SITE INSPECTION REPORT FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT TOOELE ARMY DEPOT – NORTH BRAC TOOELE, UTAH

Prepared for:

U.S. ARMY

ODCS, G-9, ISE BRAC

Final
November 2023

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Contract Number W912DR-18-D-0003
Delivery Order Number W912DR21F0140

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Final
November 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

AFFF	Aqueous Film-Forming Foam
amsl	Above Mean Sea Level
AOPI	Area of Potential Interest
Army	U.S. Army
BRAC	Base Realignment and Closure
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMF	Consolidated Maintenance Facility
CoC	Chain-of-Custody
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
DUA	Data Usability Assessment
EDC	Economic Development Conveyance
EIS	Extracted Internal Standard
EDR	Environmental Data Resources, Inc.
EGLE	Department of Environment, Great Lakes, and Energy
GAC	Granular Activated Carbon
gpd	Gallons per Day
HDPE	High-Density Polyethylene
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid
HQ	Hazard Quotient
ID	Identifier
IDW	Investigation-Derived Waste
IPaC	Information for Planning and Consultation
ITRC	Interstate Technology & Regulatory Council
IWL	Industrial Waste Lagoon
IWTP	Industrial Wastewater Treatment Plant
LC/MS/MS	Liquid Chromatography with Tandem Mass Spectrometry
LCS	Laboratory Control Sample
LOD	Limit of detection
LOQ	Limit of Quantitation
LUC	Land Use Control
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OSD	Office of the Secretary of Defense
P.E.	Professional Engineer
P.G.	Professional Geologist
PA	Preliminary Assessment
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonate
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMP	Project Management Professional
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RDA	Redevelopment Agency
REM	Registered Environmental Manager
RPD	Relative Percent Difference
RSL	Regional Screening Level
SDG	Sample Delivery Group
SI	Site Inspection
SL	Screening Level
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
T&E	Threatened and Endangered
TCLP	Toxicity Characteristic Leaching Procedure
TEAD-N	Tooele Army Depot-North
TEAD-S	Tooele Army Depot-South
U.S.C.	United States Code
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

The U.S. Army (Army) is conducting Preliminary Assessments (PAs) and Site Inspections (SIs) to determine the use, storage, disposal, or release of per- and polyfluoroalkyl substances (PFAS) at multiple Base Realignment and Closure (BRAC) installations, nationwide. This report documents SI activities conducted for 12 areas of potential interest (AOPIs) at the Tooele Army Depot-North BRAC in Tooele, Utah (herein referred to as TEAD-N BRAC). AOPIs were identified during the PA phase for investigation through groundwater sampling in an SI phase to determine whether a PFAS release occurred. Activities were completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601, et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2700, et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] Part 300); Army and U.S. Department of Defense (DoD) policy and guidance; and U.S. Environmental Protection Agency (USEPA) guidance.

The PA identified areas where PFAS-containing materials were used, stored, and/or disposed of, or areas where known or suspected releases to the environment occurred. Based on recommendations from the PA, groundwater samples were collected from or directly downgradient from the 12 AOPIs. Supplementary groundwater samples were also collected from existing monitoring wells at or near the former TEAD-N BRAC boundary to evaluate the potential for PFAS migration at the former TEAD-N BRAC facility boundary. Soil samples were not proposed as part of this SI due to limited exposure (i.e., paved surfaces) and extensive redevelopment and/or reworking of the property. In addition, access to exercise intrusive sampling activities was unavailable at the time of the SI. The field investigation at TEAD-N BRAC was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). Samples collected during this SI were analyzed for PFAS using procedures compliant with the DoD Quality Systems Manual (QSM) Version 5.4, Table B-15 (DoD 2021) and the laboratory standard operating procedure (SOP).

To determine if future investigation was warranted at each AOPI, this SI followed established USEPA guidance and DoD policy and guidance for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) (also known as GenX) (DoD 2022a). Samples collected during this SI were compared to risk screening levels (SLs) established as the residential scenario SLs calculated using the USEPA regional screening level (RSL) calculator for the tap water criteria for groundwater and published in the 2022 Office of the Secretary of Defense (OSD) Memorandum (DoD 2022a). As PFAS are a large grouping consisting of thousands of individual chemicals, PFOA, PFOS, PFBS, PFNA, PFHxS, and HFPO-DA altogether will be referred to in this report as "Target PFAS."

Conceptual site models (CSMs) were developed during the PA and then updated for each AOPI where Target PFAS were detected at concentrations greater than the limit of detection (LOD). The updated CSMs detail site geological conditions; determine primary and secondary release mechanisms; identify potential human receptors; and detail complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios. PFAS were detected in groundwater at 6 of the 12 AOPIs. Target PFAS concentrations on the TEAD-N BRAC property did not exceed SLs in groundwater at or directly downgradient from any of the 12 AOPIs. Target PFAS concentrations exceeded the SLs in one well along the former TEAD-N BRAC facility boundary; however, the well is on TEAD-N (Active Army) property. PFNA and HFPO-DA were not detected at any AOPI. Figure ES-1 depicts the facility-wide map of AOPIs and PFAS groundwater results, including the distribution of Target PFAS detections and proximity to facility boundaries.

Table ES-1 summarizes the AOPIs investigated during the SI and recommendations for further investigation.

Table ES-1. Summary of AOPIs and Recommendations for Further Investigation

AOPI Name	Exceedance of SLs	Recommendation
	Groundwater	
Metal Plating Operations at Buildings 600, 609, 611, 614, 615, 618, 620, and 637	No	Further investigation not recommended
Building 602 (Maintenance Shop)	No	Further investigation not recommended
Building 616 (Fire Station)	No	Further investigation not recommended
Building 619 (Vehicle Maintenance Facility)	No	Further investigation not recommended
Building 632/738 CMF	No	Further investigation not recommended
Combat Vehicle Test Facility	No	Further investigation not recommended
DRMO Storage Yard	No	Further investigation not recommended
90-Day Drum Storage Area and Drum Storage Area	No	Further investigation not recommended
Chromic Acid/Alodine Drying Beds	No	Further investigation not recommended
Industrial Wastewater Piping System	No	Further investigation not recommended
Former IWL and Ditches	No	Further investigation not recommended
Former IWTP	No	Further investigation not recommended
The SL exceedance in groundwater along the western boundary of TEAD-N BRAC is located on Active Army property; therefore, further investigation is not recommended to evaluate the potential for offsite PFAS migration at the boundary.		

1. INTRODUCTION

The U.S. Army (Army) is conducting Preliminary Assessments (PAs, 40 Code of Federal Regulations [CFR] §300.420(b)) and Site Inspections (SIs, 40 CFR §300.420(c)) to investigate the presence or release of per- and polyfluoroalkyl substances (PFAS), by investigating the use, storage, or disposal of PFAS at multiple Base Realignment and Closure (BRAC) installations, nationwide. This SI is focused on the Tooele Army Depot-North BRAC property (herein referred to as TEAD-N BRAC), and was conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] §9601 et seq.); the Defense Environmental Restoration Program (DERP, 10 U.S.C. §2701 et seq.); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300); Army and U.S. Department of Defense (DoD) policy and guidance; and U.S. Environmental Protection Agency (USEPA) guidance. The former TEAD-N was officially named to the National Priorities List (NPL) on February 16, 1990, and the Army is responsible for compliance with CERCLA in accordance with Executive Order 12580, as amended.

The BRAC parcel at TEAD-N consists of two non-contiguous parcels: the Maintenance and Supply Area and the Administration Area. The entire Maintenance and Supply Area was evaluated for this SI (i.e., TEAD-N BRAC). The Administration Area includes the main entrance to TEAD-N and falls within the active installation boundary for TEAD-N. As a result, the Administration Area was evaluated previously during the PFAS PA/Site Inspection (SI) for TEAD-N (Active Army) (Arcadis 2022); therefore, it was not evaluated as part of this SI.

Based on results of the TEAD-N BRAC PFAS PA (Leidos 2023b), multiple areas of potential interest (AOPIs) were identified for investigation through groundwater sampling in an SI to determine whether a PFAS release occurred. Soil samples were not proposed as part of this SI due to limited exposure (i.e., paved surfaces) and extensive redevelopment and/or reworking of the property. In addition, access to exercise intrusive sampling activities was unavailable at the time of the SI. TEAD-N is in Tooele, Utah, as shown in Figure 1-1. TEAD-N BRAC is bounded by the active Army installation to the west and south, rangeland grazing and Tooele City to the east, and rangeland grazing and a closed Tooele County Municipal Landfill to the north (USACE 2018). The entire TEAD-N BRAC is referred to as the "site," "facility," or "installation" throughout this document. Any references to "offsite" refers to areas that are outside the TEAD-N BRAC property. Nomenclature of "TEAD-N (Active Army)" indicates that it is the active installation and not part of this investigation.

1.1 SCOPE AND OBJECTIVES

The overall objective of the SI is to determine the presence or absence of PFAS at each AOPI. This SI Report uses the findings from the PA in conjunction with groundwater sampling data to determine whether PFAS have been released to the environment and whether a release has affected or may affect specific human health targets. Furthermore, the SI evaluates and summarizes the need for additional investigation (40 CFR §300.420(c)(1)).

