industrial Waste Lagoon
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
OSD = Office of the Secretary of Defense
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RAP = Reuse Asphalt Project
Qual = qualifier
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).

2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for the residential and industrial/commercial receptor scenarios (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Qualifier
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 the result was not detected above thelimit of quantitation (LOQ).

Table 7-3 - Sediment PFOS, PFOA, and PFBS Analytical Results
USAEC PFAS Preliminary Assessment/Site Inspection
Tooele Army Depot North, Utah

				Analyte	PFBS (mg/kg)		PFOA (mg/kg)		PFOS (mg/kg)	
				OSD Industrial/Commercial Risk Screening Level	25		1.6		1.6	
				OSD Residential Risk Screening Level	1.9		0.13		0.13	
Associated AOPI	**Location**	**Sample ID**	**Sample Date**	**Sample Type**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Former North Area Sanitary Landfill (SWMU 12/15)	TEADN-17-01	TEADN-17-01-SE-102920	10/29/2020	N	0.0012	UJ	0.0012	UJ	**0.00064**	J
		TEADN-FD-1-SE-102920	10/29/2020	FD	0.0011	U	0.0011	U	**0.00068**	J

Acronyms/Abbreviations:
AOPI = Area of Potential Interest
FD = field duplicate sample
ID = identification
mg/kg = milligrams per kilogram (parts per million)
N = primary sample
OSD = Office of the Secretary of Defense
PFAS = per- and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
Qual = qualifier
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

Notes:
1. **Bolded** values indicate the result was detected greater than the limit of detection (LOD).

2. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels for the residential and industrial/commercial receptor scenarios for soil, because the sediment was collected along a dry streambed and the exposure scenarios are the same as for soil (OSD. 2021. Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program. September 15.).

Qualifier
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 the limit of quantitation (LOQ).
UJ = the analyte was analyzed for but was not detected. The reported limit of quantitation (LOQ) is approximate and may be inaccurate or imprecise.

FIGURES

USAEC PFAS Preliminary Assessment / Site Inspection Tooele Army Depot-North, UT

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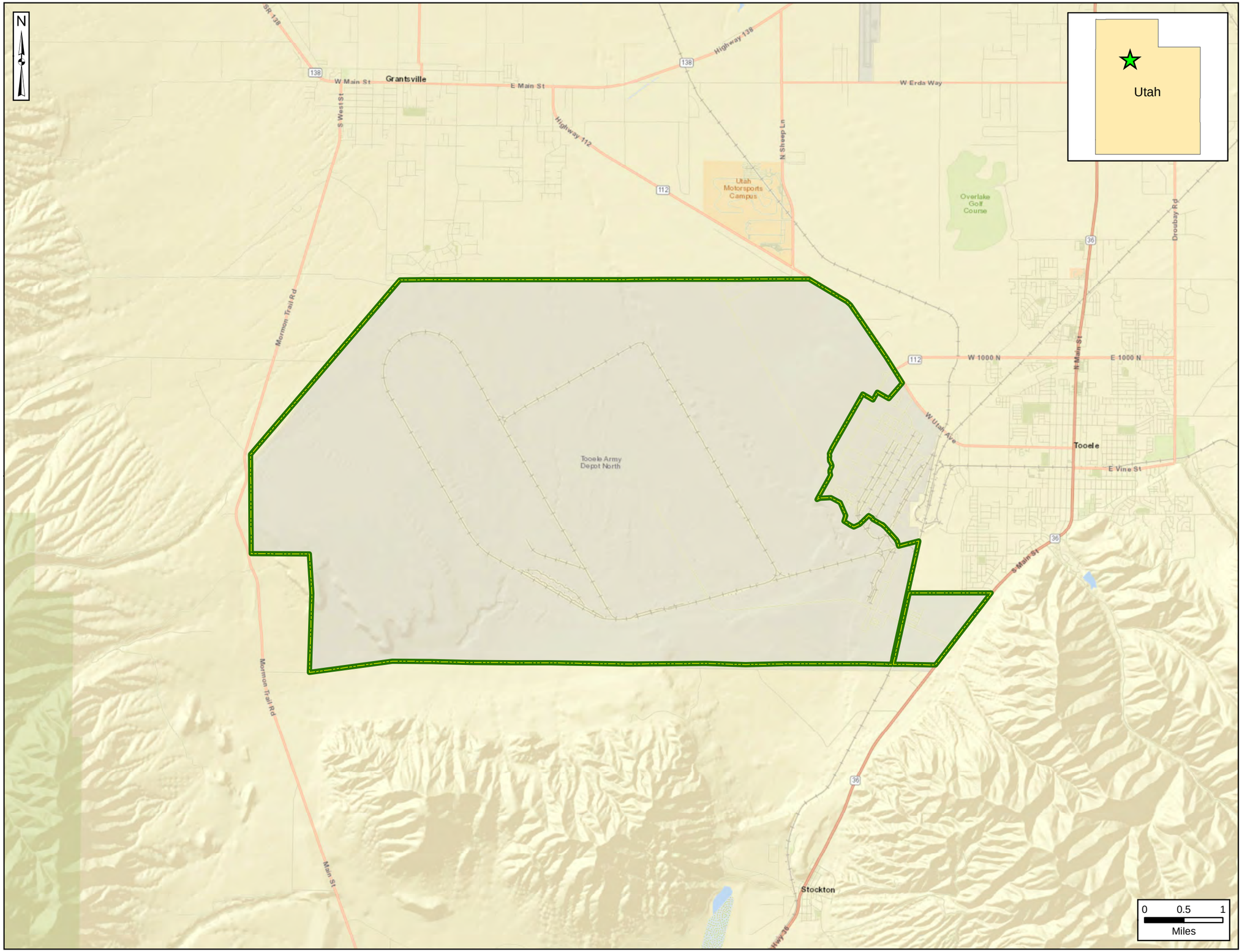
Figure 2-1
Site Location

Legend

Installation Boundary



Data Sources:
ESRI ArcGIS Online, Street Map Data

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection Tooele Army Depot-North, UT

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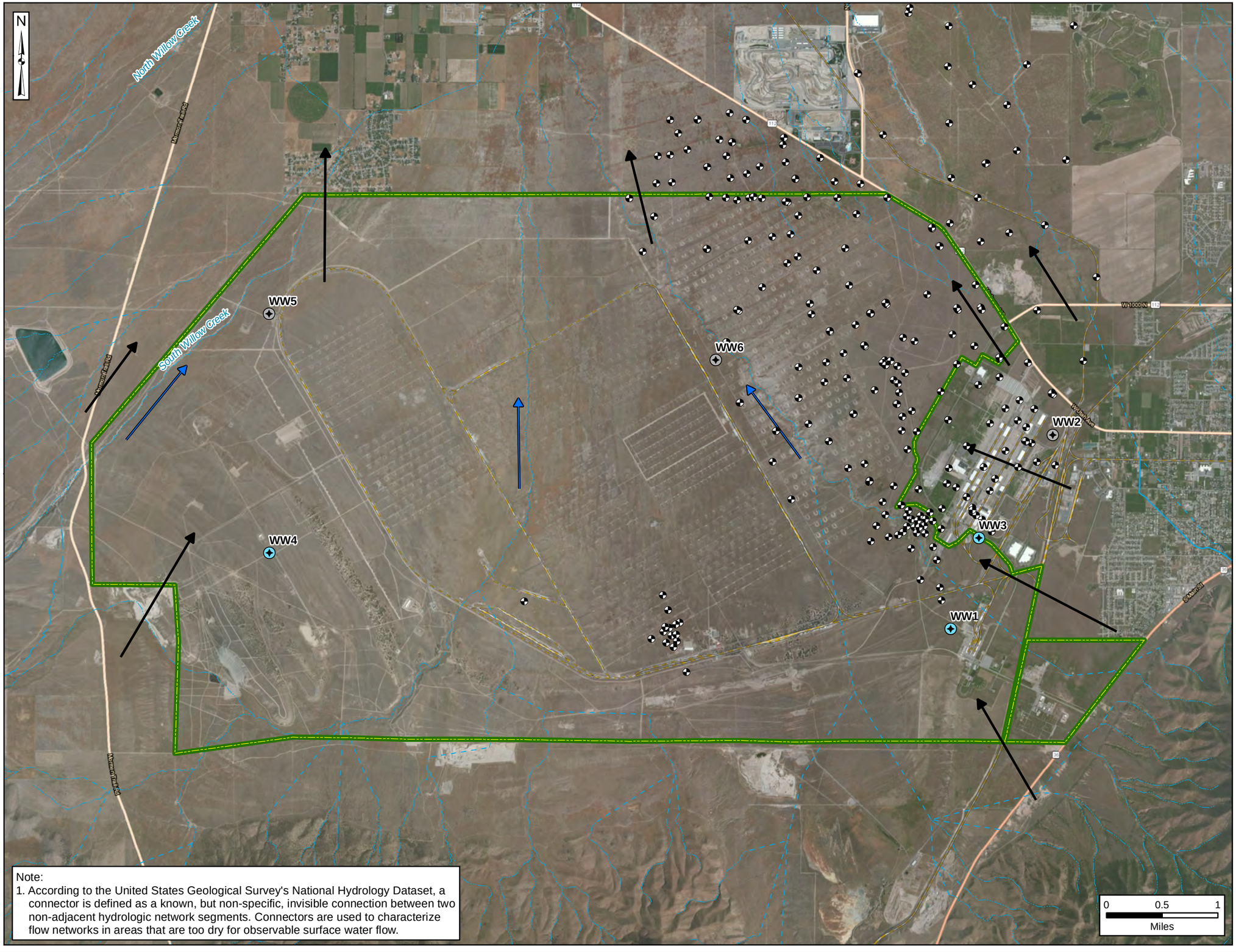
Figure 2-2
Site Layout



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but non-specific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

Legend

- Installation Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Connector[1]
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Preliminary Assessment /
Site Inspection
Tooele Army Depot-North, UT

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Figure 2-3
Topographic Map

Legend

- Installation Boundary
- Elevation Contour (10 feet)

0 0.5 1
Miles

Data Sources:
ESRI ArcGIS Online, USGS Topo Map

Coordinate System:
WGS 1984, UTM Zone 12 North

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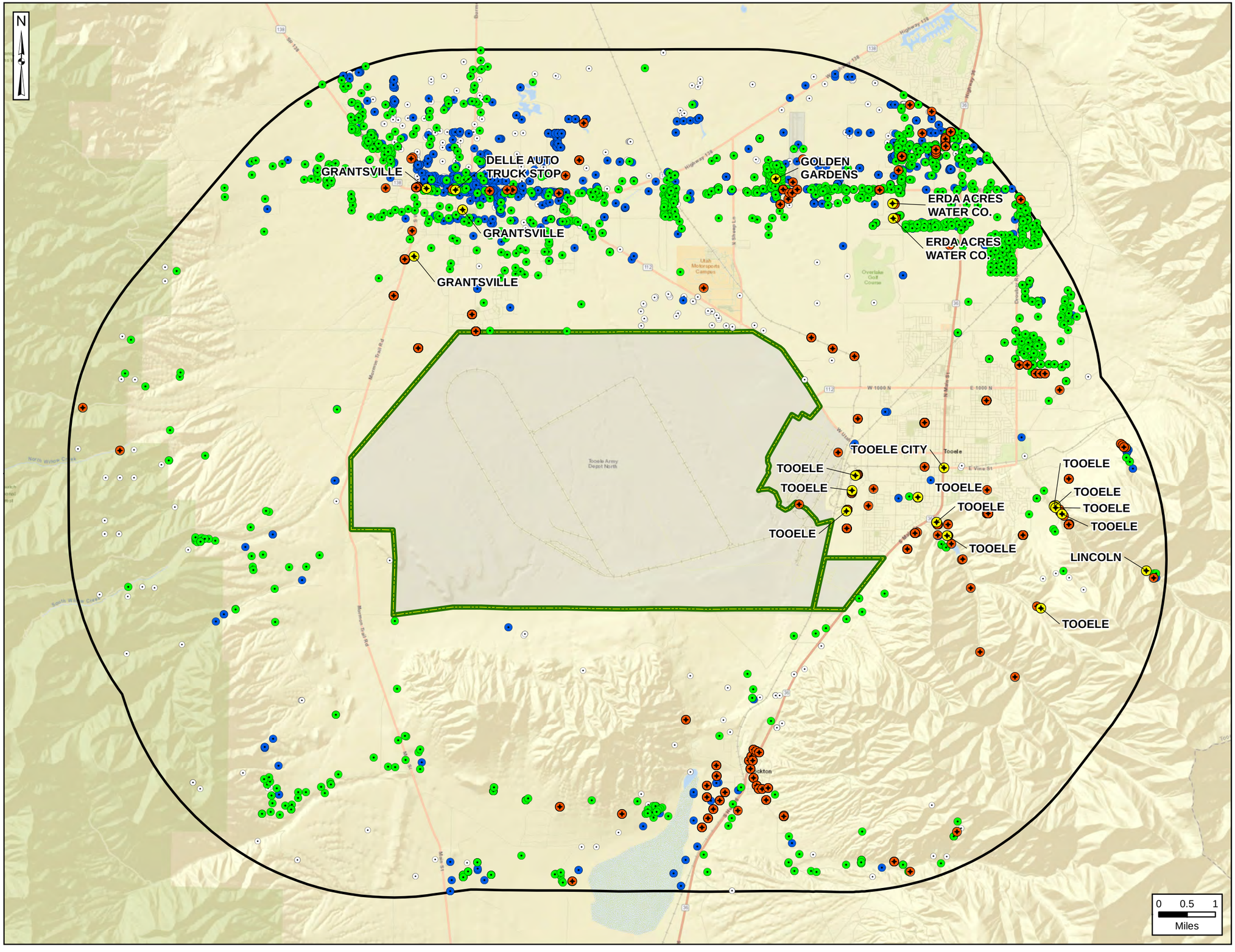
Figure 2-4
Off-Post Potable Well Locations



Legend

- Installation Boundary
- 5-Mile Radius
- Public Water Supply System Well
- Municipal Well
- Domestic Well
- Irrigation Well
- Other Designated Use Water Well

Co. = Company

Data Sources:
EDR Well Data, 2018
Utah DNR Well Data, 2019
ESRI ArcGIS Online, Street Map Data