The SI scope included preparation of project planning documents, field investigation, validation and management of analytical data, comparison of analytical data to the Office of the Secretary of Defense (OSD) screening levels (SLs) published in the 2022 OSD Memorandum (DoD 2022a), and documentation of the investigation results. This SI was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). The field activities followed site-specific sampling and health and safety protocols, as identified in the Programmatic Accident Prevention Plan (Leidos 2022b) and the TEAD-N BRAC Site Safety and Health Plan (Appendix A of the TEAD-N BRAC UFP-QAPP Addendum [Leidos 2023a]).

1.2 TEAD-N DESCRIPTION

TEAD comprises two geographically separated facilities: TEAD-N and TEAD-South (TEAD-S). TEAD-S is approximately 18 miles south of TEAD-N and is not part of this SI.

TEAD-N is located west of Tooele City, Utah. Prior to BRAC transfer, TEAD-N occupied more than 24,700 acres. In 1993, TEAD-N was placed on the list of facilities scheduled for realignment under the BRAC program, and by 1998, approximately 1,700 acres were transferred to the Redevelopment Agency of Tooele City (USACE 2018). The remainder of the property was retained by the Army. The approximately 1,700-acre BRAC property was composed of two non-contiguous parcels (USAEC 1994). The larger of the two parcels excessed (approximately 1,200 acres) is in the northeastern portion of TEAD-N and included the Maintenance and Supply Area (TEAD-N BRAC). The smaller parcel (approximately 500 acres) is in the Administration Area and includes the main entrance to TEAD-N (Active Army) (Figure 1-1).

During the development of the PA, historical records, interviews, aerial photographic analysis, site reconnaissance, available documentation, and physical evidence were reviewed to determine where PFAS-containing materials may have previously been stored, used, or disposed of (40 CFR §300.420(b)(5)). For TEAD-N BRAC, the sites evaluated include fire stations, fire training areas, landfills, plating operations, wastewater treatment plants (WWTPs), pesticide facilities, vehicle maintenance shops, paint shops, and photographic processing facilities. The TEAD-N BRAC PFAS PA recommended 12 AOPIs for further investigation in an SI due to known or potential historical PFAS-containing material use, storage, or disposal. The AOPIs, as well as the dates of operation and size of each area, are presented in Table 1-1 and illustrated in Figure 1-2.

Table 1-1. List of AOPIs at TEAD-N BRAC

AOPI Name	Dates of Operation	Size (acres)
Metal Plating Operations at Buildings 600, 609, 611, 614, 615, 618, 620, and 637	Various	7.4
Building 602 (Maintenance Shop)	1943 to Unknown	0.54
Building 616 (Fire Station)	1943 to 1977	0.08
Building 619 (Vehicle Maintenance Facility)	1943 to Unknown	4.48
Building 632/738 CMF	1992 to 1996	9.17
Combat Vehicle Test Facility	Early 1960s to Unknown	50.02
DRMO Storage Yard	Mid-1950s to Unknown	61.27
90-Day Drum Storage Area and Drum Storage Area	Unknown	15.33
Chromic Acid/Alodine Drying Beds	Unknown	6.51
Industrial Wastewater Piping System	Unknown	239.94
Former IWL and Ditches	1942 to 1988	157.38
Former IWTP	1988 to 2015	3.72

1.3 REPORT ORGANIZATION

The contents of the remaining sections of this SI Report are summarized below:

- ***Section 2. Environmental Setting***—This section discusses the environmental setting at TEAD-N. Demographics, land use, geology, hydrogeology, hydrology, soil, and climate are described.
- ***Section 3. Field Investigation Activities***—This section provides field procedures followed during the implementation of the SI.
- ***Section 4. Data Analysis and Quality Assurance Summary***—This section describes the laboratory chemical analysis program for the investigation. Sample handling procedures, laboratory equipment calibration, laboratory analytical methods, data reporting and validation, and sample data quality assurance (QA)/quality control (QC) are discussed.

- ***Section 5. Site Inspection Screening Levels***—This section presents the Target PFAS with SLs outlined in the 2022 OSD Memorandum (DoD 2022a) and the SLs to which SI results are compared.
- ***Section 6. Site Inspection Results***—This section presents the data gathered during the SI activities and updated conceptual site models (CSMs).
- ***Section 7. Conclusions and Recommendations***—This section summarizes the SI conclusions and presents recommendations for the TEAD-N BRAC AOPIs.
- ***Section 8. References—***This section lists the references that were used in the preparation of this report.
- ***Appendices***—Appendices A through G include data from field activities or related assessments:
  - Appendix A. Daily Field Summary Notes
  - Appendix B. Photograph Log
  - Appendix C. Field Activity Logs
  - Appendix D. Sampling Forms and Calibration Logs
  - Appendix E. Investigation-Derived Waste (IDW) Documents
  - Appendix F. Data Usability Assessment (DUA)
  - Appendix G. Data Presentation Tables.

2. ENVIRONMENTAL SETTING

This section provides general information about TEAD-N, including the site location, operational 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 is composed of two geographically separated facilities: TEAD-N and TEAD-S. TEAD-S is approximately 18 miles south of TEAD-N and is not part of the SI (Rust 1998). TEAD-N is approximately 35 miles southwest of Salt Lake City in the Tooele Valley in Tooele County, Utah. South Mountain and Stockton Bar are located south of TEAD-N, and the Stansbury and Oquirrh Mountains are located west and east, respectively. Great Salt Lake is to the north of TEAD-N.

2.2 SITE OPERATIONAL HISTORY

TEAD was established as the Tooele Ordnance Depot by the U.S. Army Ordnance Department on April 7, 1942. During World War II, TEAD was a backup depot for the Stockton Ordnance Depot and Benicia Arsenal, both in California. Vehicles, small arms, and other equipment for export were stored at TEAD in addition to operating as a prisoner of war camp. During the Korean War, TEAD manufactured, rebuilt, and repaired various military equipment. After the Korean War in 1953, obsolete bombs and ammunition were destroyed at TEAD. In 1962, the depot was redesignated as Tooele Army Depot and became one of the major ammunition storage and equipment maintenance installations in the United States. Maintenance mission responsibilities for topographic equipment, troop support items, construction equipment, power generators, and serviceable assets continued throughout the 1970s. In 1988, the BRAC Commission realignment of Pueblo Army Depot, near Pueblo, Colorado, moved Pueblo's general supply storage mission to TEAD (U.S. Army 2020). The major missions of TEAD have included the maintenance, renovation, and storage of vehicles and the storage, issuance, and disposal of munitions.

In 1993, TEAD-N was placed on the list of facilities scheduled for realignment and closure under the BRAC program, and by 1998, approximately 1,700 acres were transferred to the Redevelopment Agency of Tooele City (USACE 2018). The final transfer was completed in 2002. Approximately 23,000 acres remain active under Army control as an active installation. The approximately 1,700-acre BRAC property was composed of two non-contiguous parcels (USAEC 1994). The larger of the two parcels (approximately 1,200 acres) was in the northeastern portion of TEAD-N and included the Maintenance and Supply Area, which was the focus of this SI (i.e., TEAD-N BRAC). The smaller parcel (approximately 500 acres) was in the Administration Area and includes the main entrance to TEAD-N. The Army is currently leasing this parcel, which is within the active installation boundary, and it is not part of this investigation.

2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE

The area surrounding TEAD-N is largely undeveloped, primarily consisting of grazing land and industrial use. In 2020, the U.S. census reported a population of 72,698 for Tooele County with approximately 36,000 people residing in the Tooele City (U.S. Census Bureau 2020).

The two non-contiguous parcels that make up the BRAC property at TEAD-N were transferred via an Economic Development Conveyance (EDC) regulated under the Conditions, Covenants, and Restrictions (U.S. Army 1998). In September 1996, the Army transferred the 41.2-acre Consolidated Maintenance Facility (CMF) to the Redevelopment Agency (RDA) of Tooele City, and in December 1998, the Army transferred an additional 1,620.1 acres to the RDA (U.S. Army 2020). In June 2002, a 0.8-acre parcel was transferred to the Tooele Federal Credit Union. Conditions and restrictions have been placed on all transferred parcels, limiting use of the property until such time that the required remedial actions have been

completed. Residential use will not be allowed on certain portions of the BRAC property on a long-term basis. Transferees may not access or extract groundwater, nor inject any materials into wells on these defined parcels. These restrictions prohibit groundwater use for all areas of the TEAD-N BRAC property except for the parcel that contains the CMF (Building 632/738) and Chromic Acid/Alodine Drying Beds (U.S. Army 1998, USACE 2018).

After a series of ownership changes, the Maintenance and Supply Area (TEAD-N BRAC) property sold to Ninigret Group, LLC in 2013, and Peterson Holdings was hired as the property management company. In 2014, Peterson Holdings purchased portions of the property from Ninigret Group. Peterson Industrial Depot, the property managed by Peterson Holdings, consists of 44 separate buildings totaling approximately 2.3 million square feet of industrial/warehouse space, a rail service for tenants of the industrial depot, and approximately 288,000 square feet of storage space (PID 2022). Ninigret Group also manages more than 2 million square feet of industrial buildings and land as part of the Ninigret Depot. Approximately 60 tenants currently occupy Ninigret Depot, including Detroit Diesel, Utah Transit Authority, Walmart, Utah Fabrication, the Tooele City School District, and a Cabela's distribution facility (Ninigret 2022). The current and future land use at TEAD-N BRAC is industrial.

2.4 TOPOGRAPHY

Topography of TEAD-N is flat with a general surface elevation of 4,700 feet above mean sea level (amsl) and slopes that gradually trend toward the center of the installation and the north (USACE 2018). Ground surface elevation at TEAD-N BRAC ranges from approximately 4,900 feet amsl in the southern portion of the property to approximately 4,750 feet amsl in the northern portion of the property (Figure 2-1).

2.5 GEOLOGY

TEAD-N is in the Great Salt Lake Basin, which is characterized by large fault-block mountains that trend north-south and form interior basins bounded by fault-block mountain ranges (USACE 2018). TEAD-N is on the southern side of Tooele Valley, a structural depression filled with unconsolidated and semi-consolidated sequences of Tertiary- and Quaternary-aged sediments that range from clay to coarse gravel. The valley sediments range from a few feet thick at the edges of the valley to thousands of feet thick in the central part of the valley. Mountains border the valley to the east, south, and west. Great Salt Lake is located on the northern side. The Oquirrh Mountains to the east and South Mountain to the south primarily are composed of extensively folded and faulted, alternating beds of quartzite and limestone of late Mississippian, Pennsylvanian, and early Permian age. The Stansbury Mountains located to the west have similar bedrock units except for the addition of Cambrian aged Quartzite (Montgomery Watson 1993).

Bedrock beneath TEAD-N consists of alternating quartzite and limestone beds similar to units identified in the mountain ranges. The depth to bedrock at TEAD-N ranges from outcrops visible at the ground surface (outcrops in the northeastern corner of the facility and along the southern boundary of the installation) to more than 2,000 feet below ground surface (bgs) in the south-central portion of the installation (Arcadis 2022). Depth to bedrock at the TEAD-N BRAC property ranges from approximately 1,500 feet bgs in the southern portion of the property to approximately 600 feet bgs in the northern portion of the property (Montgomery Watson 1997).

2.6 HYDROGEOLOGY

The regional groundwater flow system includes the Rush and Tooele Valleys. Groundwater is primarily found in the alluvial valley deposits. Groundwater beneath TEAD-N occurs under unconfined, confined, and perched conditions in either the bedrock or the alluvial aquifers (Ageiss 1994a).

Fractures and weathered rock make up 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 (Arcadis 2022).

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 and is generally unconfined but becomes confined toward the north. 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 (Arcadis 2022).

Groundwater generally flows from the southeast to the northwest (Figure 2-1), toward the center of the valley and eventually toward Great Salt Lake. Groundwater levels across TEAD-N range from approximately 4,500 feet amsl in the southeastern (upgradient) portion of the site to 4,300 feet amsl in the northwestern (downgradient) portion. Depth to groundwater ranges from approximately 700 feet bgs in the southwestern side of the installation to 400 feet bgs at the eastern side of the installation to 300 feet bgs along the northern boundary (USEPA 2013). Depth to groundwater at the TEAD-N BRAC property averages approximately 362 feet bgs (Brice Engineering, LLC 2021).

Groundwater recharge primarily comes from infiltration that occurs in the surrounding mountains. Across most of the valley, recharge to groundwater from vertical infiltration of precipitation tends to be minimal, due to losses from evapotranspiration (USACE 2013). However, the absence of vegetation and prevalence of impervious surfaces in industrialized areas such as TEAD-N BRAC have reduced evapotranspiration and concentrated precipitation to the extent that some infiltration to groundwater does occur.

2.7 SURFACE WATER HYDROLOGY

Surface water features are limited at TEAD-N due to the arid nature of the region. No major surface water bodies are in Tooele Valley, and surface water is not used as a drinking water source at TEAD-N. Precipitation that lands on the valley floor is typically consumed by evapotranspiration. Excess runoff either infiltrates into the subsurface or becomes overland runoff in the streams that drain the mountains (Arcadis 2022, Gardner and Kirby 2011), but water from these streams is generally diverted for irrigation prior to entering the installation. Drainage at TEAD-N typically flows from south to north along natural stream beds, and drainage courses during periods of heavy rainfall and/or rapid snow melt (USACE 2013).

2.8 WATER USAGE

TEAD-N (Active Army) operates its own water supply and distribution system, located on the eastern side of the Tooele Valley, that is sourced from groundwater. Three potable supply wells (WW1, WW3, and WW4) and two non-potable wells (WW5 and WW6) are located at TEAD-N (USDOHHS 2003). However, TEAD-N BRAC receives its water from Tooele City. The water rights for well WW2, located on the BRAC parcel, were transferred to Tooele City in January 1999. The well was used for irrigation purposes by Tooele County (USDOHHS 2003) and has since been abandoned according to personnel interviews conducted for the TEAD-N BRAC PA. A deed restriction is in place prohibiting groundwater use for all areas of TEAD-N BRAC except for the parcel that contains the CMF (Building 632/738) (U.S. Army 1998).

Groundwater beneath TEAD-N flows to the northwest, exiting the installation beneath the facility's northern boundary. Several large irrigation and livestock supply wells, located north of TEAD-N, are often pumped during the summer, which can locally impact the groundwater flow system near TEAD-N. Tooele City operates several production wells that draw water from the valley east of the installation's eastern boundary. A 1993 study estimated that the groundwater usage at TEAD-N accounts for 4 percent of the total water use within the Tooele Valley (Montgomery Watson 1993). The Environmental data Resources, Inc. (EDR) report did not identify any public supply wells within 1 mile of TEAD-N BRAC's northern boundary (EDR 2021).

2.9 ECOLOGICAL PROFILE

TEAD-N BRAC consists of approximately 1,200 acres and lies within the Sagebrush Basins and Slopes ecoregion of the Central Basin and Range. TEAD-N BRAC is developed and currently contains commercial businesses, storage warehouses, various maintenance facilities, storage areas, railroads, and open fields. The open fields provide some habitat for wildlife at TEAD-N BRAC.

Flora—The general lack of precipitation during the summer months limits plant life to several drought resistant or tolerant species (Arcadis 2022). Six plant communities were identified on TEAD-N in undisturbed areas: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), pinyon-Utah juniper (mix of *Pinus* spp. and *Juniperus osteosperma*), Utah juniper, black greasewood (*Sarcobatus vermiculatus*), and basin wildrye (*Leymus cinereus*) (U.S. Army 2020).

TEAD-N BRAC has been characterized as Pinon-Utah Juniper communities, which contains bluebunch wheatgrass (*Pseudoroegneria spicata*), cheatgrass (*Bromus tectorum)*, mountain big sagebrush (*Artemisia tridentata*), Utah juniper (*Juniperus osteosperma*), and yellowbrush (mix of specie). Important plant species include black sagebrush (*Artemisia nova*), bluegrass (*Poa pratensi)*, and antelope bitterbrush (*Purshia tridentata*) (Ageiss 1994a). No forests or wetlands are present at TEAD-N BRAC (NWI 2023).

Fauna—Nearly 70 species of mammals have been observed at TEAD-N, and approximately 20 more are expected to inhabit the area (Tetra Tech 2015). Large mammal species that have been found at TEAD-N include pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), porcupine (*Erethizon dorsatum*), and striped skunk (*Mephitis mephitis*). Small mammal species occurring on TEAD-N include shrews (*Sorex* spp.); bats (multiple genera); squirrels, ground squirrels, and chipmunks (multiple genera), rabbits and hares (multiple genera), gophers (*Thomomys* spp.), kangaroo rats (*Dipodomys* spp.), and pocket mice (*Perognathus* spp.) (Tetra Tech 2015).

Six species of reptiles and more than 60 species of birds have been observed at TEAD-N (Tetra Tech 2015). Common bird species that occur at TEAD-N, among many others, include the western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), lark sparrow (*Chondestes grammacus*), common raven (*Corvus corax*), barn swallow (*Hirundo rustica*), and mourning dove (*Zenaida macroura*) (Tetra Tech 2015).

Rare, Threatened, and Endangered Species—The Endangered Species Act provides protection for species that are federally listed as threatened and endangered (T&E). There were no federally listed T&E species identified by the U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System Information for Planning and Consultation (IPaC) tool as potentially occurring on TEAD-N BRAC (USFWS 2023). The monarch butterfly (*Danaus plexippus*) is a candidate species that was identified by IPaC as potentially occurring (USFWS 2023). The potential for this candidate species to occur does not mean the species is present at TEAD-N BRAC. Showy milkweed (*Asclepias speciosa*) is a host plant for the monarch butterfly that is present at TEAD-N but may not be present at TEAD-N BRAC. No specific information is available on the presence of monarch butterflies at TEAD-N BRAC.