Coordinate System:
WGS 1984, UTM Zone 12 North

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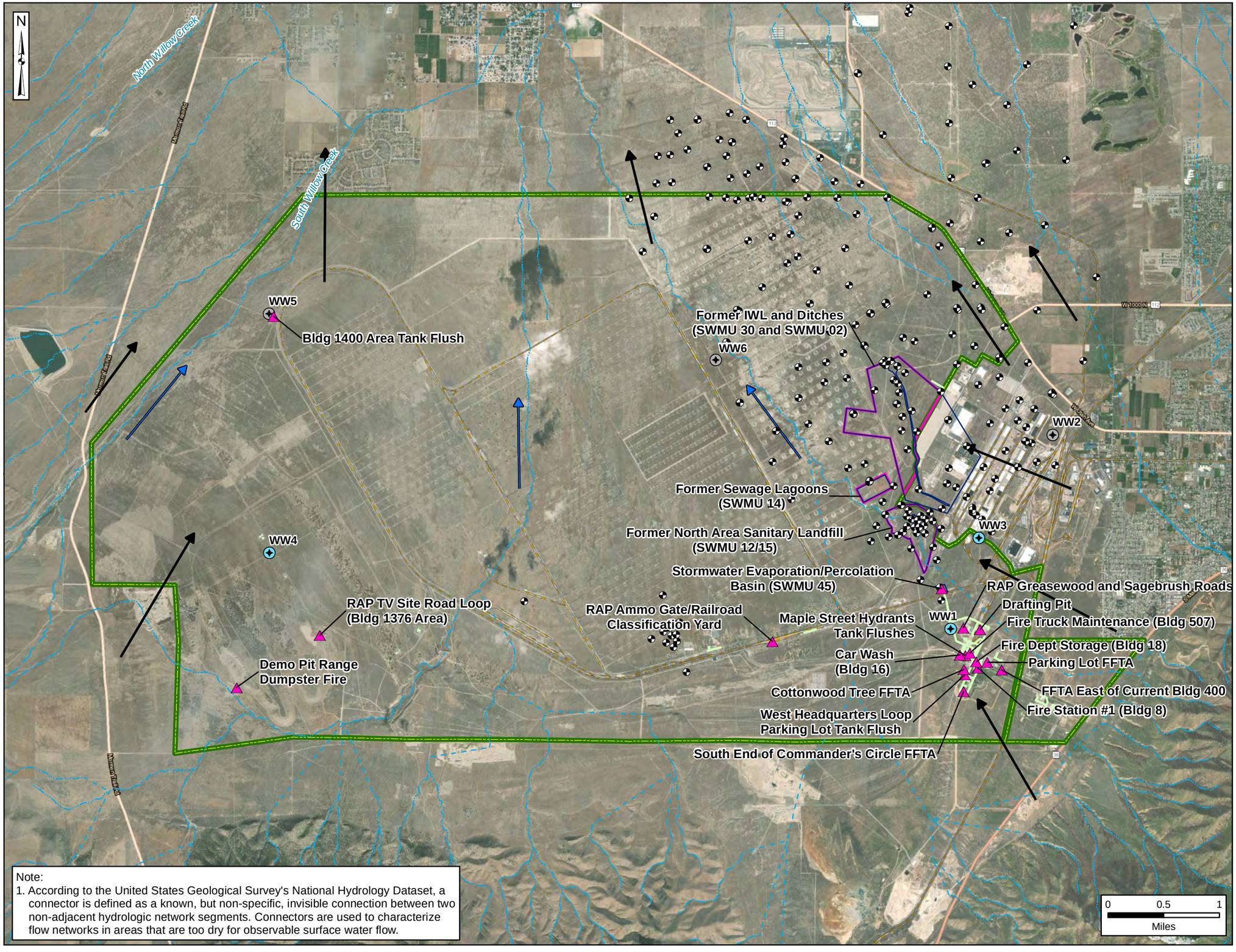
Figure 5-2
AOPI Locations



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but non-specific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

Legend

- Installation Boundary
- AOPI Location
- IRP Site Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Connector[1]
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well
- Stormwater Line

AOPI = area of potential interest
Bldg = building
Dept = department
FFTA = firefighting training area
IRP = Installation Restoration Program
IWL = industrial waste lagoon
RAP = reuse asphalt project
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Tooele Army Depot-North, UT

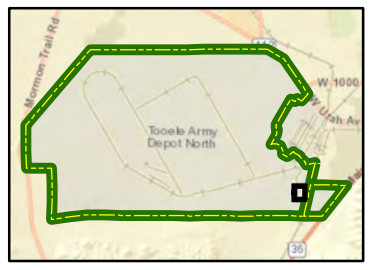
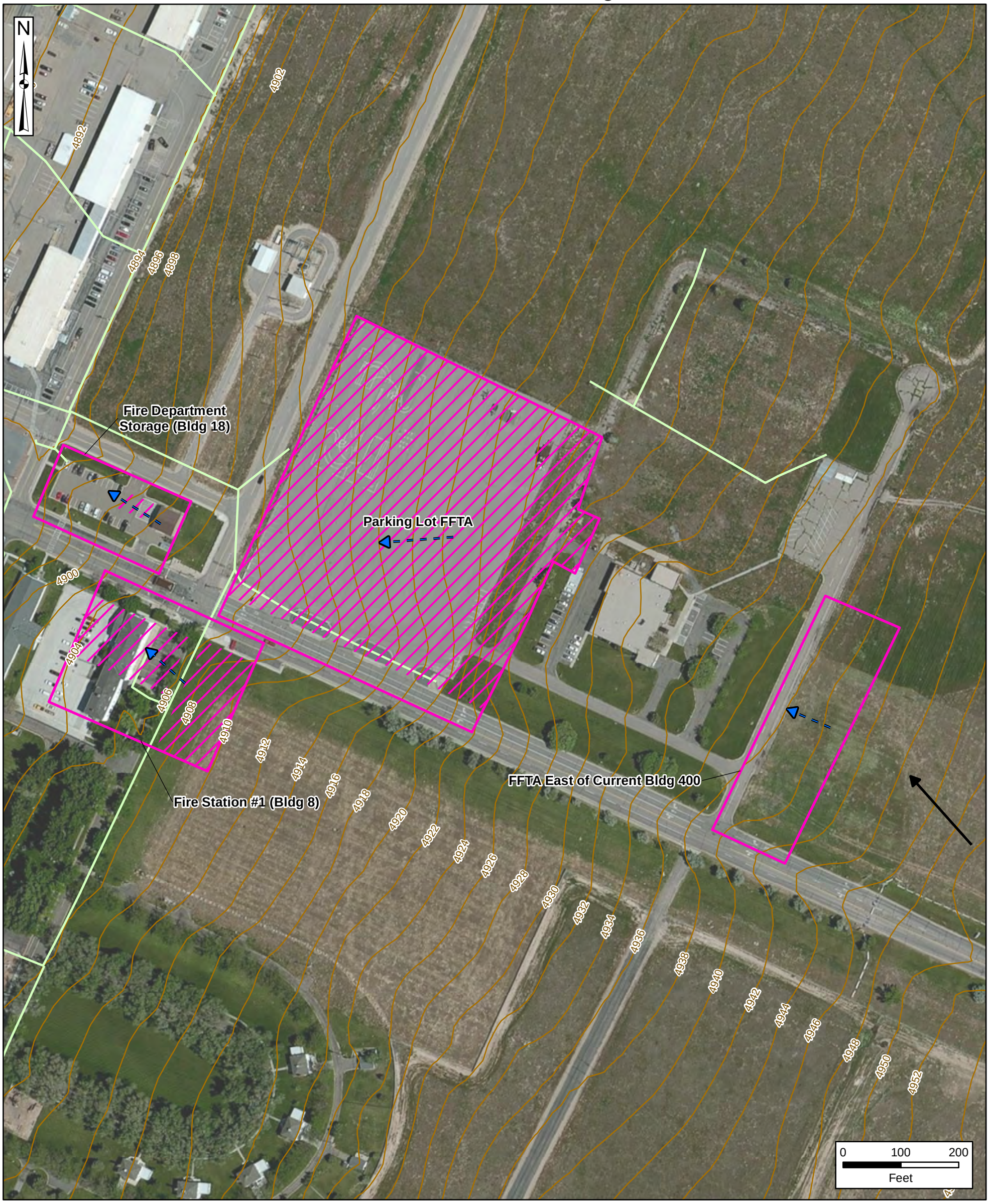


Figure 5-3
Aerial Photo of Fire Station #1 (Building 8), Fire Department Storage (Building 18), Parking Lot FFTA, and FFTA East of Current Building 400 AOPIs



Installation Boundary
AOPI Boundary
Inferred Extent of AFFF Use*
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Stormwater Line
Elevation Contour (feet)

*Inferred AFFF use areas are drawn based on personnel interviews.

AFFF = aqueous film-forming foam
AOPI = area of potential interest
Bldg = building
FFTA = firefighting training area

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Tooele Army Depot-North, UT

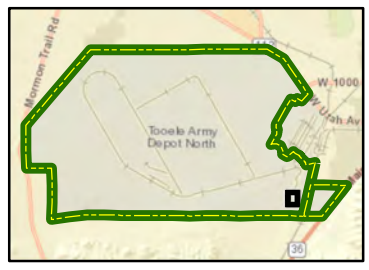
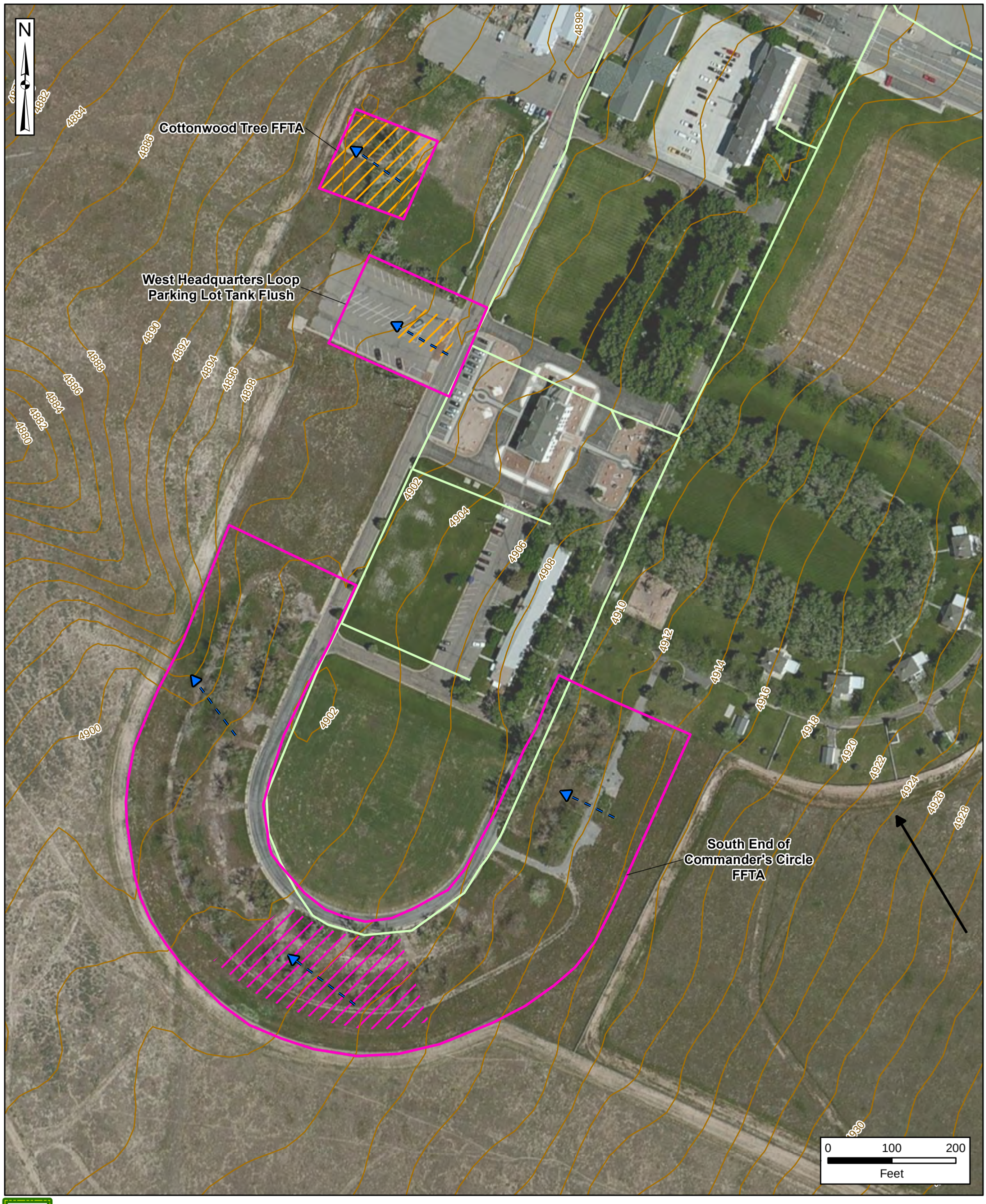


Figure 5-4
Aerial Photo of Cottonwood Tree FFTA, West Headquarters Loop Parking Lot Tank Flush, and South End of Commander's Circle FFTA AOPIs



Installation Boundary
AOPI Boundary
Inferred Extent of AFFF Use*
Inferred Firefighting Foam Use Area**
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Stormwater Line
Elevation Contour (feet)

*Inferred AFFF use areas are drawn based on personnel interviews.
**Inferred firefighting foam use areas are drawn based on personnel interviews; however, it is not certain if Class A or Class B (AFFF) foam was used in the area.