Five migratory birds of particular concern are identified by the IPaC tool as potentially occurring on TEAD-N BRAC (USFWS 2023). These birds include the American white pelican (*Pelecanus erythrorhynochos*), bald eagle (*Haliaeetus leucocephalus*), California gull (*Larus californicus*), Cassin's finch (*Carpodacus cassinii*), and evening grosbeak (*Coccothraustes vespertinus*) (USFWS 2023).

2.10 CLIMATE

Tooele, Utah is classified as a hot summer continental climate and experiences large seasonal temperature differences. Precipitation is distributed year-round, with occasional wintertime droughts occurring in regions with this climate. June, July, and August are the warmest months in Tooele, with the highest

temperatures occurring in July at a monthly average temperature of 76.6°F. However, the humidity levels are very low and relatively constant year-round. The coldest period in Tooele occurs in January, with average temperature of 29.8°F. The rainy period of the year lasts for 11 months (August through June) and typically experiences the most rainfall in May, with an average 1.5 inches (Weather Spark 2022). Snowfall typically occurs from November to April and averages a monthly high of 4.9 inches in December. The average hourly wind speed in Tooele experiences seasonal variation but the windier part of the year typically occurs from February to July. The highest wind speeds occur in April, with an average hourly wind speed of 7.8 miles per hour (Weather Spark 2022).

3. FIELD INVESTIGATION ACTIVITIES

This section provides field procedures followed during the implementation of the SI (40 CFR §300.420(c)(4)(i)). The principal guidance documents for the field investigation activities and procedures used for the TEAD-N BRAC SI were consistent with the requirements presented in the Army *Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (U.S. Army 2018).

3.1 SITE INSPECTION DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) were developed to define the problem at the AOPIs, identify the necessary decisions, specify decision-making rules and the level of confidence necessary to resolve the problem, identify the number of samples necessary to support the decision, and obtain agreement from the decision makers before the sampling program was initiated. The TEAD-N BRAC sample locations were determined based on current site conditions (i.e., groundwater flow direction), location of existing monitoring wells, historical data (e.g., suspected location of PFAS release), and historical activities (e.g., remedial activities, disposal of potentially contaminated materials). The project stakeholders concurred that selected sampling schemes would be representative of site conditions prior to initiation of field investigation activities. The field investigation at TEAD-N BRAC was conducted in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). The field activities employed to execute the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a) are described below, including any variances or deviations.

3.2 SAMPLE DESIGN AND RATIONALE

Twelve AOPIs were investigated during the TEAD-N BRAC SI to determine the presence or absence of PFAS in the environment. Information inputs from the preliminary CSMs presented on Worksheet #10 of the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a) are the basis for sample design at each AOPI. All samples were analyzed for the Target PFAS list of perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluorohexane sulfonate (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) (also known as GenX).

The general approach originally proposed in the TEAD-N BRAC UFP-QAPP Addendum for the determination of the presence or absence of PFAS at an AOPI consists of collection of groundwater samples from existing monitoring wells via HydraSleeve™ samplers. The general approach for determining the presence or absence of PFAS at TEAD-N BRAC consisted of sitewide groundwater sample collection from existing monitoring wells where proximal to AOPIs or the facility boundary. Soil samples were not proposed as part of this SI due to limited exposure (i.e., paved surfaces) and extensive redevelopment and/or reworking of the property. In addition, access to exercise intrusive sampling activities was unavailable at the time of the SI.

Each location that was sampled, with a unique set of coordinates, was assigned a specific site location: TEAD-XXX-##

Where:

- XXX = abbreviation for the AOPI being sampled. For existing perimeter monitoring wells, “PER” was used in lieu of an AOPI abbreviation.
- ## = the 3- to 6-character existing monitoring well identifier (ID).

Each sample that was collected received a unique sample number, related to the site ID above, using the following format: TEXXX followed by the existing monitoring well ID.

Where:

- XXX = abbreviation for the AOPI being sampled. For existing perimeter monitoring wells, "PER" was used in lieu of an AOPI abbreviation.

QA/QC samples were denoted according to the sample type. Rinsate blanks, field duplicates, and matrix spike (MS) and matrix spike duplicate (MSD) samples were denoted by appending "RB," "FD," "MS," and "MSD," respectively, to the parent sample ID. Field blanks and potable/source water blanks were named using the format of TEAD-YY##.

Where:

- YY = FB (field blank) or SRC (source blank)
- ## = sequential number of each type of blank sample collected.

3.3 FIELD INVESTIGATION ACTIVITIES

SI field activities were conducted from April 18 to April 21, 2023. The locations and methods of sample collection during the SI are described in the following sections. Sampling procedures adhered to the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a) with relevant information summarized below.

Sampling activities at TEAD-N BRAC included collecting groundwater samples from existing monitoring wells. Samples were analyzed for 26 PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Table B-15 of DoD Quality Systems Manual (QSM) Version 5.4 (DoD 2021) to determine the presence or absence of Target PFAS. Thirty-four samples were collected among the 12 AOPIs. A breakdown of samples collected at each AOPI is provided in Table 3-1. Prior to beginning sampling, site reconnaissance was performed. Any variances in sampling procedure, such as moving a location or sample point elimination, were discussed with the project team and communicated in daily field summary emails (Appendix A). Field procedures and any variances are discussed in the following sections. Photographs of SI field activities are provided in Appendix B.

Table 3-1. TEAD-N BRAC AOPI SI Sample Collection

AOPI Name	Groundwater Samples
Metal Plating Operations at Building 600, 609, 611, 614, 615, 618, 620, and 637	6
Building 602 (Maintenance Shop)	--
Building 616 (Fire Station)	--
Building 619 (Vehicle Maintenance Facility)	1
Building 632/738 CMF	2
Combat Vehicle Test Facility	1
DRMO Storage Yard	3
90-Day Drum Storage Area and Drum Storage Area	1
Chromic Acid/Alodine Drying Beds	2
Industrial Wastewater Piping System	6
Former IWL and Ditches	1
Former IWTP	--
Perimeter Wells	11
Total	**34**

-- No existing monitoring wells present at AOPI; however, a downgradient off-AOPI sample was used to assess the AOPI.

3.4 FIELD PROCEDURES

The following sections describe the field activities and procedures for PFAS-free source water sampling, sampling for groundwater, and equipment calibration. Specific details regarding each of these activities are documented on Task Team Activity Log Sheets that are provided in Appendix C.

Because many materials routinely used during environmental investigations can potentially contain PFAS, the field crew conducted SI activities in accordance with the PFAS sampling standard operating procedure (SOP) presented in Appendix A of the Programmatic UFP-QAPP (Leidos 2022a). Procedures include requirements for equipment, containers, handling, and sampling, including PFAS-specific requirements, to ensure that sample contamination does not occur during collection and transport.

3.4.1 PFAS-Free Source Water Sampling

Prior to beginning work, two bulk source water samples (TEAD-SRC-01 and TEAD-SRC-02) were collected on February 2, 2023, for PFAS analysis to determine if the source water was PFAS-free and could be used for decontamination. Sample TEAD-SRC-01 was collected from the active installation's Army supply well WW3. Sample TEAD-SRC-02 was collected from a low-pressure water tap located inside Building 801 (Peterson Industrial Depot). Water sources were purged for a minimum of 1 minute prior to filling high-density polyethylene (HDPE) bottles. Water from the low-pressure tap was determined to be PFAS-free (i.e., PFAS not detected above the limit of detection [LOD]) and was used as decontamination water source during field sampling.

3.4.2 Groundwater Sampling

All groundwater samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). QC samples, including rinsate blanks, field duplicates, and MS/MSDs, were also collected. Groundwater was sampled from existing monitoring wells using HydraSleeve™ samplers. Where groundwater volume was insufficient for HydraSleeve™ sample collection, but sufficient for grab sample collection, HDPE bailers were used (see Section 3.4.4).

Prior to HydraSleeve™ deployment, static water level measurements were collected to the nearest 0.01 feet. HydraSleeve™ samplers were then assembled by attaching the HDPE sampling sleeve to the polyvinyl chloride top collar and a bottom stainless steel weight. Once the collar and weight were attached to the HydraSleeve™ sampler, stainless steel hooks connected the sampling apparatus to a PFAS-free tether. After assembly of the HydraSleeve™ was complete, the sampler was deployed inside the monitoring well by gently lowering it to the predetermined sampling depth within the water column marked on the tether. Once the depth of the water column was achieved, the tether was attached to the well plug to hang the HydraSleeve™ sampler in the well. The HydraSleeve™ samplers remained in place for 48 hours prior to grab sample collection. Water quality parameters (pH, temperature, conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity) were measured and recorded on a groundwater sampling form (Appendix D). In addition, observations of the physical appearance and odor (if any) of the purge water (e.g., organic or sulfide odors, black precipitates) were recorded.

Existing monitoring wells with potential for sample collection via HDPE bailer, as outlined on Worksheet #18 of the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a), were evaluated for sufficient groundwater volume at the onset of field activities. Those monitoring wells with sufficient volume for grab groundwater sample collection were sampled via an HDPE bailer.

All samples were collected and handled while wearing clean, non-powdered, disposable nitrile gloves. Sample bottles were labeled and sealed in zip-lock bags and placed on wet ice for cooling to $\leq$6°C. New, clean nitrile gloves were donned prior to each new sample collected. Sampling containers were labeled with

the following information: site name, sample identification, date and time of sample collection, name of sampler, sample preservation, and type of analysis (i.e., PFAS).

3.4.3 Equipment Calibration

A water quality instrument (i.e., AquaRead Water Quality Meter) used during groundwater sampling was calibrated daily per Worksheet #24 of the Programmatic UFP-QAPP (Leidos 2022a) against known standards in accordance with the manufacturer's instructions and documented on the calibration logs provided in Appendix D.

3.4.4 Variances

No instances of field modification impacting project scope and/or data usability/quality were encountered during the SI fieldwork. The existing monitoring well network at TEAD-N BRAC was used to collect data for the SI. The field event incorporated the following changes and alternative sampling approaches into the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a):

- An obstruction was observed at existing perimeter monitoring well P-06S approximately 150 to 200 feet bgs, which prevented the deployment of a HydraSleeve™ sampler. As a result, existing monitoring well C-15 was employed rather than P-06S based on proximity to the north-northeastern perimeter boundary of the TEAD-N BRAC property and available groundwater for sample collection.
- Six monitoring wells were assessed for groundwater by field personnel at the onset of SI fieldwork to determine if sufficient volume was present for grab sample collection via bailer (i.e., A-03, A-04, C-16, C-17, P-02S, and P-02D). Monitoring well A-04 was added to the sampling plan as an alternate well to P-05D (see discussion in the following bullet) because sufficient groundwater volume was present. Existing monitoring wells A-03, C-16, and C-17 were observed to have insufficient groundwater volumes; therefore, these wells were not sampled. Wells P-02S and P-02D were not located and deemed abandoned upon further discussion with Brice Engineering, LLC and Troy Johnson (BRAC).
- Potential obstructions were encountered at existing monitoring well P-05D. This monitoring well is near the western boundary on TEAD-N BRAC property and was associated with the Industrial Waste Lagoon (IWL) and Ditches AOPI. As a result, HydraSleeve™ sampling equipment was not deployed and P-05D was removed from the sampling plan. Existing monitoring well A-04 (on Active Army property) was sampled via HDPE bailer as a replacement due to the proximity to the Former IWL and Ditches AOPI western perimeter and downgradient position from P-05D.

3.5 DECONTAMINATION PROCEDURES

To ensure that chemical analysis results reflect the actual concentrations at sample locations, the non-dedicated, reusable equipment used in sampling activities was rigorously cleaned and decontaminated between sample locations in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). The non-disposable sampling equipment used to conduct sampling activities (e.g., water level meter) was decontaminated before sampling activities began, between locations, and after sampling activities were completed. Decontamination guidelines followed the direction provided in the March 2020 Interstate Technology & Regulatory Council (ITRC) fact sheet that discusses site characterization considerations (ITRC 2020) and PFAS decontamination procedures described by the Michigan Department of Environment, Great Lakes, and Energy (EGLE), formerly the Michigan Department of Environmental Quality (MDEQ 2018). Wastewater generated from decontamination activities was handled as IDW. Decontamination water was combined with sampling purge water and managed as one medium.

The decontamination process included an initial scrub with a laboratory-grade, phosphate-free, biodegradable detergent (e.g., Liquinox®) and PFAS-free bulk source water to remove particulate matter and surface film. Equipment was scrubbed using polyethylene or polyvinyl chloride brushes. Following this scrub, the equipment was then rinsed twice in separate bins containing bulk source water, and sprayed with deionized water. Decontaminated sampling equipment was wrapped in thin sheets of HDPE to prevent subsequent contamination if being stored and not used immediately.

3.6 DISPOSITION OF FIELD INVESTIGATION-DERIVED WASTE

The IDW generated during the SI at TEAD-N BRAC included liquids (well purge water and decontamination rinse water) and contact waste (spent HydraSleeve™ samplers). These materials were managed in accordance with the IDW Management Plan provided in Appendix B of the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a).

All IDW generated at TEAD-N BRAC was placed in United Nations-approved, 16-gallon drums for storage, transport, and disposal. Permanent labels for the drums included a unique container number, a description of the contents (i.e., wastewater), the fill date, the source location, the generator's name (i.e., TEAD-N BRAC), and a telephone number for the generator's point of contact (e.g., the Army BRAC Environmental Coordinator). Each bucket or carboy used to temporarily store liquid IDW before it was transferred to a 16-gallon drum was marked "Non-potable Water" or "Decontamination Waste" to comply with requirements of the IDW Management Plan.

The contents of the IDW drums were sampled for characterization and profiling. For drums containing liquid IDW, a composite sample was collected using new HDPE bailers and pouring directly into sample bottles. The waste hauler (US Ecology) was contacted prior to sampling to determine parameters required for disposal of waste potentially containing PFAS. The certified waste hauler provided guidance to analyze for suspected contaminants based on site history and previous investigations. The sample was analyzed for PFAS, toxicity characteristic leaching procedure (TCLP) volatile organic compounds (VOCs), TCLP semivolatile organic compounds (SVOCs), TCLP metals, TCLP pesticides, TCLP herbicides, pH, and flashpoint. The sample results indicated the material was non-hazardous waste.

In December 2023, US Ecology will remove the solid and liquid IDW waste drums from TEAD-N BRAC for offsite disposal as non-hazardous waste. Both solid and liquid waste will be disposed of at US Ecology Idaho, Inc. in Grand View, Idaho. Soiled personal protective equipment was bagged and disposed of as municipal waste. A copy of the waste manifest is provided in Appendix E. Copies of final signed manifests and certificates of disposal are managed by the Solid Waste Office of Tooele Army Depot

4. DATA ANALYSIS AND QUALITY ASSURANCE SUMMARY

This section summarizes the QA/QC program and laboratory chemical analysis program implemented as part of the TEAD-N BRAC SI field activities (40 CFR §300.420(c)(4)). Additional information on these procedures is presented in the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a).

Pace Laboratory, Inc., in West Columbia, South Carolina, was the analytical laboratory under contract for the analysis of PFAS during the TEAD-N BRAC SI field activities. Sections 4.1 through 4.4 summarize sample handling procedures, laboratory analytical methods, data QA/QC, data reporting and validation, and sample QA/QC. A QA summary of the analytical data is presented in Section 4.5. Appendix F provides the DUA that details the quality and usability of the SI analytical data and the process performed to evaluate the data for compliance with established QC criteria.

4.1 SAMPLE HANDLING PROCEDURES

A critical aspect of sample collection and analysis protocols is the maintenance of strict chain-of-custody (CoC) procedures, which include tracking and documentation during sample collection, shipment, and laboratory processing. The Sample Manager was responsible for sample custody until the samples were properly packaged, documented, and released to the commercial carrier. The laboratory was responsible for sample custody thereafter in accordance with approved procedures.

4.1.1 Chain-of-Custody Record

CoC forms were used to document the traceability and integrity of all samples from the point of collection to the laboratory by maintaining a record of sample collection, shipment, and receipt by the laboratory. A CoC form was filled out and was signed and dated by each sample custodian.

Shipping containers were sealed with custody tape. Sealed coolers were transported to the commercial carrier for overnight delivery to the laboratory. The air bill number, written on the CoC form, acted as the custody documentation while the sealed coolers were in the possession of the commercial carrier. The CoC form was placed in a resealable plastic bag and taped to the inside lid of the cooler.

When the possession of samples was transferred, the individual relinquishing the samples and the individual receiving the samples signed, dated, and noted the time of transferal on the CoC. This record represents the official documentation for all transferal of sample custody until the samples arrived at the laboratory.

4.1.2 Laboratory Sample Receipt

All samples received by the Laboratory Sample Custodian or designee were checked for proper preservation (e.g., pH, temperature of coolant blank above 2°C or below 6°C); integrity (e.g., leaking, broken bottles); and proper, complete, and accurate documentation and ID of the samples. The temperature of the coolant blank was noted. No insufficiencies and/or discrepancies were noted.

Samples received at the laboratory were logged into the laboratory computer database. Initial entries included field sample number, date of receipt, and analyses required. As samples were received, they were assigned a laboratory sample ID. The sample custodian labeled each container with its sample ID, and the samples then were transferred to their designated storage areas.

Samples received by the laboratory were considered to be physical evidence and were handled according to USEPA procedural safeguards. In addition, all data generated from the sample analyses, including all associated calibrations, method blanks, and other supporting QC analyses, were identified with the project name, project number, and sample delivery group (SDG) designation. All data were maintained under the proper custody. The laboratory provided complete security for samples, analyses, and data.

4.2 LABORATORY ANALYTICAL METHODS

The chemical analysis program for the TEAD-N BRAC SI conforms to the analytical requirements presented in the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a) for the chemical analysis of field investigation samples. All samples were analyzed for PFAS using LC/MS/MS procedures compliant with DoD QSM Version 5.4, Table B-15 (DoD 2021) and the laboratory SOP.

4.3 DATA QUALITY ASSURANCE/QUALITY CONTROL

This section presents the QA/QC procedures applied during sampling and laboratory analysis. This discussion includes laboratory QA/QC (Section 4.3.1) and field QA/QC (Section 4.3.2) procedures. Details on the results of the QC samples (field and laboratory) are presented in the DUA (Appendix F).