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

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Tooele Army Depot-North, UT

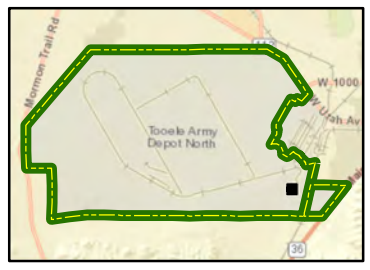
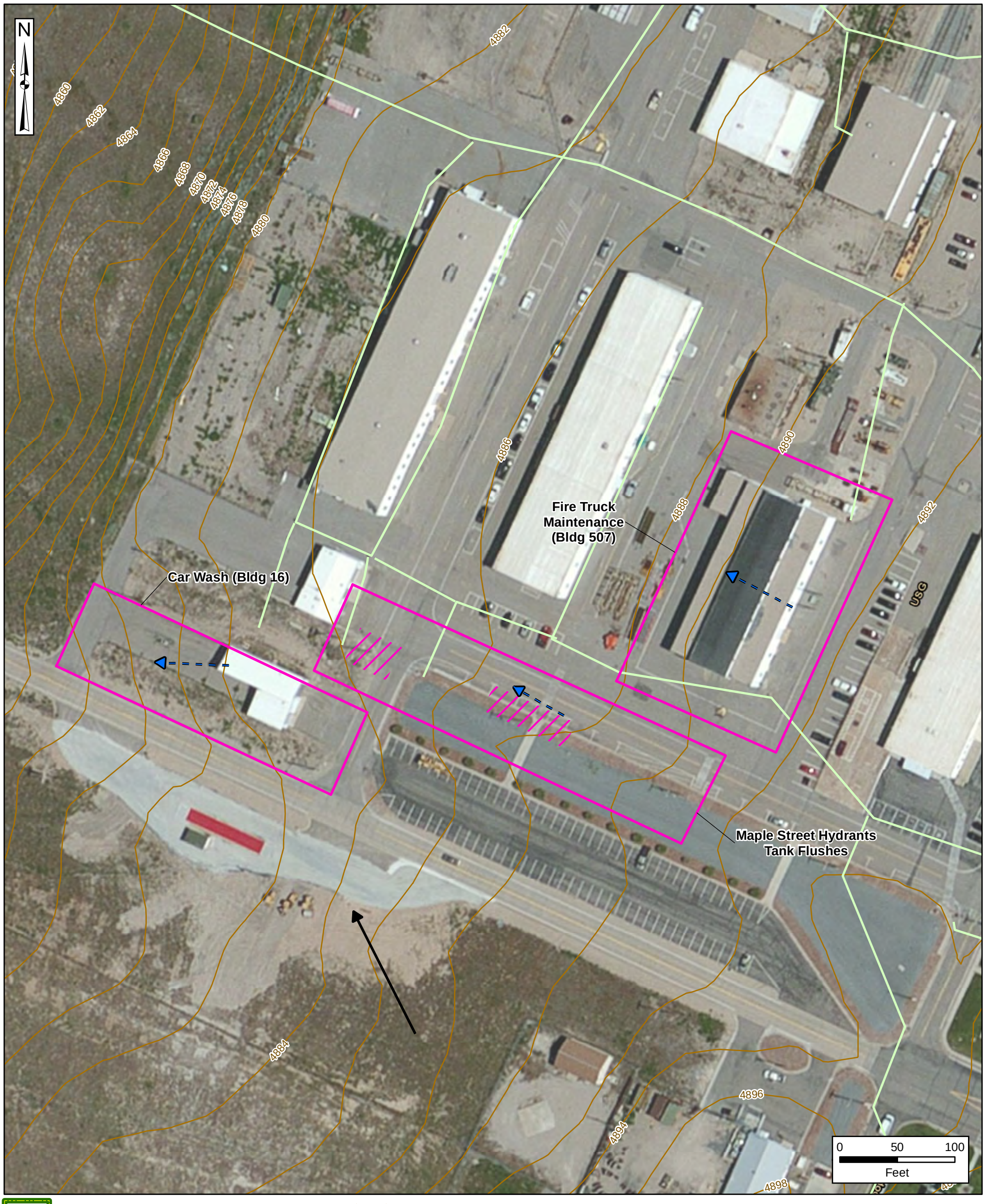


Figure 5-5
Aerial Photo of Car Wash (Building 16), Maple Street Hydrants Tank Flushes, and Fire Truck Maintenance (Building 507) AOPIs



Installation Boundary
AOPI Boundary
Inferred Extent of AFFF Use*
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Stormwater Line
Elevation Contour (feet)

*Inferred AFFF use areas are drawn based on personnel interviews.

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

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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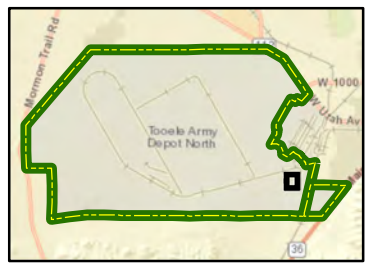

Figure 5-6
Aerial Photo of Drafting Pit and RAP
Greasewood and Sagebrush Roads AOPIs

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Potable Well (Active)
Stormwater Line
Elevation Contour (feet)

AOPI = area of potential interest
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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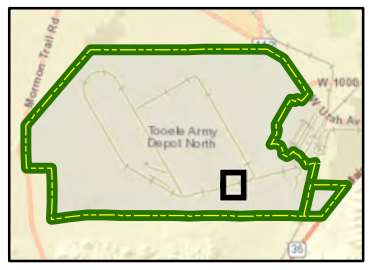

Figure 5-7
Aerial Photo of RAP Ammo Gate/Railroad
Classification Yard Roadway AOPI

Installation Boundary

AOPI Boundary

Groundwater Flow Direction

Inferred Stormwater Runoff Flow Direction

Elevation Contour (feet)

AOPI = area of potential interest
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
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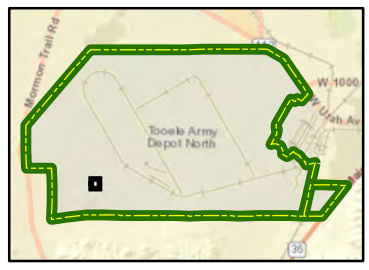

Figure 5-8
Aerial Photo of RAP TV Site Road Loop (Building 1376 Area) AOPI

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Elevation Contour (feet)

AOPI = area of potential interest
Bldg = building
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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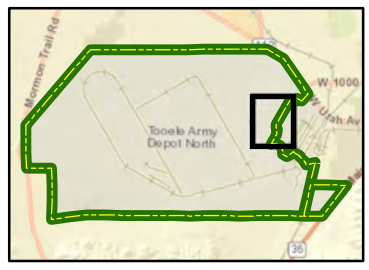

Figure 5-9
Aerial Photo of Former IWL and Ditches
(SWMU 30 and SWMU 2) AOPI

Installation Boundary
AOPI Boundary
IRP Site Boundary
Stormwater Line
Elevation Contour (feet)
Stream (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Monitoring Well

AOPI = area of potential interest
IRP = Installation Restoration Program
IWL = industrial wastewater lagoons
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

* SWMU 30 received a no further action (NFA) declaration in 2001.

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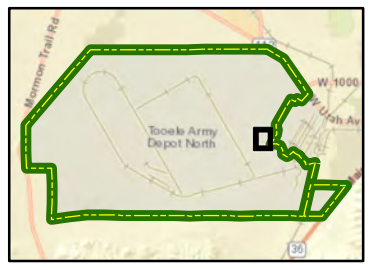

Figure 5-10
Aerial Photo of Former Sewage Lagoons (SWMU 14) AOPI

Installation Boundary
AOPI Boundary
IRP Site Boundary
Stormwater Line
Elevation Contour (feet)
Stream (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Monitoring Well

AOPI = area of potential interest
IRP = Installation Restoration Program
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Tooele Army Depot-North, UT

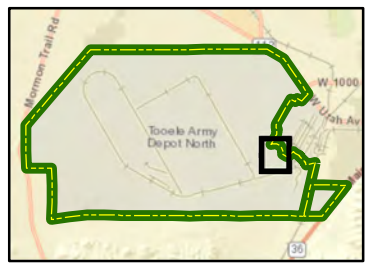
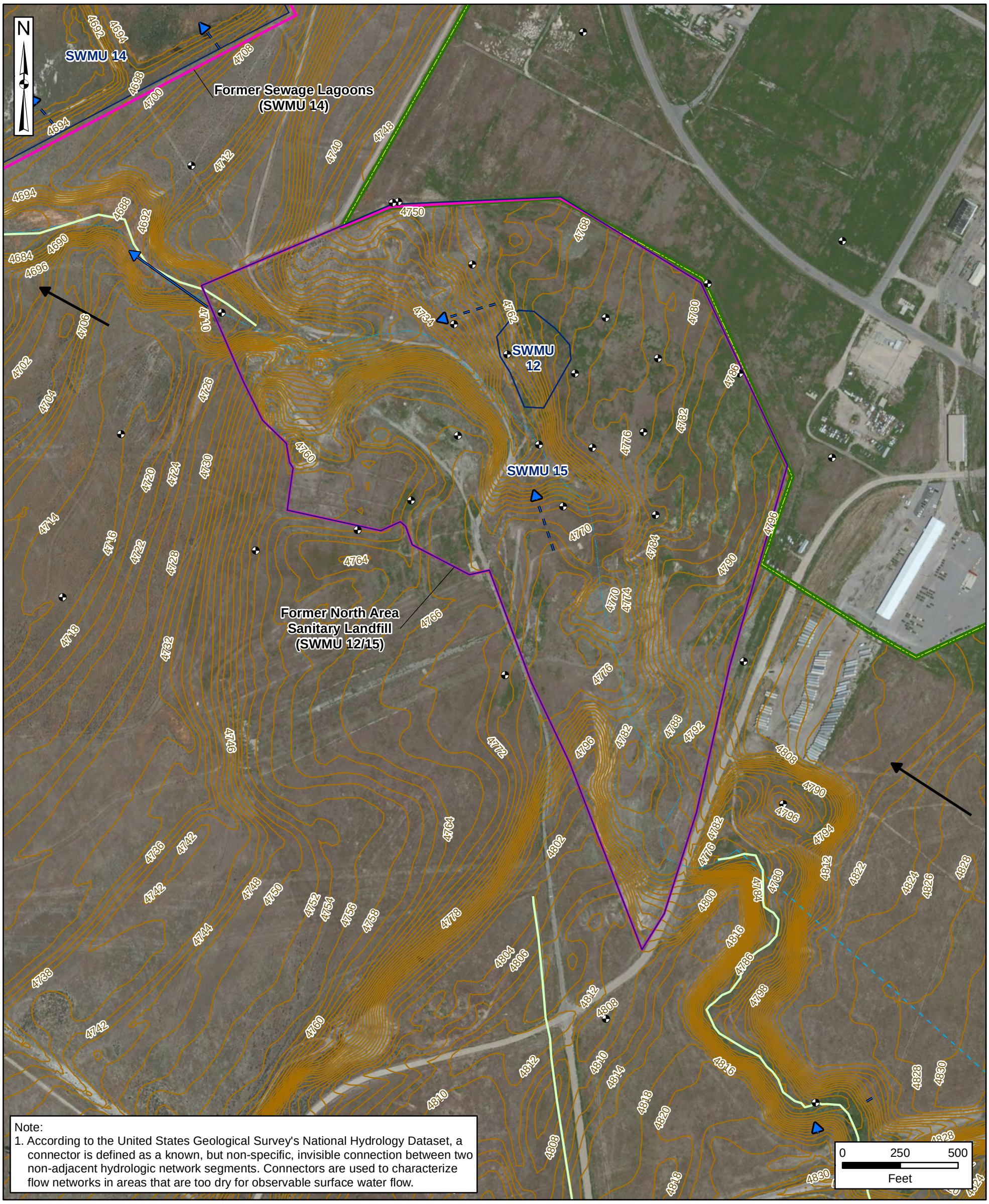


Figure 5-11
Aerial Photo of Former North Area Sanitary Landfill (SWMU 12/15) AOPI



- Installation Boundary
- AOPI Boundary
- IRP Site Boundary
- Stormwater Line
- Elevation Contour (feet)
- Stream (Intermittent)
- Connector[1]
- Surface Water Flow Direction
- Groundwater Flow Direction
- Inferred Stormwater Runoff Flow Direction
- Monitoring Well

AOPI = area of potential interest
IRP = Installation Restoration Program
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-North, UT

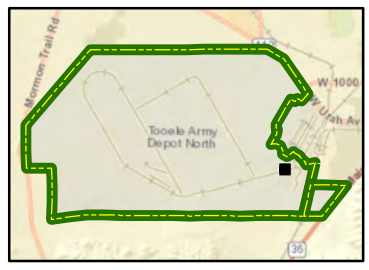


Figure 5-12
Aerial Photo of Stormwater Evaporation/ Percolation Basin (SWMU 45) AOPI

Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but non-specific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.

- Installation Boundary
- AOPI Boundary
- IRP Site Boundary
- Stormwater Line
- Elevation Contour (feet)
- Connector[1]
- Groundwater Flow Direction
- Inferred Stormwater Runoff Flow Direction
- Monitoring Well

AOPI = area of potential interest
IRP = Installation Restoration Program
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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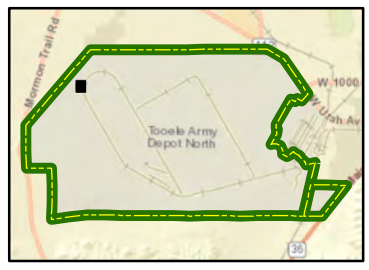

Figure 5-13
Aerial Photo of Building 1400 Area Tank Flush AOPI

Installation Boundary
AOPI Boundary
Inferred Extent of AFFF Use*
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction
Potable Well (Inactive)
Stormwater Line
Elevation Contour (feet)

*Inferred AFFF use areas are drawn based on personnel interviews.

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

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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Tooele Army Depot-North, UT

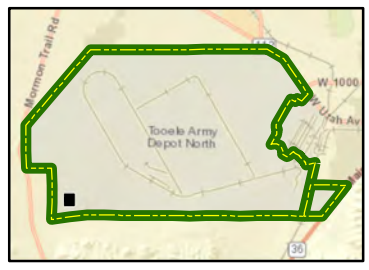

Figure 5-14
Aerial Photo of Demo Pit Range Dumpster Fire AOPI

Note:
1. The location of the Demo Pit Range Dumpster Fire AOPI has been mapped based on the best knowledge to date provided during personnel interviews. Exact location of AOPI is unknown.

Installation Boundary
AOPI Boundary
Elevation Contour (feet)
Stream (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
Inferred Stormwater Runoff Flow Direction

AOPI = area of potential interest

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection Tooele Army Depot-North, UT

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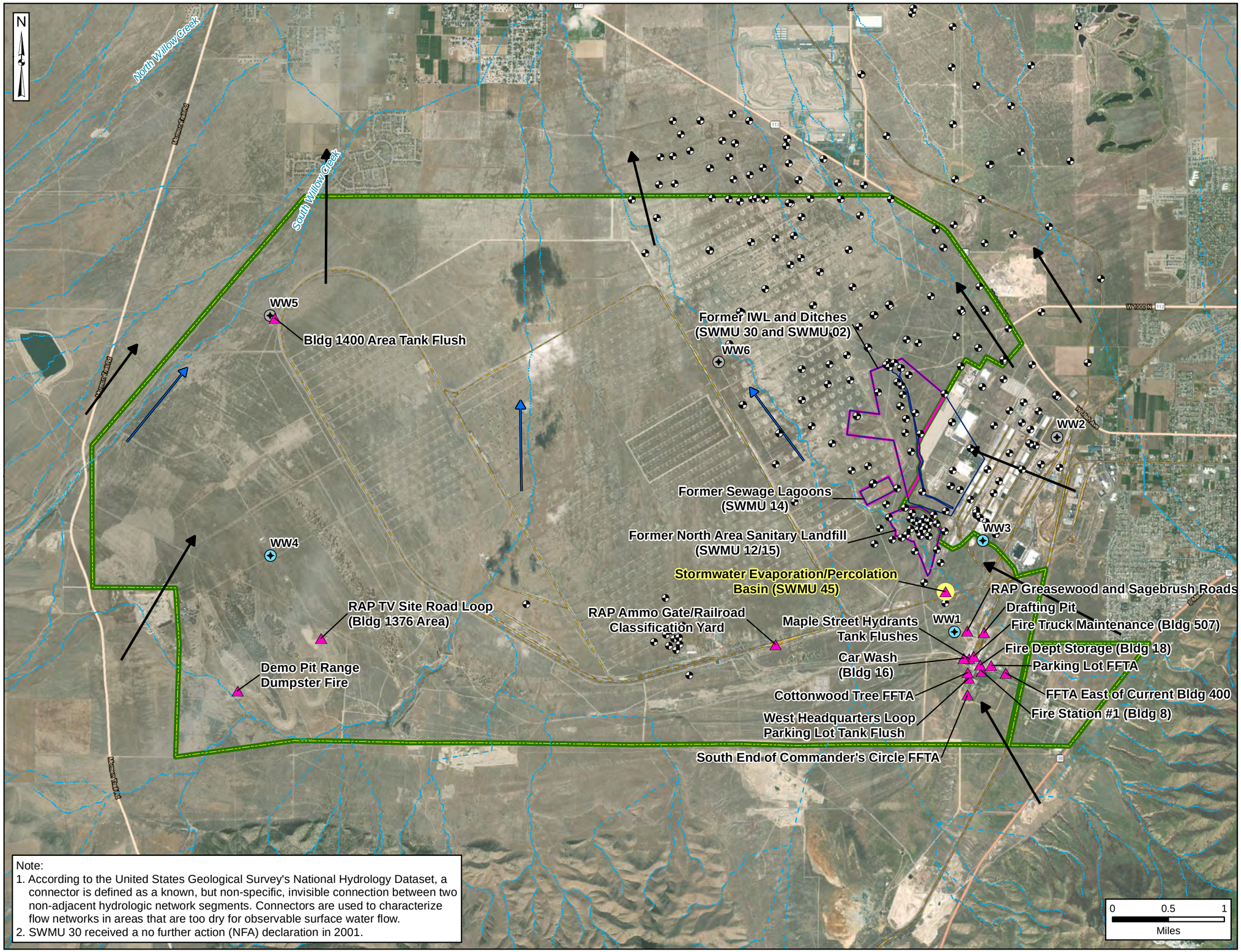
Figure 7-1
AOPI Locations and OSD Risk Screening Level Exceedances



Note:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but non-specific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. SWMU 30 received a no further action (NFA) declaration in 2001.