4.3.1 Laboratory Quality Assurance/Quality Control

Samples were analyzed for PFAS using LC/MS/MS in compliance with DoD QSM Version 5.4, Table B-15 (DoD 2021). QC checks included holding times, method blanks, calibration standards, extracted internal standards (EISs), laboratory control samples (LCSs), MS/MSDs, and detection limits. The acceptance criteria and laboratory SOP are provided in the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a).

Method Blanks—Method blanks were used to monitor the possibility of laboratory-induced contamination by running a volume of approved reagent water through the entire analytical scheme (i.e., extraction, concentration, analysis). Blank requirements are specified in the DoD QSM Version 5.4, Table B-15 (DoD 2021) and the laboratory SOP.

Matrix Spike/Matrix Spike Duplicates—Additional sample volume was collected from select field sample locations to evaluate accuracy and precision using MS/MSD analyses. MS/MSDs are aliquots of environmental samples to which known concentrations of certain target analytes have been added before sample preparation, cleanup, and determinative procedures have been implemented (SW846 Chapter One). Accuracy was expressed as the percent recovery of each added compound. Precision was expressed as the relative percent difference (RPD) between the MS and the MSD results. MS/MSD samples were collected and analyzed at a frequency of one for every 20 samples of similar matrix received at the laboratory.

Laboratory Control Samples—LCSs were analyzed to evaluate the accuracy of the analysis in the absence of sample matrix impacts. A known concentration of select compounds were added to the LCS. The spiked samples were analyzed in the same manner as the environmental samples. Accuracy was expressed as the percent recovery of each added compound. An LCS was analyzed with each SDG.

4.3.2 Field Quality Assurance/Quality Control

Table 4-1 summarizes the frequency of field QC samples that were collected during the TEAD-N BRAC field investigation. The requirements for field QC were established on Worksheet #20 of the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a).

Table 4-1. Frequency of Field QC Samples for TEAD-N BRAC Field Investigation

QC Sample	Frequency
Field Blank	1 per water source used as final rinse of equipment
Source Water Blank	1 per bulk rinse water source
Equipment Rinsate Blank	1 for every 10 or fewer investigative samples
Field Duplicate	1 for every 10 or fewer investigative samples
Reagent Blank	1 per drinking water sampling event; none required for this event
MS/MSD	1 for every 20 or fewer investigative samples

4.4 DATA REPORTING AND VALIDATION

The Leidos QA Manager or designee initiated a validation of the analytical data packages. One hundred percent of the data were validated using objective criteria taken from the requirements of the Programmatic UFP-QAPP (Leidos 2022a) and DoD QSM Version 5.4 (DoD 2021) and qualified in accordance with the DoD Data Validation Guidelines Module 3 (DoD 2020) and the revised table for sample qualification in the presence of blank contamination (DoD 2022b).

Reported laboratory data were reviewed in accordance with DoD QSM Stage 2B validation guidelines to ensure that the QC results fell within appropriate QC limits for holding times, blank contamination, EISs, calibrations, MS/MSDs, LCSs, and ion ratios. Any data validation qualifiers resulting from outlier QC results were applied and a data validation report, as previously described, was prepared. In addition, 10 percent of the data were validated in accordance with DoD QSM Stage 3 guidelines, and analytical results were checked and recalculated from raw data.

Equipment rinsate blanks and field blanks were associated with the corresponding environmental samples. These blanks were evaluated following the same criteria as method blanks, and the associated environmental samples were appropriately qualified as needed. After the data validation for the project was completed, a project DUA (Appendix F) was prepared.

4.5 QUALITY ASSURANCE SUMMARY

A comprehensive QA/QC program was implemented during the sampling event at TEAD-N BRAC in April 2023. Samples and associated QC samples (e.g., field duplicates, equipment rinsate blanks, source water blanks, MSs, MSDs) were collected and analyzed for PFAS using methods specified in the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a). Consistent with the data quality requirements established in the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (2023) and DQOs, all sample data and associated QC data were evaluated during the review and validation process. Individual sample results were qualified, as necessary, to designate usability of the data toward meeting project objectives. Data qualifiers were applied based on deviations from the measurement performance criteria in the Programmatic UFP-QAPP (Leidos 2022a). Results of the validation are presented in the DUA (Appendix F). The analyses associated with each data quality indicator are summarized below, with details of the results of the QC checks provided in the DUA (Appendix F).

4.5.1 Precision

Precision was evaluated by the analysis of MS/MSDs and field duplicate samples and the RPD between the duplicate spike results.

4.5.2 Accuracy

Bias introduced due to blank contamination (in method, instrument, or field blanks) and any impact on accuracy were evaluated during validation. Analytical accuracy was measured through the use of LCSs, MS/MSDs, isotope dilution standards, initial and continuing calibration, and target compound quantitation requirements.

4.5.3 Sensitivity

Sensitivity requirements were evaluated against minimum required limits of quantitation (LOQs) and LODs in the Programmatic UFP-QAPP (Leidos 2022a).

4.5.4 Representativeness

Representativeness was satisfied by ensuring that the Programmatic UFP-QAPP (Leidos 2022a) and TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a) protocols were followed, appropriate sampling techniques were used, established analytical procedures were implemented, and analytical holding times of the samples were not exceeded.

4.5.5 Comparability

Comparability was achieved by using consistent, documented, and UFP-QAPP-approved methods and meeting project accuracy and precision objectives.

4.5.6 Completeness

Completeness measures the amount of valid data obtained from the sampling and analysis effort. For analytical data to be usable, each data point must be validated and meet criteria without significant non-conformance. The DQOs for the TEAD-N BRAC SI were set at 90 percent for field sampling and laboratory completeness. Two alternate wells were collected in place of proposed wells. Seven wells were not sampled due to obstructions or being too dry or abandoned. Analytical completeness was 100 percent.

4.5.7 Data Usability Assessment

Data that have been qualified as estimated (J, J+, J-, UJ) during validation indicate accuracy, precision, or sensitivity QC measurements may have exceeded criteria, but the results are considered valid. No samples have data points recommended for exclusion.

5. SITE INSPECTION SCREENING LEVELS

Detected concentrations of the Target PFAS in samples collected during this SI are compared to residential scenario SLs calculated using the USEPA regional screening level (RSL) calculator for soil and the tap water criteria for groundwater, as published in the 2022 OSD Memorandum (DoD 2022a). This SI uses the SLs and a target hazard quotient (HQ) of 0.1 to evaluate the Target PFAS concentrations. These SLs (Table 5-1) are used to evaluate the data and determine if future investigation is warranted at each AOPI.

Table 5-1. Screening Levels from the 2022 OSD Memorandum

Chemical	Residential Tap Water HQ = 0.1 (ng/L or ppt)	Residential Soil HQ = 0.1 (µg/kg or ppb)
HFPO-DA	6	23
PFBS	601	1,900
PFHxS	39	130
PFNA	6	19
PFOA	6	19
PFOS	4	13

Note: The residential tap water SLs are used to evaluate groundwater data. Laboratory results are reported to two significant figures.

6. SITE INSPECTION RESULTS

This section presents the background, summary of analytical results, and a CSM for each AOPI at TEAD-N BRAC where Target PFAS were detected. Sampled media and QA/QC samples were analyzed for the list of 26 PFAS specified in the Programmatic UFP-QAPP (Leidos 2022a). The sample results discussed below by AOPI focus on the six Target PFAS outlined in the 2022 OSD Memorandum (DoD 2022a): PFOS, PFOA, PFBS, PFNA, PFHxS, and HFPO-DA. Analytical data presentation tables for all PFAS analyzed using approved methods are provided in Appendix G.

Soil samples were not proposed or collected as part of this SI due to limited exposure (i.e., paved surfaces), extensive redevelopment and/or reworking of the property, and limitations on access to exercise intrusive sampling activities. Surface water and sediment were not present at TEAD-N BRAC.

In addition to the groundwater samples collected at or downgradient from the 12 AOPIs, supplementary groundwater samples were collected during this SI to investigate the potential for migration of PFAS at or near the former TEAD-N BRAC facility boundary. A discussion of PFAS results at the TEAD-N BRAC facility boundary and facility-wide is presented in Section 6.14.

6.1 CONCEPTUAL SITE MODELS

The preliminary CSMs developed for each AOPI during the PA were further refined for each AOPI where Target PFAS were detected at concentrations greater than the LOD in sampled media. Based on the SI sample results, CSMs presented for each AOPI represent the current understanding of site conditions with respect to known or suspected sources of PFAS-containing materials, potential transport mechanisms and migration pathways, and potentially exposed current and reasonably anticipated future human receptors.

The CSMs evaluate ingestion, dermal contact, and inhalation exposure routes for human receptors. The exposure pathways are evaluated as complete, potentially complete, or incomplete in the CSMs presented in figures in each AOPI-specific CSM section. In the absence of toxicity information for the inhalation route, the inhalation exposure pathway of PFAS (via dust) is considered potentially complete for soil where Target PFAS are detected. The remaining exposure pathway designations are determined as follows:

- ***Complete*** – Human exposure pathways are considered complete where Target PFAS have been detected at concentrations exceeding SLs and no land use controls (LUCs) are in place restricting access or use of the media.
- ***Potentially Complete*** – Human exposure pathways are considered potentially complete if Target PFAS have been detected at concentrations less than the SLs for soil, groundwater, surface water, or sediment or if SLs have been exceeded along the migration pathway. For example, if Target PFAS are not detected in soil but are detected at concentrations exceeding SLs in groundwater, the exposure pathway for soil is considered potentially complete. In addition, a groundwater exposure pathway is considered potentially complete where Target PFAS have been detected and could migrate from the AOPI source area to offsite groundwater that is used for drinking water. Exposure pathways are also potentially complete for media where existing LUCs are in place for non-PFAS because the LUCs are not Target PFAS specific.
- ***Incomplete*** – Human exposure pathways are considered incomplete for media where Target PFAS have not been detected at concentrations greater than the LODs.

Conditions and restrictions have been placed on the TEAD-N BRAC properties, limiting use of the property until such time that the required remedial actions have been completed. Residential use will not be allowed on certain portions of TEAD-N BRAC property on a long-term basis. Transferees will not access or extract groundwater, nor inject any materials into wells located on these defined parcels. These restrictions prohibit

groundwater use for all areas of the TEAD-N BRAC property except for the parcel that contains the Building 632/738 CMF AOPI and Chromic Acid/Alodine Drying Beds AOPI (U.S. Army 1998, USACE 2018). The future land use at TEAD-N BRAC is anticipated to remain commercial/industrial. LUCs that impact specific AOPIs are detailed in the following sections.

6.2 METAL PLATING OPERATIONS AT BUILDINGS 600, 609, 611, 614, 615, 618, 620, AND 637 AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Metal Plating Operations AOPI.

6.2.1 AOPI Background

The Metal Plating Operations AOPI is located in the south quadrant of the property, downgradient from the Combat Vehicle Test Facility AOPI. The properties are owned by Peterson Industrial Depot, and several of the properties are currently being leased for commercial or industrial use.

From 1943 through 1988, the Industrial Wastewater Piping System (Solid Waste Management Unit [SWMU] 49) received industrial wastewater from all buildings comprising the AOPI, except for Building 615, which was not constructed until 1956. Through 1988, wastewater from these buildings discharged to the Former IWL and Ditches (SWMUs 2 and 30). After 1988, the Former Industrial Wastewater Treatment Plant (IWTP) (SWMU 38) treated the industrial wastewater from these buildings. Given the operational period, PFAS-containing mist suppressants were likely used during the plating process and relayed to the Industrial Wastewater Piping System, Former IWL and Ditches, and Former IWTP. Buildings 609 and 618 also had documented releases of recycled wastewater from the Former IWTP (Tetra Tech 1996). The buildings that remain are no longer owned by the Army and are used for various reasons described in Section 6.2.3. The former metal plating buildings dates of operation and relevant site history are listed as follows:

- Building 600 was built in 1943 and operated as an electroplating, metals stripping/cleaning/anodizing, vapor degreasing, spray painting, and sandblasting facility.
- Building 609 operated as an electroplating, metals stripping/cleaning/anodizing, and radiator repair facility. Recycled wastewater from the Former IWTP was being used to wash down the roadway for an unknown period. This building has been demolished.
- Building 611 was built in 1943 and operated as an electroplating, metals stripping/cleaning/anodizing, and vapor degreasing facility for an unknown period.
- Building 614 was built in 1943 and operated as a metal plating (etching and rinsing of plates) facility for an unknown period.
- Building 615 was built in 1956 and operated as an electroplating, metals stripping/cleaning/anodizing, spray painting, and sandblasting facility for an unknown period.
- Building 618 operated as a battery shop and metal plating facility from 1943 to 1985 (Ageiss 1994a). In July 1991, 5,000 gallons of recycled wastewater from the Former IWTP were spilled from a break in a recycled water pipe at the northwestern corner of the lunchroom.
- Building 620 was built in 1943 and operated as a battery repair and charging shop and an electroplating, metals stripping/cleaning/anodizing, and vapor degreasing facility for an unknown period.
- Building 632/738 was built in 1992 and operated as the CMF until 1996.
- Building 637 was built in 1943 and operated as an electroplating, metals stripping/cleaning/anodizing, vapor degreasing, spray painting, and sandblasting/engine rebuild facility for an unknown period.

All of these facilities were likely connected to the Industrial Wastewater Piping System.

6.2.2 SI Sampling and Results

Groundwater samples were collected from the Metal Plating Operations AOPI at the following locations (Figure 6-1):

- Six groundwater samples and one QC duplicate were collected from six existing wells within the suspected release area (TEAD-MPF-C19, TEAD-MPF-C21, TEAD-MPF-C47F, TEAD-MPF-C50F, TEAD-MPF-C51F, and TEAD-MPF-C52).
  - TEAD-MPF-C19 was downgradient from Building 614.
  - TEAD-MPF-C21 was downgradient from Building 609.
  - TEAD-MPF-C47F and TEAD-MPF-C52 were downgradient from Building 615.
  - TEAD-MPF-C50F was downgradient from Building 611.
  - TEAD-MPF-C51F was downgradient from Buildings 600 and 611.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results groundwater samples collected at the Metal Plating Operations AOPI are summarized below and presented in Table 6-1 and Figure 6-2.

6.2.2.1 Groundwater

PFHxS was detected at concentrations less than the SL at all six existing monitoring wells within the suspected release area (TEAD-MPF-C19 [estimated], TEAD-MPF-C21 [estimated], TEAD-MPF-C47F, TEAD-MPF-C50F [estimated], TEAD-MPF-C51F [estimated], and TEAD-MPF-C52).

PFOA was detected at concentrations (estimated) less than the SL at all existing monitoring wells.

PFBS was detected at concentrations less than the SL at three monitoring well locations (TEAD-MPF-C21, TEAD-MPF-C50F [estimated], and TEAD-MPF-C52 [estimated]).

PFOS, PFNA, and HFPO-DA were not detected at concentrations greater than the LODs in groundwater at the AOPI.

6.2.3 CSM

Metal plating buildings acreage and physical setting are as follows:

- Building 600 (0.75 acres)
  - Building 600 is a long, rectangular maintenance building currently being used for general maintenance and storage. The building is a wooden structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. Several small floor drains that feed underground piping were located within the metal plating area and former spray-painting booths.
- Building 609 (0.19 acres)
  - Building 609 historical structures have been removed. The building has been demolished, and all that remains is the former concrete floor. The former building footprint is fenced. Former floor drains remain visible and appeared to be sealed. Trench drains for stormwater collection are present on three sides of the former building and led to the Industrial Wastewater Piping System. Several floor drains that feed underground piping remain in place running east to west and appeared to be sealed.

- Building 611 (0.77 acres)
    - Building 611 is a long, rectangular maintenance building and presently vacant. The building is a wooden and cinderblock structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. Several floor drains that feed underground piping remain in place running north to south.
- Building 614 (0.16 acres)
    - Building 614 is a rectangular wooden structure constructed on concrete underlain by soil. The floor in the interior of the building is a mixture of carpet and vinyl tile placed over the original flooring. None of the metal plating infrastructure remains in the building. The building is presently vacant and in disrepair.
- Building 615 (0.52 acres)
    - Building 615 is an L-shaped maintenance building currently used by a concrete contractor and metal fabricator. The building is a metal and cinderblock structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. Several floor drains that feed underground piping remain in place throughout the building.
- Building 618 (0.52 acres)
    - Building 618 is a rectangular industrial building presently used by a custom granite company. The building is a metal and wood structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. The floor in the interior of the building is a mixture of ceramic tile and vinyl tile has been placed over the original flooring.
- Building 620 (2.20 acres)
    - Building 620 is currently being used as a storage warehouse. The structure is a long, rectangular warehouse building. The building is a wooden structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. Several floor drains that feed underground piping remain in place running east to west throughout the building.
- Building 637 (2.29 acres)
    - Building 637 is a long, rectangular warehouse building presently being used by a construction contractor. The building is a metal and wood structure constructed on concrete underlain by soil. None of the metal plating infrastructure remains in the building. Several floor drains that feed underground piping remain in place throughout the building.

The ground surface elevation ranges across the area of the Metal Plating Buildings AOPI from approximately 4,792 to 4,827 feet amsl, and groundwater was encountered, on average, at approximately 354 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

Metal plating operations including, but not limited to, electroplating, metals stripping/cleaning/anodizing, vapor degreasing, and etching and rinsing were reportedly conducted at the various buildings comprising the Metal Plating Operations AOPI. Given the period of operation, PFAS-containing mist suppressants were likely used during metal plating activities. The primary release mechanism is the potential release of PFAS to soil related to historical metal plating operations potentially involving PFAS-containing mist suppressants. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the Metal Plating Operations AOPI is limited due to paved surfaces (approximately 95 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of this SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the majority of the AOPI is composed of impervious cover, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete.