Legend

- Installation Boundary
- AOPI Location
- AOPI with OSD Risk Screening Level Exceedance
- IRP Site Boundary
- River/Stream (Perennial)
- Stream (Intermittent)
- Connector[1]
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well

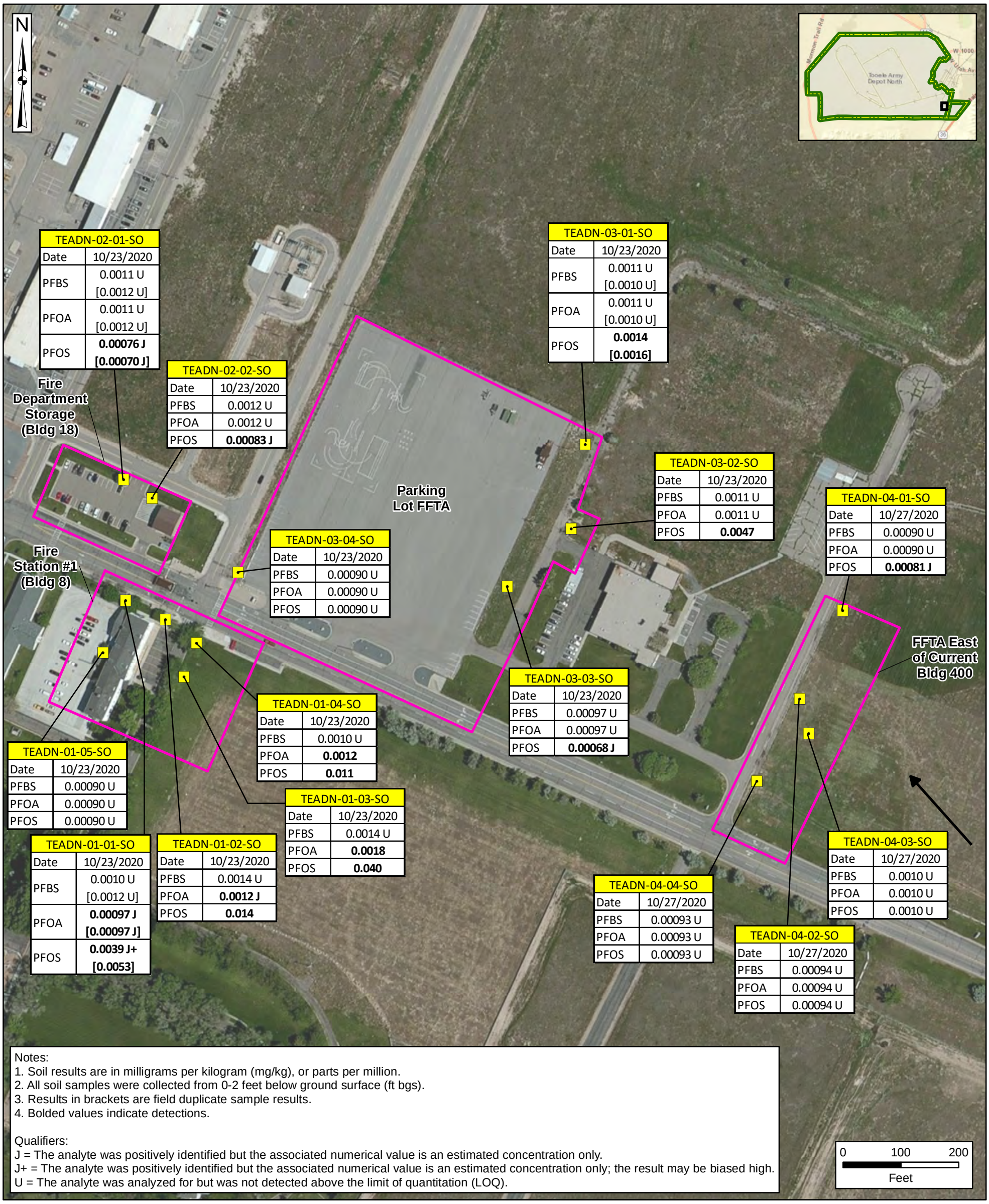
AOPI = area of potential interest
Bldg = building
Dept = department
FFTA = firefighting training area
IRP = Installation Restoration Program
IWL = industrial waste lagoon
RAP = reuse asphalt project
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-North, UT

Figure 7-2
PFOS, PFOA, and PFBS Analytical Results for Fire Station #1 (Building 8), Fire Department Storage (Building 18), Parking Lot FFTA, and FFTA East of Current Building 400



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

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

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Soil Sampling Location

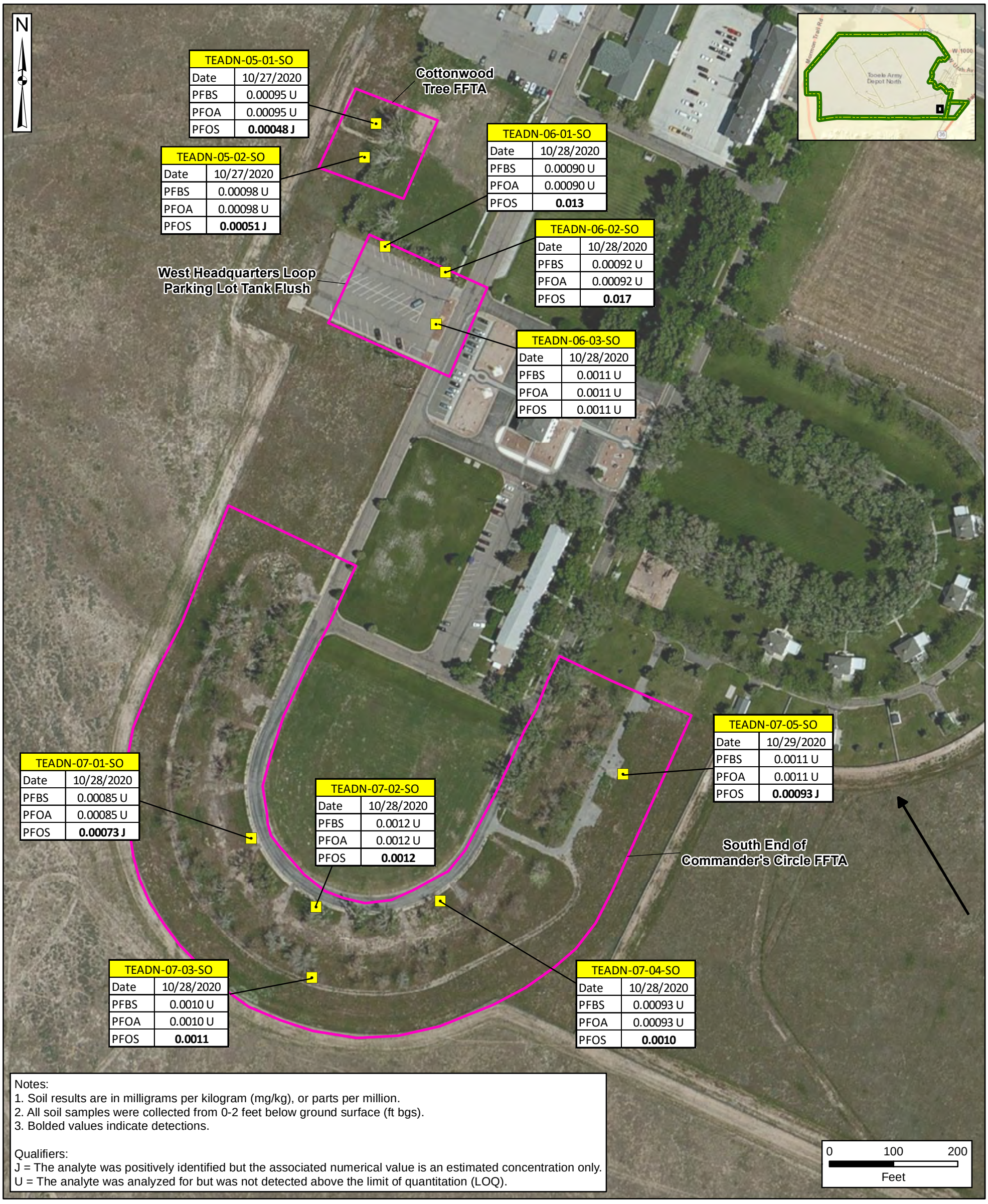
AOPI = area of potential interest
Bldg = building
FFTA = firefighting training area
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-North, UT

Figure 7-3
PFOS, PFOA, and PFBS Analytical Results for Cottonwood Tree FFTA, West Headquarters Loop Parking Lot Tank Flush, South End of Commander's Circle FFTA



TEADN-05-01-SO	
Date	10/27/2020
PFBS	0.00095 U
PFOA	0.00095 U
PFOS	**0.00048 J**

TEADN-05-02-SO	
Date	10/27/2020
PFBS	0.00098 U
PFOA	0.00098 U
PFOS	**0.00051 J**

TEADN-06-01-SO	
Date	10/28/2020
PFBS	0.00090 U
PFOA	0.00090 U
PFOS	**0.013**

TEADN-06-02-SO	
Date	10/28/2020
PFBS	0.00092 U
PFOA	0.00092 U
PFOS	**0.017**

TEADN-06-03-SO	
Date	10/28/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	0.0011 U

TEADN-07-01-SO	
Date	10/28/2020
PFBS	0.00085 U
PFOA	0.00085 U
PFOS	**0.00073 J**

TEADN-07-02-SO	
Date	10/28/2020
PFBS	0.0012 U
PFOA	0.0012 U
PFOS	**0.0012**

TEADN-07-03-SO	
Date	10/28/2020
PFBS	0.0010 U
PFOA	0.0010 U
PFOS	**0.0011**

TEADN-07-04-SO	
Date	10/28/2020
PFBS	0.00093 U
PFOA	0.00093 U
PFOS	**0.0010**

TEADN-07-05-SO	
Date	10/29/2020
PFBS	0.0011 U
PFOA	0.0011 U
PFOS	**0.00093 J**

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

Qualifiers:
J = The analyte was positively identified but 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 Boundary
Groundwater Flow Direction
Soil Sampling Location

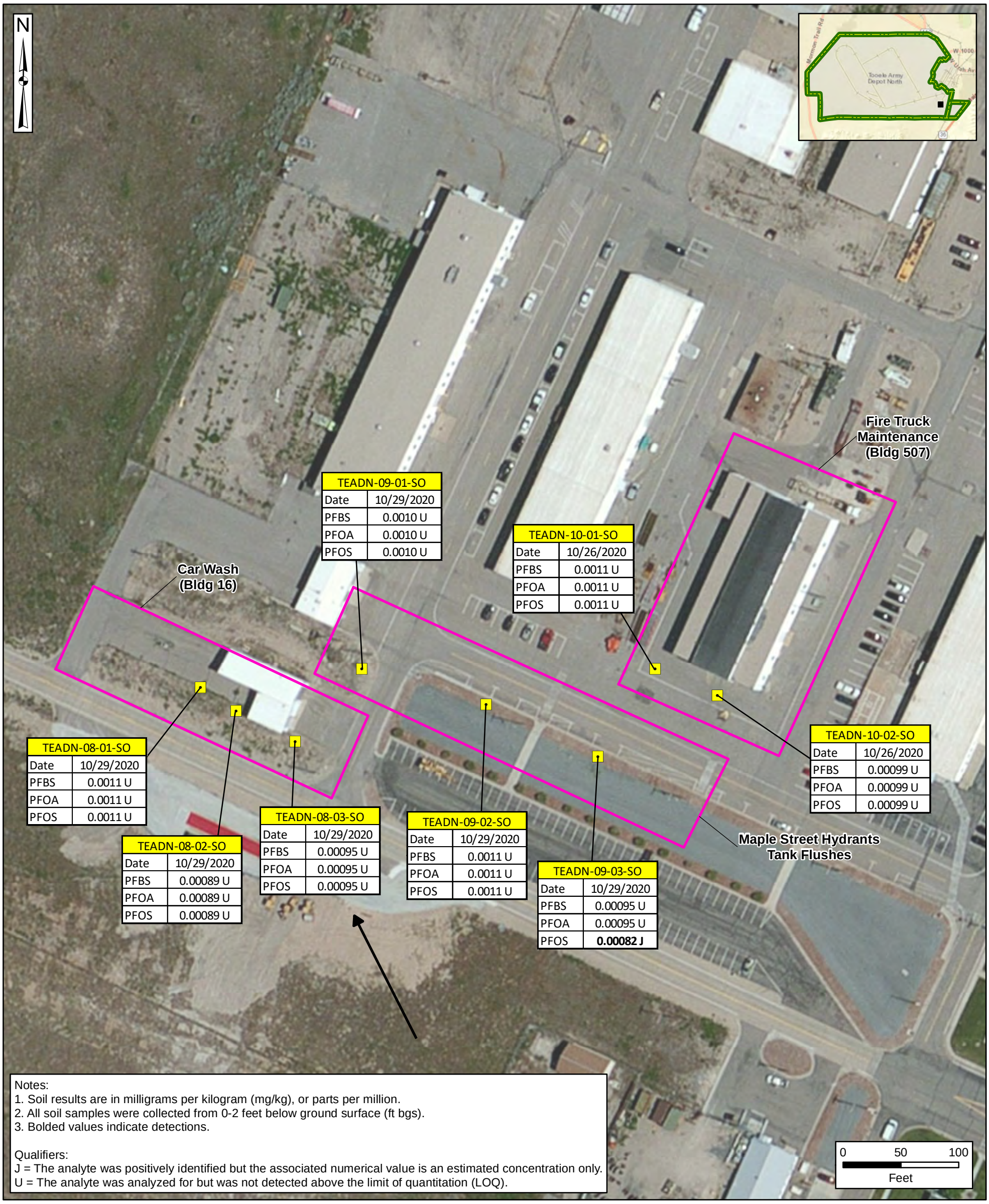
AOPI = area of potential interest
FFTA = firefighting training area
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot-North, UT

Figure 7-4
PFOS, PFOA, and PFBS Analytical Results for Car Wash (Building 16), Maple Street Hydrants Tank Flushes, and Fire Truck Maintenance(Building 507)



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

Qualifiers:
J = The analyte was positively identified but 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 Boundary
Groundwater Flow Direction
Soil Sampling Location

AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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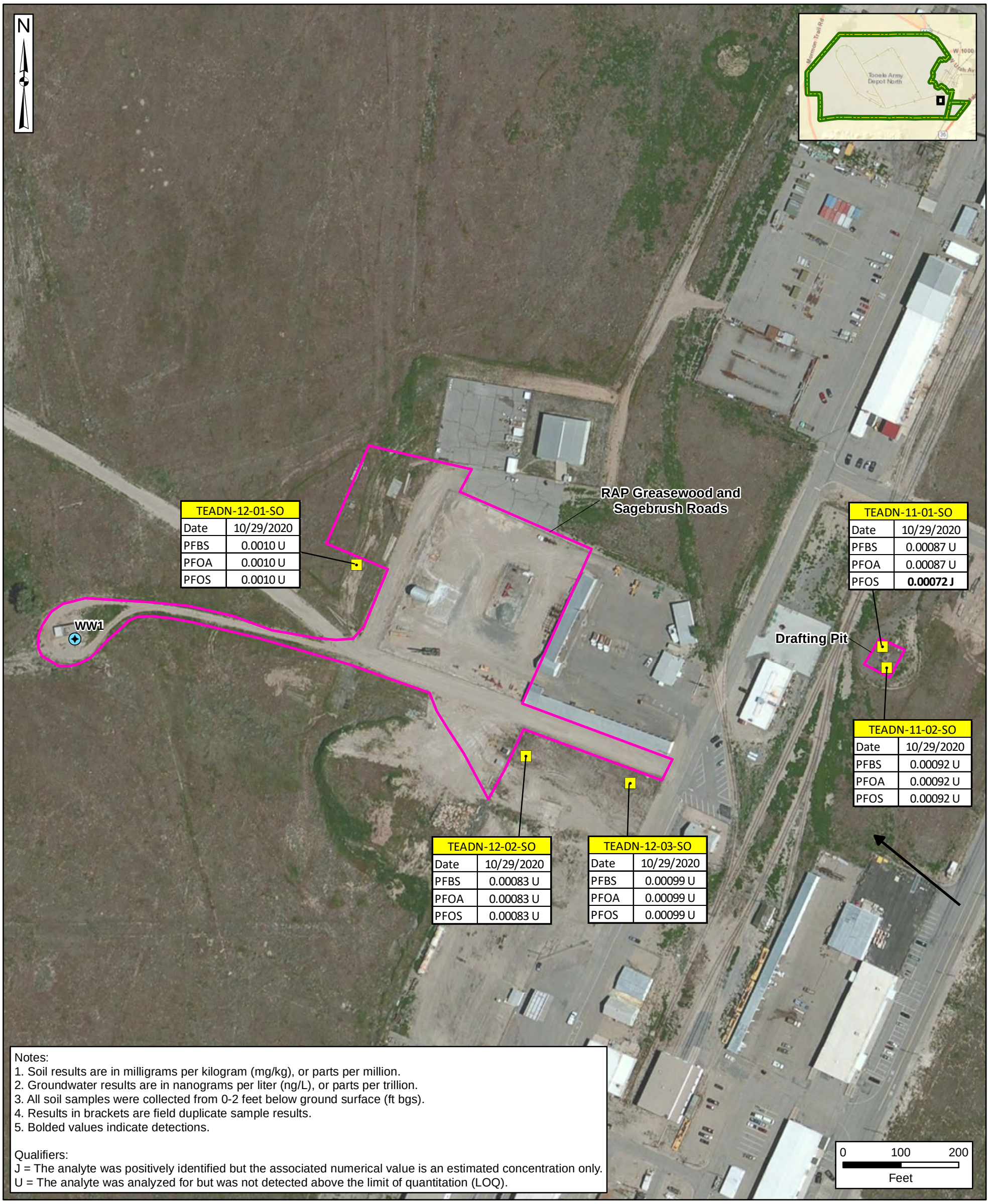
Figure 7-5
PFOS, PFOA, and PFBS Analytical Results for Drafting Pit and RAP Greasewood and Sagebrush Roads



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

Qualifiers:
J = The analyte was positively identified but 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 Boundary
Groundwater Flow Direction
Potable Well (Active)
Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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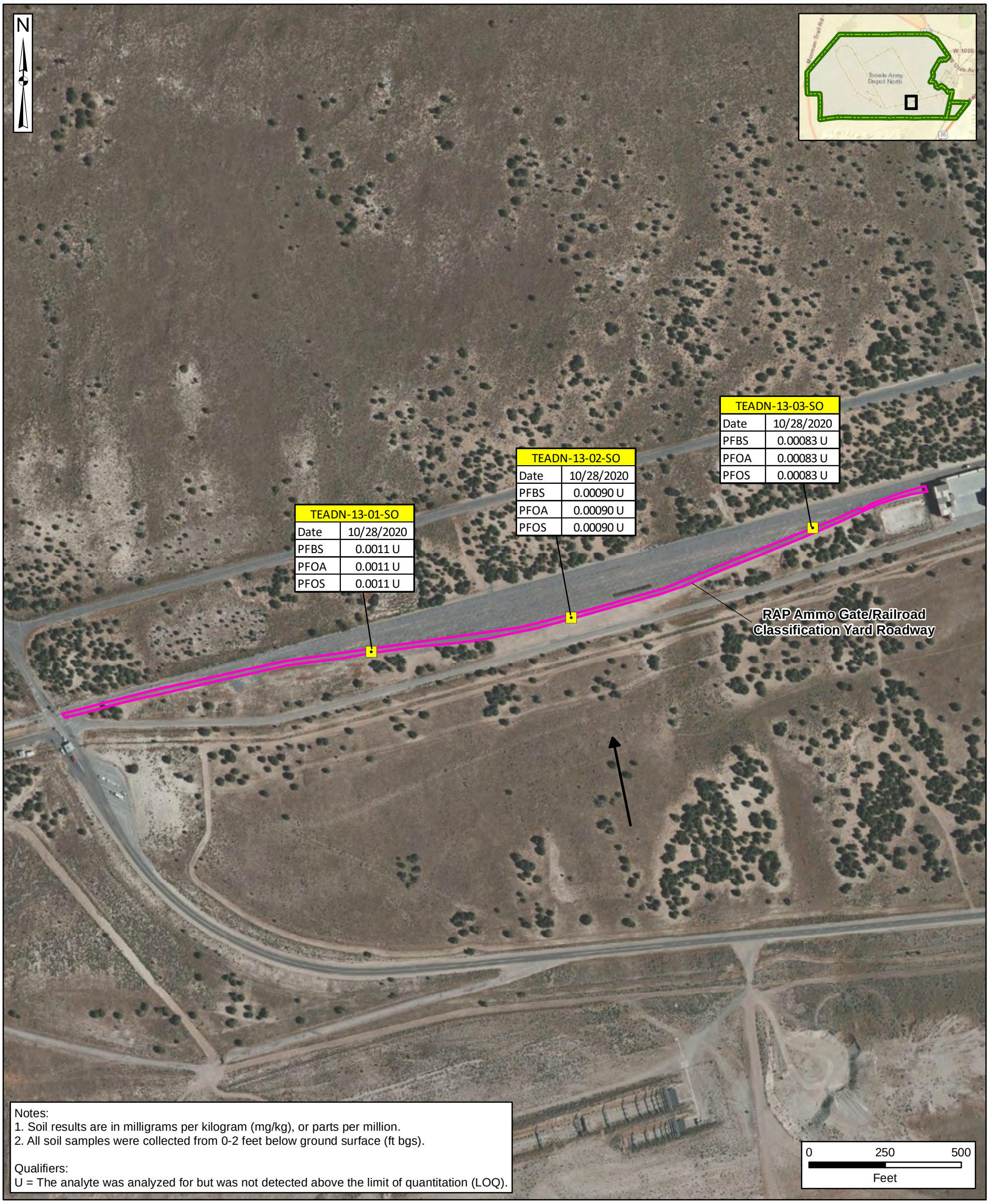
Figure 7-6
PFOS, PFOA, and PFBS Analytical Results for RAP Ammo Gate/Railroad Classification Yard Roadway



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

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

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Soil Sampling Location

AOPI = area of potential interest
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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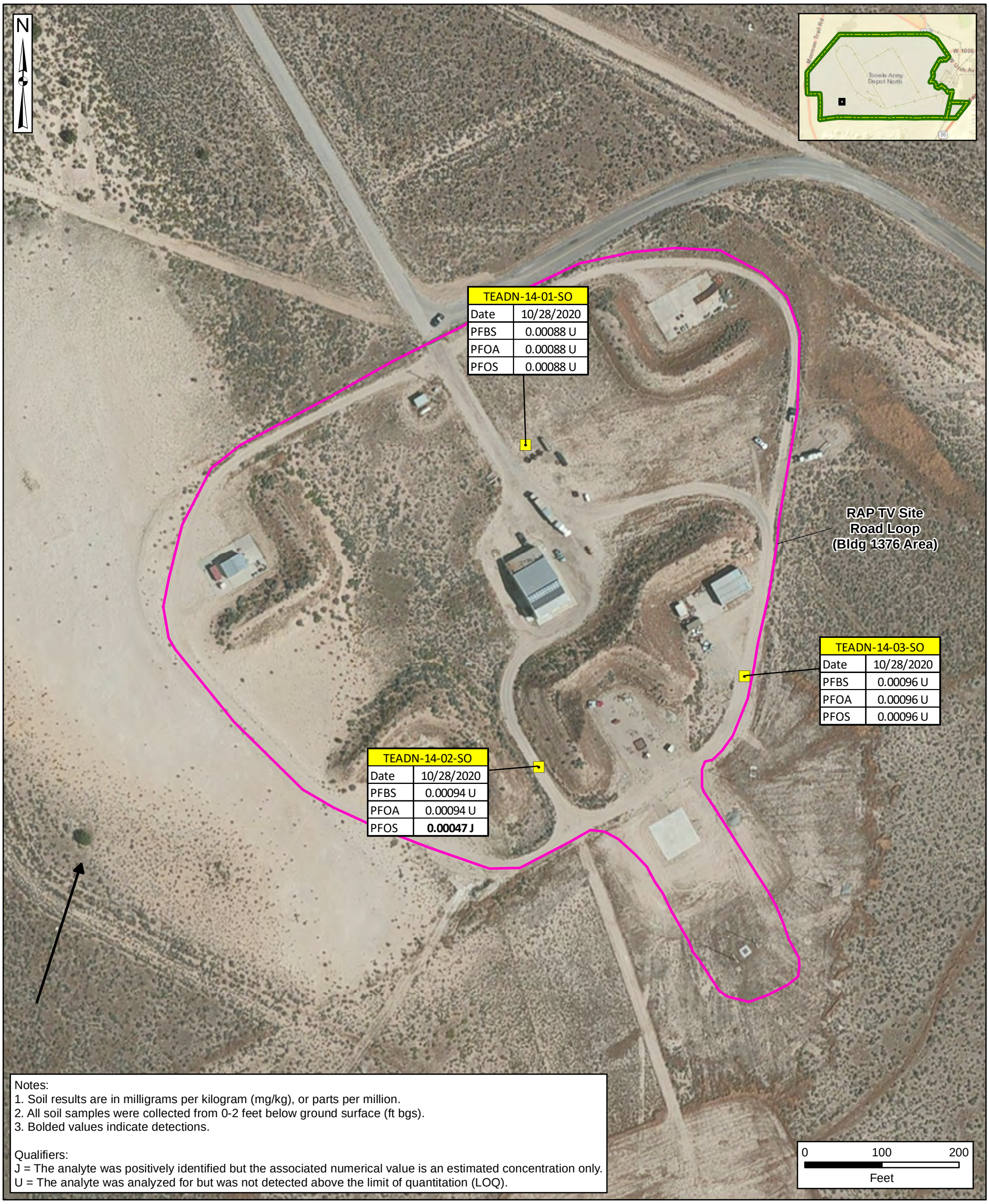
Figure 7-7
PFOS, PFOA, and PFBS Analytical Results for
RAP TV Site Road Loop (Building 1376 Area)



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

Qualifiers:
J = The analyte was positively identified but 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 Boundary
Groundwater Flow Direction
Soil Sampling Location

AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RAP = reuse asphalt project

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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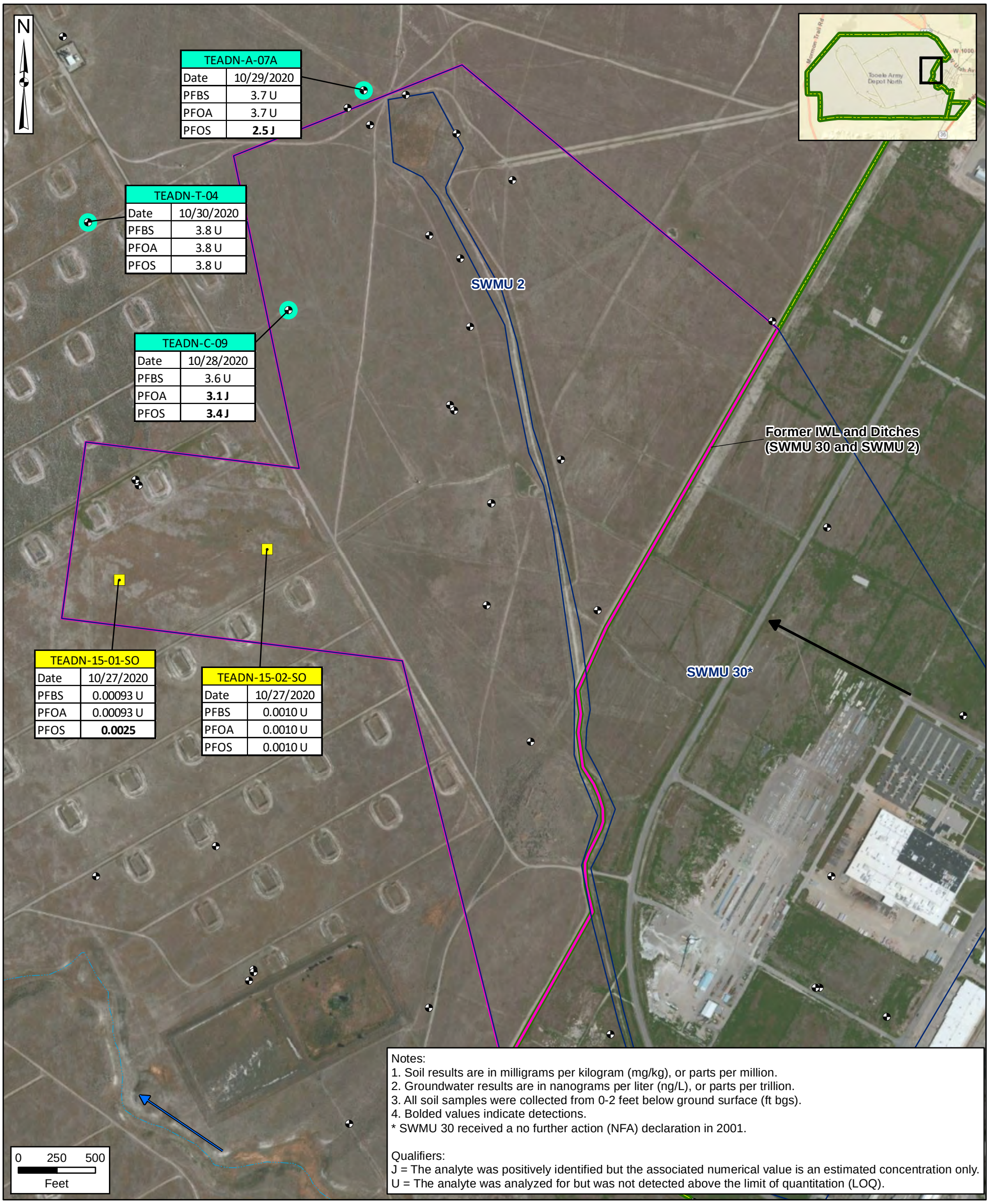
Figure 7-8
PFOS, PFOA, and PFBS Analytical Results for Former IWL and Ditches (SWMU 30 and SWMU 2)



Notes:
1. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
2. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
3. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
4. Bolded values indicate detections.
* SWMU 30 received a no further action (NFA) declaration in 2001.

Qualifiers:
J = The analyte was positively identified but 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 Boundary
IRP Site Boundary
Stream (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

AOPI = area of potential interest
IRP = Installation Restoration Program
IWL = industrial wastewater lagoons
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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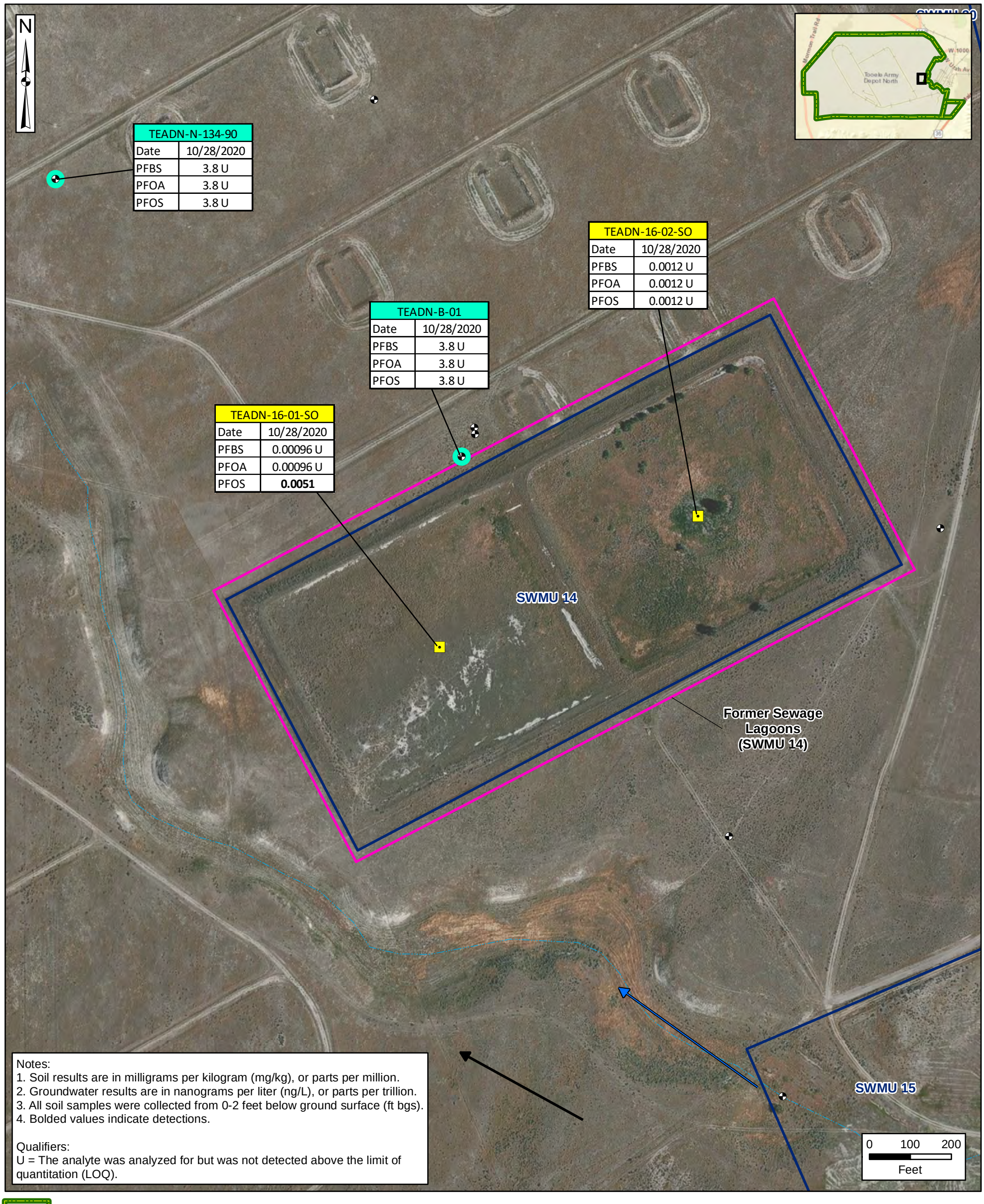
Tooele Army Depot-North, UT

Figure 7-9
PFOS, PFOA, and PFBS Analytical Results for Former Sewage Lagoons (SWMU 14)



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

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

- Installation Boundary
- AOPI Boundary
- IRP Site Boundary
- Stream (Intermittent)
- Surface Water Flow Direction
- Groundwater Flow Direction
- Monitoring Well
- Soil Sampling Location
- Groundwater Sampling Location - Existing Well

AOPI = area of potential interest
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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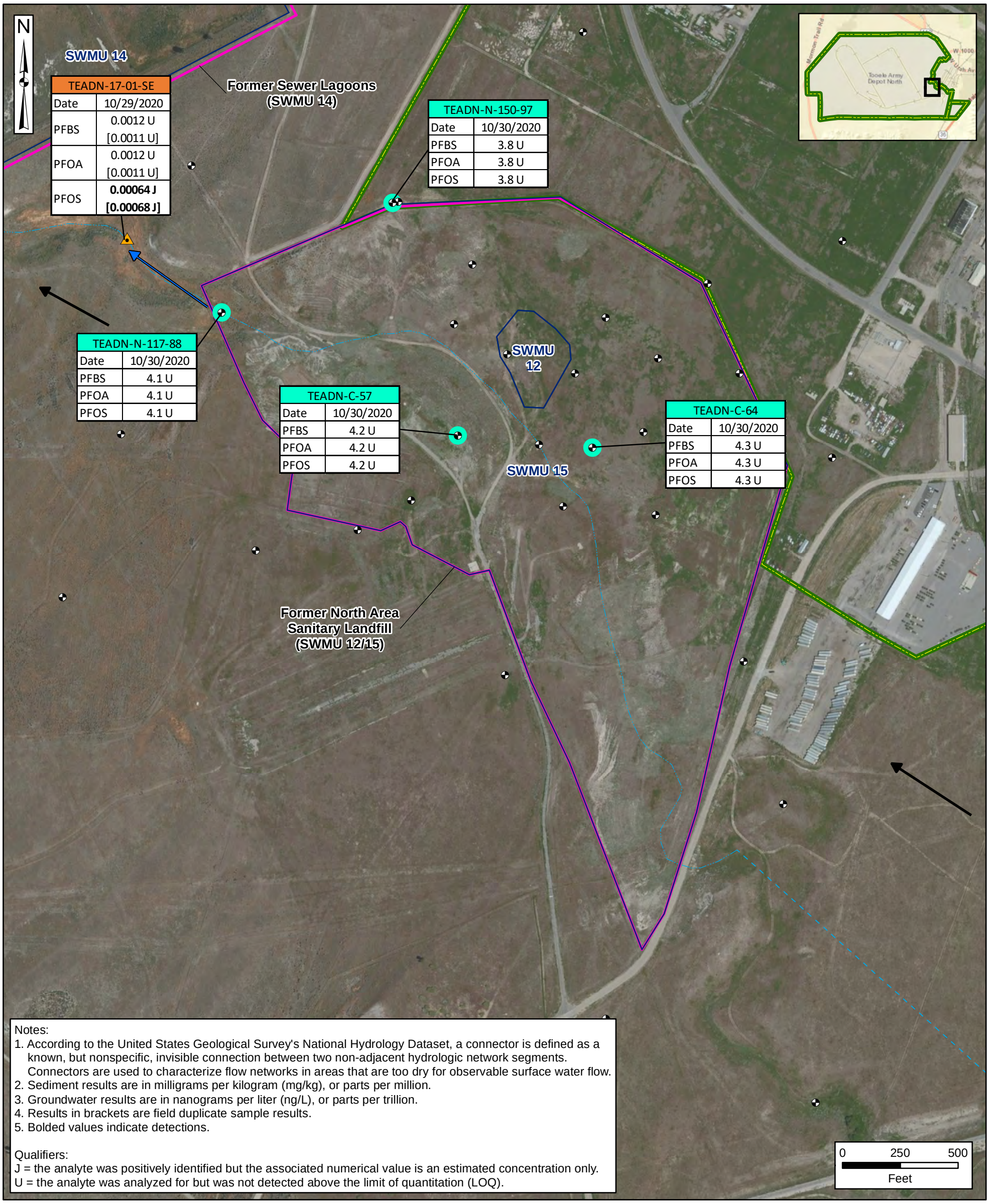
Tooele Army Depot-North, UT

Figure 7-10
PFOS, PFOA, and PFBS Analytical Results for Former North Area Sanitary Landfill (SWMU 12/15)



Notes:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. Sediment results are in milligrams per kilogram (mg/kg), or parts per million.
3. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
4. Results in brackets are field duplicate sample results.
5. Bolded values indicate detections.

Qualifiers:
J = the analyte was positively identified but 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 Boundary
IRP Site Boundary
Stream (Intermittent)
Connector[1]
Surface Water Flow Direction
Groundwater Flow Direction
Monitoring Well
Sediment Sampling Location
Groundwater Sampling Location - Existing Well

AOPI = area of potential interest
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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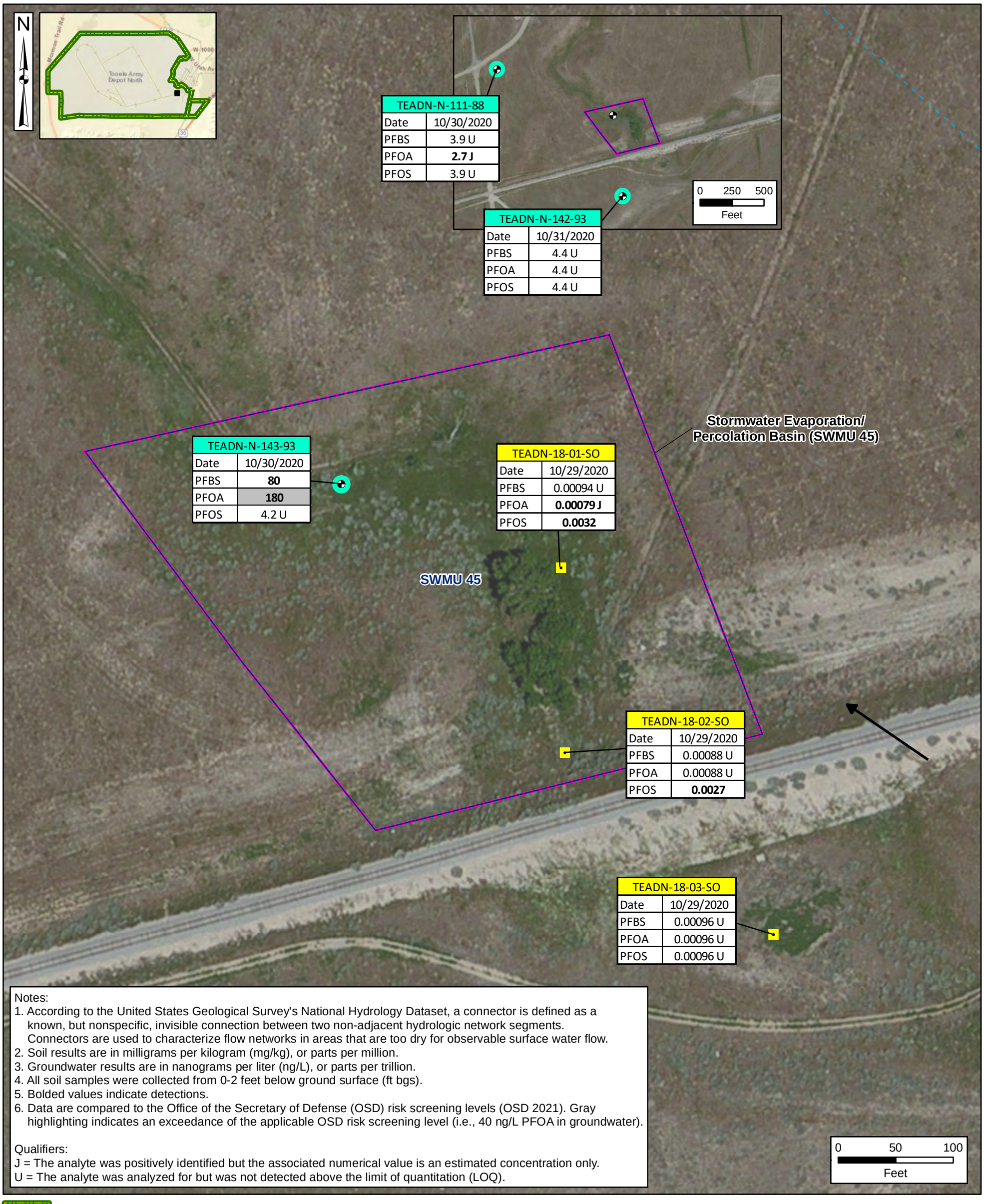
Tooele Army Depot-North, UT

Figure 7-11
PFOS, PFOA, and PFBS Analytical Results for Stormwater Evaporation/Percolation Basin (SWMU 45)



Notes:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but nonspecific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. Soil results are in milligrams per kilogram (mg/kg), or parts per million.
3. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
4. All soil samples were collected from 0-2 feet below ground surface (ft bgs).
5. Bolded values indicate detections.
6. Data are compared to the Office of the Secretary of Defense (OSD) risk screening levels (OSD 2021). Gray highlighting indicates an exceedance of the applicable OSD risk screening level (i.e., 40 ng/L PFOA in groundwater).

Qualifiers:
J = The analyte was positively identified but 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 Boundary
IRP Site Boundary
Connector[1]
Groundwater Flow Direction
Monitoring Well
Soil Sampling Location
Groundwater Sampling Location - Existing Well

AOPI = area of potential interest
IRP = Installation Restoration Program
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
SWMU = solid waste management unit

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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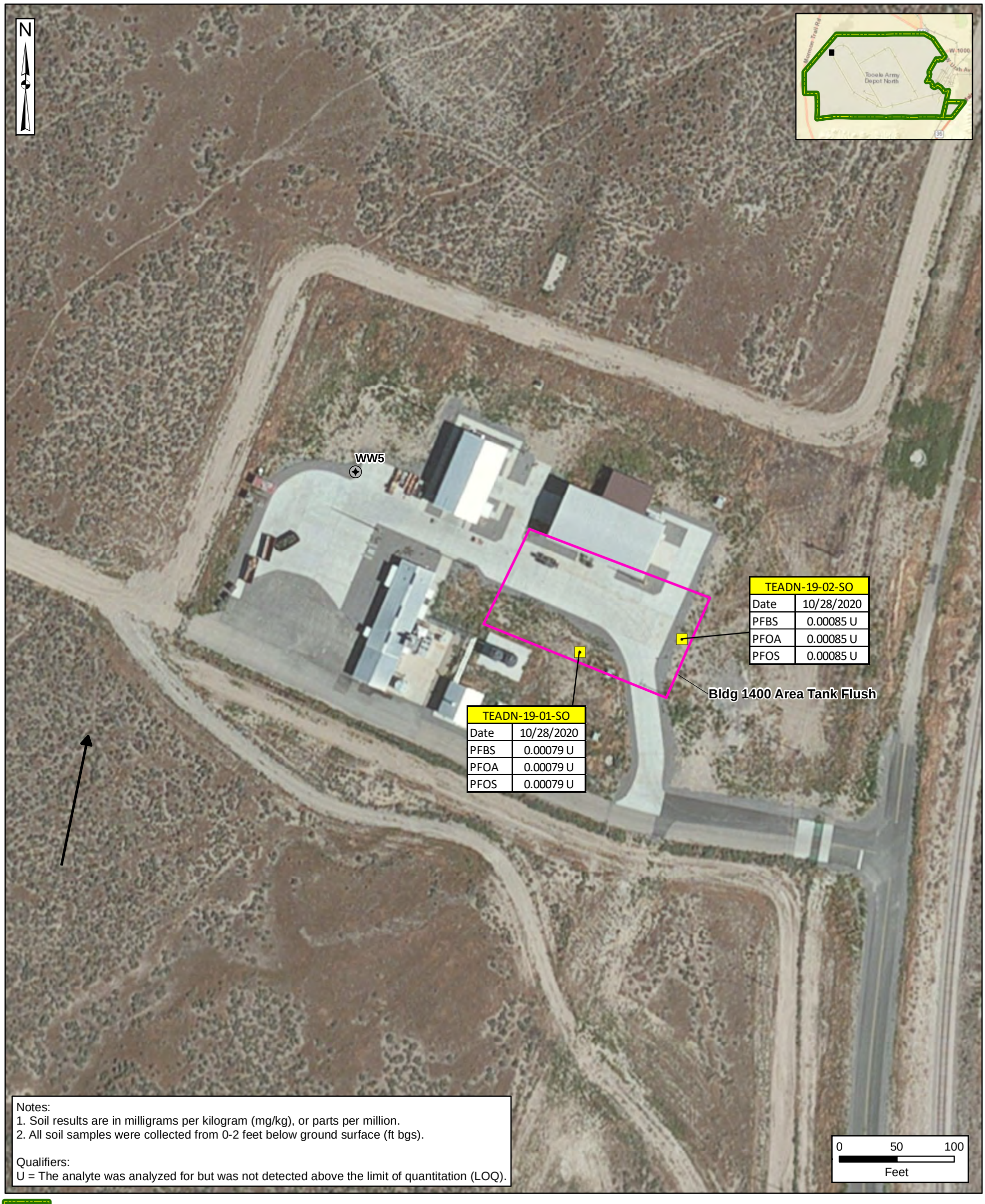
Figure 7-12
PFOS, PFOA, and PFBS Analytical Results for
Building 1400 Area Tank Flush



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

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

Installation Boundary
AOPI Boundary
Groundwater Flow Direction
Potable Well (Inactive)
Soil Sampling Location

AOPI = area of potential interest
Bldg = building
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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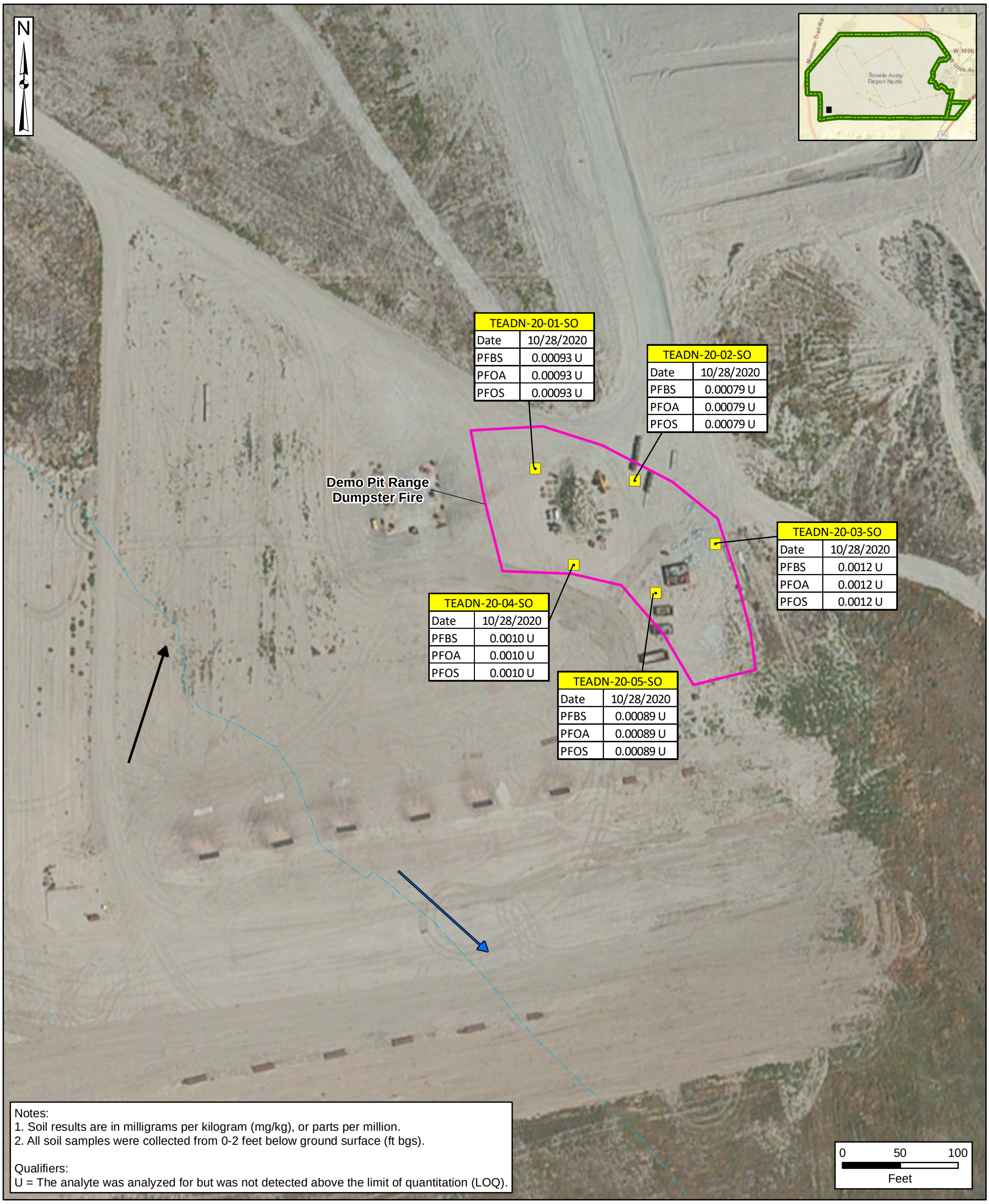
Figure 7-13
PFOS, PFOA, and PFBS Analytical Results for
Demo Pit Range Dumpster Fire



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

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

Installation Boundary
AOPI Boundary
Stream (Intermittent)
Surface Water Flow Direction
Groundwater Flow Direction
Soil Sampling Location

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

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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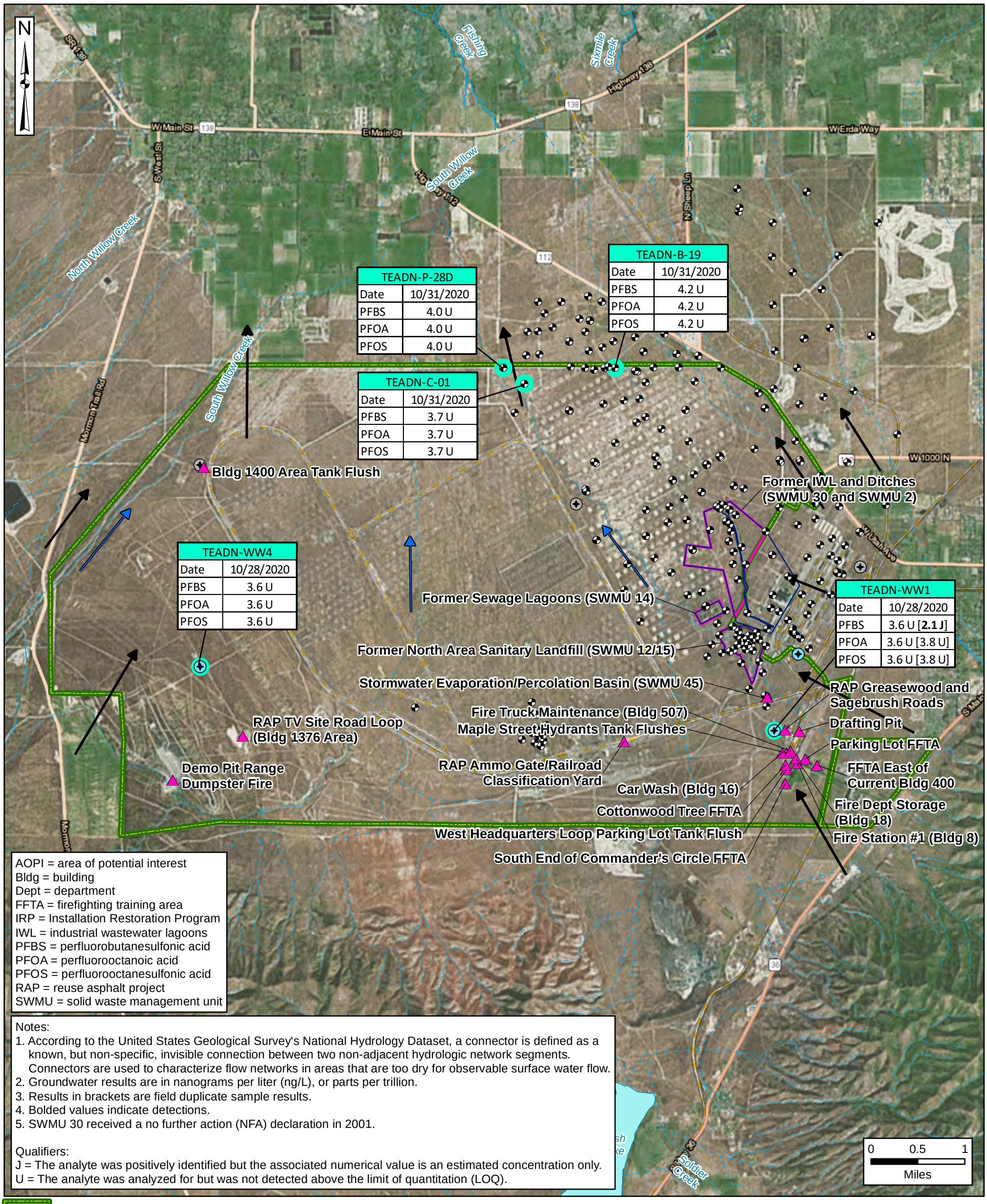
Tooele Army Depot-North, UT

Figure 7-14
PFOS, PFOA, and PFBS Analytical Results for Downgradient Boundary Monitoring Wells



AOPI = area of potential interest
Bldg = building
Dept = department
FFTA = firefighting training area
IRP = Installation Restoration Program
IWL = industrial wastewater lagoons
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RAP = reuse asphalt project
SWMU = solid waste management unit

Notes:
1. According to the United States Geological Survey's National Hydrology Dataset, a connector is defined as a known, but non-specific, invisible connection between two non-adjacent hydrologic network segments. Connectors are used to characterize flow networks in areas that are too dry for observable surface water flow.
2. Groundwater results are in nanograms per liter (ng/L), or parts per trillion.
3. Results in brackets are field duplicate sample results.
4. Bolded values indicate detections.
5. SWMU 30 received a no further action (NFA) declaration in 2001.

Qualifiers:
J = The analyte was positively identified but 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
- River/Stream (Perennial)
- Stream (Intermittent)
- Canal/Ditch
- Connector[1]
- Water Body
- Surface Water Flow Direction
- Groundwater Flow Direction
- IRP Site Boundary
- AOPI Boundary
- AOPI Location
- Potable Well (Active)
- Potable Well (Inactive)
- Monitoring Well
- Groundwater Sampling Location - Existing Well

Data Sources:
Groundwater flow directions, Revised Final Resource Conservation and Recovery Act Facility Investigation Report, Montgomery Watson, 1993.
ESRI ArcGIS Online, Aerial Imagery

Coordinate System:
WGS 1984, UTM Zone 12 North

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 [1]
AFFF Releases to Soil and/or Paved Surfaces				Soil	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○
					Inhalation (dust)	●	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

Notes:
[1] All types of off-installation human receptors include drinking water receptors and recreational users.
[2] The AOPIs addressed by this CSM include: Fire Department Storage (Building 18), Parking Lot Firefighting Training Area (FFTA), FFTA East of Current Building 400, Cottonwood Tree FFTA, South of Commander's Circle FFTA, and Drafting Pit.
AFFF = aqueous film-forming foam
AOPI = area of potential interest
CSM = conceptual site model
PFAS = per- and polyfluoroalkyl substances
USAEC = United States Army Environmental Command

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Conceptual Site Model for Fire Department Storage (Building 18), Parking Lot FFTA, FFTA East of Current Building 400, Cottonwood Tree FFTA, South of Commander's Circle FFTA, and Drafting Pit AOPIs
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Figure 7-15

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 [1]
AFFF Releases to Soil and/or Paved Surfaces				Soil	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯
					Inhalation (dust)	◯	◯	◯	◯
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◯	◯	◯	◯
					Dermal Contact	◯	◯	◯	◯

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

◯ = Incomplete Exposure Pathway

Notes:
[1] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
RAP = Reused Asphalt Project
USAEC = United States Army Environmental Command

ARCADIS

Conceptual Site Model for RAP Greasewood and Sagebrush Roads AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot - North, Utah

Figure 7-16

Source Medium	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	Human Receptors: On-Installation: Resident	Human Receptors: On-Installation: Recreational User	Human Receptors: Off-Installation: 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	◐	○	○	○
	Surface Runoff / Dissolution / Adsorption	Stormwater Drainage System		Intermittent Surface Water in Stormwater Basin [1]	Ingestion	See Figure 7-20 for Conceptual Site Model for the Stormwater Evaporation/Percolation Basin AOPI			
					Dermal Contact				
			Adsorption / Desorption	Sediment/Soil in Stormwater Basin	Ingestion	See Figure 7-20 for Conceptual Site Model for the Stormwater Evaporation/Percolation Basin AOPI			
					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, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
USAEC = United States Army Environmental Command

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Conceptual Site Model for Fire Station #1 (Building 8), Maple Street Hydrants Tank Flushes, and West Headquarters Loop Parking Lot Tank Flush AOPIs

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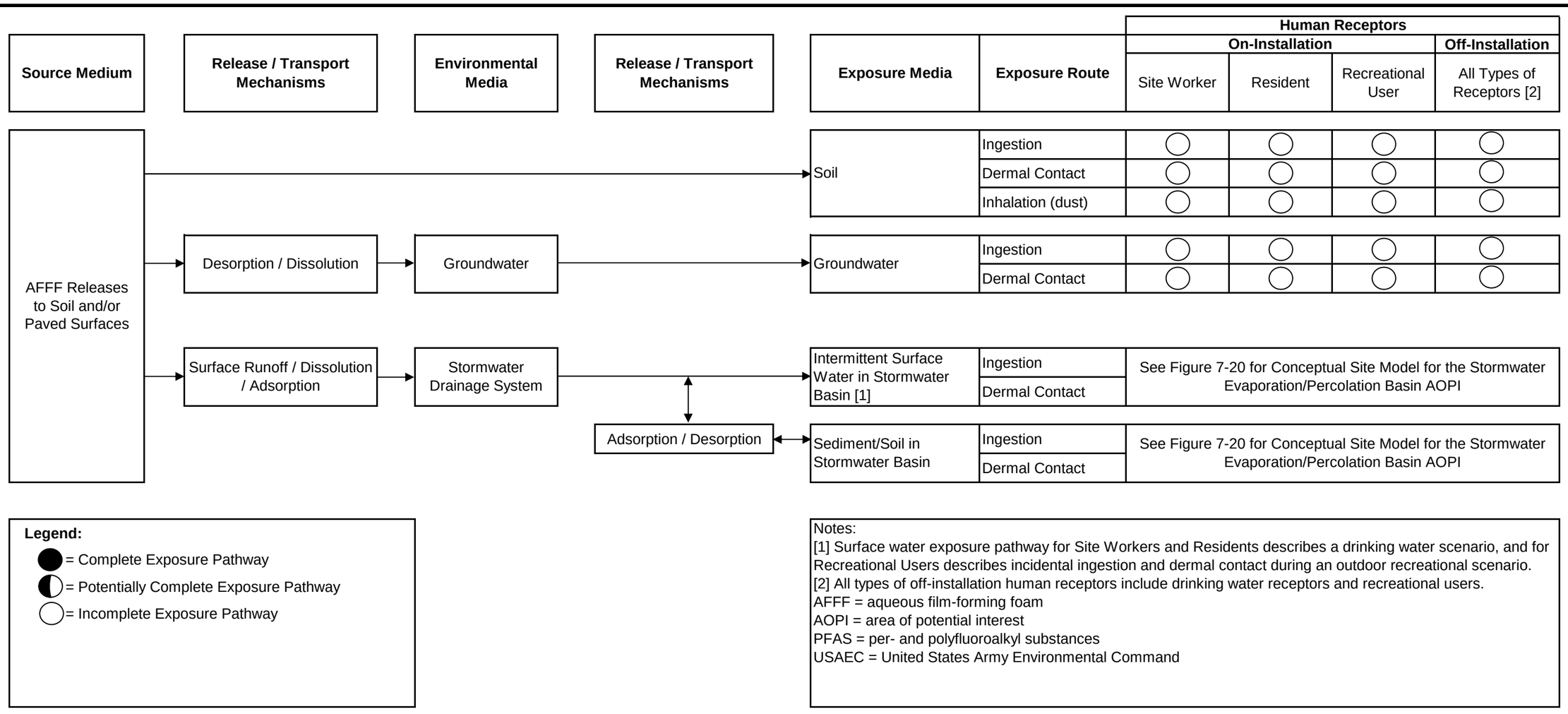
Figure 7-17



Legend:

- = Complete Exposure Pathway
- = Potentially Complete Exposure Pathway
- = Incomplete Exposure Pathway

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
USAEC = United States Army Environmental Command

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Conceptual Site Model for Fire Truck Maintenance (Building 507) and Car Wash (Building 16) AOPIs
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Tooele Army Depot - North, Utah

Figure 7-18

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 [1]
AFFF Releases to Soil and/or Paved Surfaces				Soil	Ingestion	●	○	○	○
					Dermal Contact	●	○	○	○
					Inhalation (dust)	●	○	○	○
	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○

Legend:

● = Complete Exposure Pathway

◐ = Potentially Complete Exposure Pathway

○ = Incomplete Exposure Pathway

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

AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
RAP = Reused Asphalt Project
USAEC = United States Army Environmental Command

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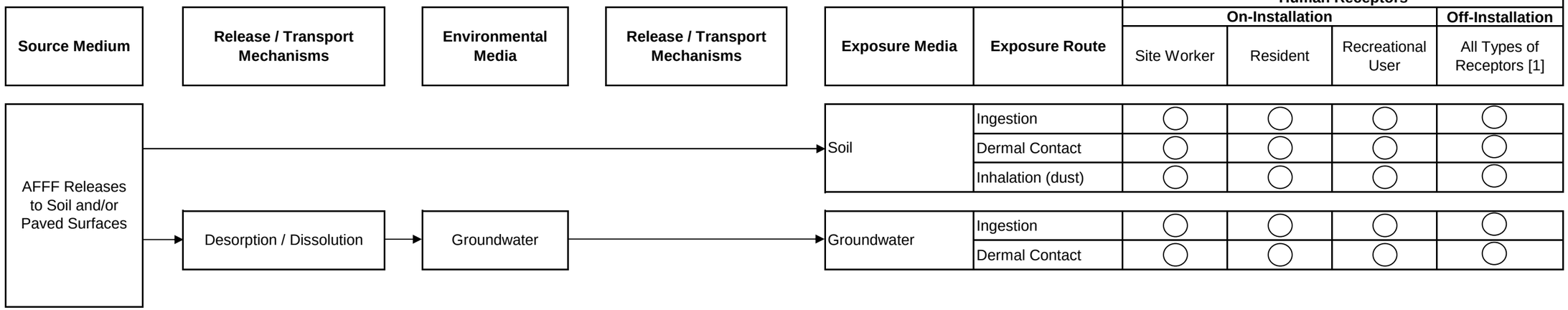
Conceptual Site Model for RAP TV Site Road Loop (Building 1376 Area) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot - North, Utah

Figure 7-19



Legend:

- = Complete Exposure Pathway
- = Potentially Complete Exposure Pathway
- = Incomplete Exposure Pathway

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

AFFF = aqueous film-forming foam
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
RAP = Reused Asphalt Project
USAEC = United States Army Environmental Command

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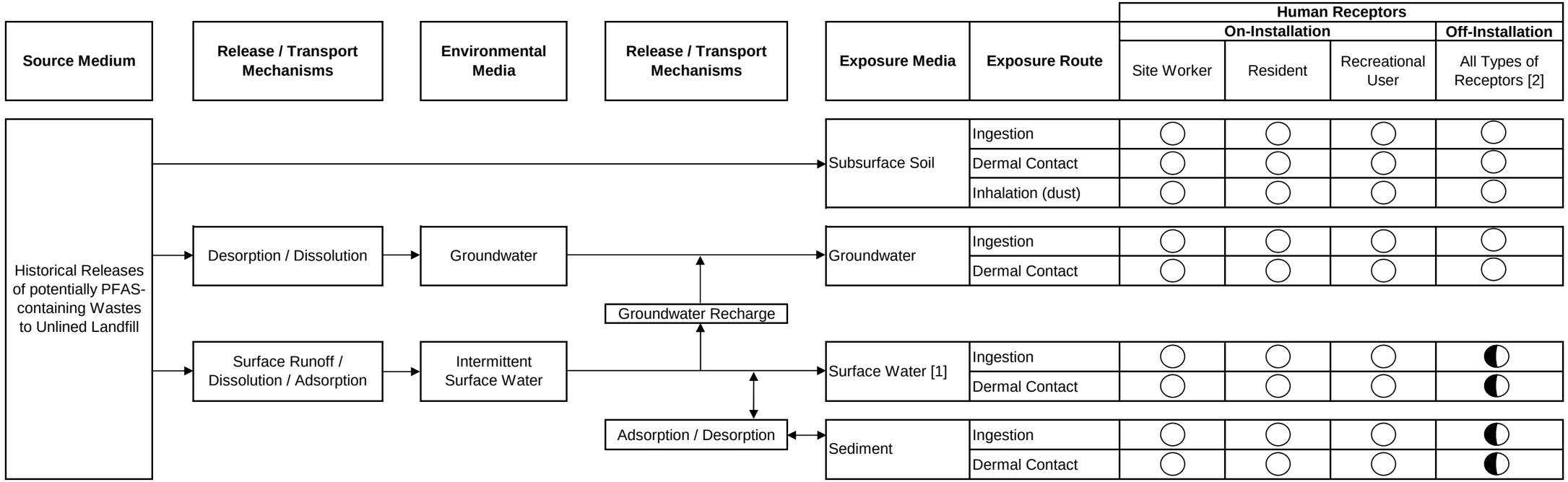
Conceptual Site Model for Building 1400 Area Tank Flush, RAP Ammo Gate / Railroad Classification Yard, and Demo Pit Range Dumpster Fire AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-20



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

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Conceptual Site Model for the Former North Area Sanitary Landfill (SWMU 12/15) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
Tooele Army Depot - North, Utah

Figure 7-21

Source Media	Release / Transport Mechanisms	Environmental Media	Release / Transport Mechanisms	Exposure Media	Exposure Route	Human Receptors: On-Installation: Site Worker	On-Installation: Resident	On-Installation: Recreational User	Off-Installation: All Types of Receptors [2]
Historical Releases of potentially PFAS-containing wastewater to Evaporation / Infiltration Areas, Ditches, or Lagoon	Desorption / Dissolution	Groundwater		Groundwater	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○
			Groundwater Recharge						
				Surface Water (Currently Dry) [1]	Ingestion	◐	○	○	○
					Dermal Contact	◐	○	○	○
			Adsorption / Desorption	Sediment/Soil of Former Basin or Lagoon	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, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

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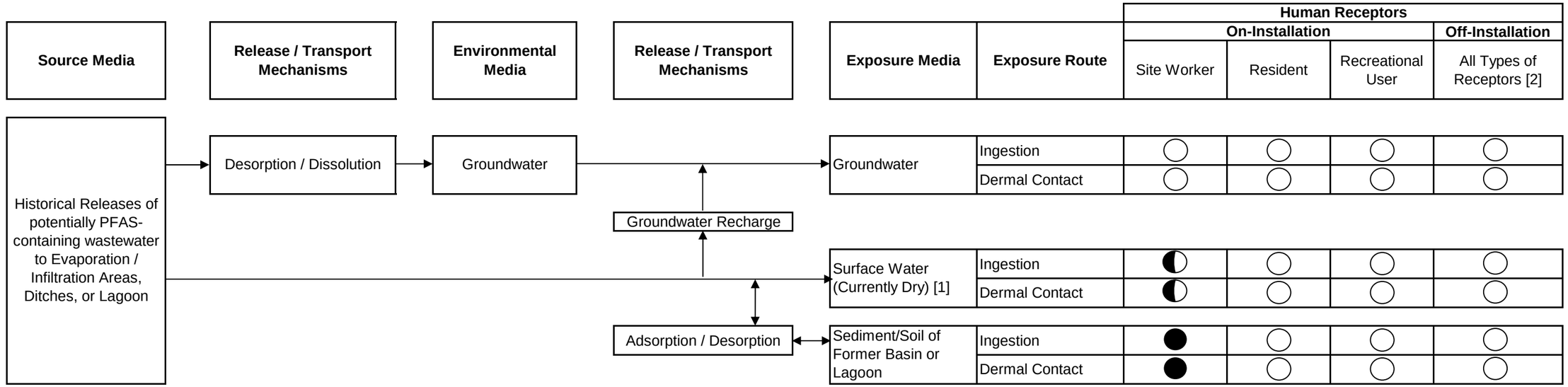
Conceptual Site Model for the Stormwater Evaporation/Percolation Basin (SWMU 45) and Former Industrial Waste Lagoon and Ditches (SWMU 30 and SWMU 2) AOPIs
USAEC PFAS Preliminary Assessment / Site Inspection

Figure 7-22



Legend:

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

Notes:
[1] Surface water exposure pathway for Site Workers and Residents describes a drinking water scenario, and for Recreational Users describes incidental ingestion and dermal contact during an outdoor recreational scenario.
[2] All types of off-installation human receptors include drinking water receptors and recreational users.
AOPI = area of potential interest
PFAS = per- and polyfluoroalkyl substances
SWMU = solid waste management unit
USAEC = United States Army Environmental Command

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Conceptual Site Model for the Former Sewage Lagoons (SWMU 14) AOPI
USAEC PFAS Preliminary Assessment / Site Inspection
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Figure 7-23

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