A groundwater restriction, not related to PFAS, is in place at this AOPI preventing its use for drinking water due to plumes of VOC groundwater contamination. The onsite groundwater exposure pathways are potentially complete because Target PFAS were detected at concentrations less than the SLs. In addition, the groundwater exposure pathway for offsite residents is potentially complete because potable wells are present downgradient from the TEAD-N boundary.

Figure 6-3 presents the CSM for the Metal Plating Operations AOPI.

6.2.4 Recommendation

Target PFAS were not detected above the SLs at the Metal Plating Operations AOPI in groundwater; therefore, further investigation is not recommended.

Table 6-1. Target PFAS Results and Screening for the Metal Plating Operations at Buildings 600, 609, 611, 614, 615, 618, 620, and 637 AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-MPF-C19	TEMPF-C19	WELL	358.00-358.00	04/21/2023	3.5 U	1.8 U	**2.6 J**	1.8 U	**2.0 J**	1.8 U
TEAD-MPF-C21	TEMPF-C21	WELL	371.00-371.00	04/20/2023	3.6 U	**22**	**2.1 J**	1.8 U	1.8 U	1.8 U
TEAD-MPF-C47F	TEMPF-C47F	WELL	367.00-367.00	04/21/2023	3.6 U	1.8 U	**4.5**	1.8 U	**2.1 J**	1.8 U
TEAD-MPF-C50F	TEMPF-C50F	WELL	348.00-348.00	04/20/2023	3.4 U	**1.0 J**	**2.0 J**	1.7 U	**2.5 J**	1.7 U
TEAD-MPF-C51F	TEMPF-C51F	WELL	334.00-334.00	04/21/2023	3.6 U	1.8 U	**1.9 J**	1.8 U	**1.2 J**	1.8 U
TEAD-MPF-C52	TEMPF-C52	WELL	442.00-442.00	04/21/2023	3.6 U	**1.4 J**	**5.0**	1.8 U	**2.5 J**	1.8 U
	TEMPF-C52FD	WELL	442.00-442.00	04/21/2023(D)	3.5 U	**1.4 J**	**5.5**	1.8 U	**2.6 J**	1.8 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
(D) = Field duplicate sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.3 BUILDING 602 (MAINTENANCE SHOP) AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 602 AOPI.

6.3.1 AOPI Background

The Building 602 AOPI is located in the south quadrant of the property, upgradient of the Former IWL and Ditches and Chromic Acid/Alodine Drying Beds AOPIs.

Building 602 was constructed in 1943 and operated as a general maintenance and generator rebuild shop for an unknown period. From 1943 through 1988, the Industrial Wastewater Piping System received wastewater from Building 602 and discharged it to the Former IWL and Ditches. After 1988, the Former IWTP treated industrial wastewater. In April 1991, 200 gallons of recycled wastewater from the Former IWTP were spilled from a break in a recycled water pipe at the northwestern corner of the building (Tetra Tech 1996). The Former IWTP was designed to remove VOCs and SVOCs. Subsequently, waste received by the Former IWTP resulting from TEAD-N operational activities were likely not treated for PFAS. Therefore, potentially PFAS-containing recycled wastewater could have been released at the time of the 1991 pipe break.

6.3.2 SI Sampling and Results

Groundwater samples were not collected from within the suspected release area at the Building 602 AOPI; however, upgradient, cross-gradient, and downgradient wells associated with nearby AOPIs (e.g., Drum Storage Areas, Former IWL and Ditches, Chromic Acid/Alodine Drying Beds, Metal Plating Operations Buildings) capture results relevant to Building 602 due to proximity (Figures 6-2 6-6). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

6.3.3 Recommendation

Detected concentrations of Target PFAS in groundwater nearby the Building 602 AOPI do not exceed the SLs; therefore, further investigation is not recommended.

6.4 BUILDING 616 FIRE STATION AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 616 AOPI.

6.4.1 AOPI Background

The Building 616 AOPI is located in the south quadrant of the property, positioned in the center of the Metal Plating Operations AOPI, and generally downgradient from the Combat Vehicle Test Facility and Building 619 AOPIs.

Building 616 was constructed in 1943 and operated as a fire station until approximately 1977. According to the former Fire Captain, aqueous film-forming foam (AFFF) was historically stored on two fire trucks when parked in the station building and on the outdoor ramp. The building had two drive-in bay doors. After closure of the fire station, the building was used as a testing center and administrative offices (Tetra Tech 1996) and the bay doors were replaced with windows; however, the door track/hardware remains in place inside the building. Based on the operational time frame of the former fire station and because AFFF was confirmed at the AOPI, PFAS-containing materials may have been used, stored, and/or disposed of at the Building 616 AOPI.

6.4.2 SI Sampling and Results

Groundwater samples were not collected from within the suspected release area at the Building 616 AOPI; however, wells associated with nearby AOPIs in the general upgradient and downgradient direction (e.g., Metal Plating Operations Buildings, Building 619, Building 632/738 CMF) capture results relevant to Building 616 due to proximity (Figures 6-2 and 6-6). Section 6.5 presents the results. This AOPI is no longer owned by the Army and is currently vacant and in disrepair.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

6.4.3 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

6.5 BUILDING 619 (VEHICLE MAINTENANCE FACILITY) AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 619 AOPI.

6.5.1 AOPI Background

The Building 619 AOPI is located in the south quadrant of the property, in the vicinity of the Metal Plating Operations AOPI, and generally downgradient from the Combat Vehicle Test Facility AOPI. This AOPI is downgradient from and proximate to the Building 616 Fire Station AOPI.

Building 619 was constructed in 1943 and operated as a vehicle maintenance facility for vehicular rebuilding, tuning, testing, welding, and vapor degreasing for an unknown period (Tetra Tech 1996). According to personnel interviews, fire trucks were disassembled at the facility prior to rebuild, and AFFF tanks were removed from fire trucks at the receiving area before the trucks arrived at the building for disassembly. Furthermore, AFFF was reportedly used to clean up fluid spills during maintenance activities. From 1943 through 1988, the Industrial Wastewater Piping System received wastewater from Building 619 and discharged it to the Former IWL and Ditches. After 1988, the Former IWTP treated industrial wastewater. Because AFFF was confirmed at the AOPI, PFAS-containing materials may have been used, stored, and/or disposed of at the Building 616 AOPI. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.5.2 SI Sampling and Results

A groundwater sample was collected from one existing well (TEAD-619-C48F) within the suspected release area at the Building 619 AOPI. (Figure 6-1). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for the groundwater sample collected at the Building 619 AOPI are summarized below and presented in Table 6-2 and Figure 6-2.

6.5.2.1 Groundwater

PFOA, PFHxS, and PFBS (estimated) were detected at concentrations less than their respective SLs in groundwater collected from monitoring well TEAD-619-C48F, which is within the suspected release area of Building 619. Building 619 is in the vicinity of the Metal Plating Operations AOPI (results discussed in Section 6.2.2).

PFOS, PFNA, and HFPO-DA were not detected at concentrations greater than the LODs in groundwater at the AOPI.

6.5.3 CSM

The Building 619 AOPI is approximately 4.48 acres. The structure consists of a metal and cinderblock building constructed on concrete underlain by soil. The building has three long, rectangular wings that form an "E" shape. The ground surface surrounding Building 619 is either concrete or asphalt. Floor drains collected industrial wastewater from within the building and discharged to the facility drainage system. The ground surface elevation is approximately 4,824 feet amsl, and groundwater was encountered at approximately 357 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

Building 619 reportedly disassembled fire trucks storing AFFF and used AFFF to clean up spills from vehicle maintenance operations. The primary release mechanism is the potential release of PFAS to soil related to historical operations involving AFFF. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the Building 619 AOPI is not a viable pathway due to paved surfaces (i.e., nearly 100 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of the SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the majority of the AOPI is composed of impervious cover, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete

A groundwater restriction, not related to PFAS, is in place at this AOPI preventing its use for drinking water due to plumes of VOC groundwater contamination. The onsite groundwater exposure pathways are potentially complete because Target PFAS were detected at concentrations less than the SLs. In addition, the groundwater exposure pathway for offsite residents is potentially complete because potable wells are present downgradient from the TEAD-N boundary.

Figure 6-4 presents the CSM for the Building 619 AOPI.

6.5.4 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-2. Target PFAS Results and Screening for the Building 619 AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-619-C48F	TE619-C48F	WELL	366.00-366.00	04/21/2023	3.7 U	**1.9 J**	**5.6**	1.8 U	**4.4**	1.8 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.6 BUILDING 632/738 CMF AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 632/738 CMF AOPI.

6.6.1 AOPI Background

The Building 632/738 CMF AOPI is located in the west quadrant of the facility, in the vicinity of the Former IWL and Ditches AOPI, and downgradient from the Chromic Acid/Alodine Drying Beds and Metal Plating Operations AOPIs.

Building 632/738 was constructed in 1992 and operated as the CMF until 1996. According to personnel interviews, metal plating operations were included among the maintenance activities that were consolidated to the CMF (Tetra Tech 1996). The Former IWTP treated industrial wastewater from the CMF. Given the operational time frame of the CMF, PFAS-containing mist suppressants were likely used during metal plating operations; therefore, PFAS-containing materials may have been used, stored, and/or disposed of at the Metal Plating Operations AOPI. This AOPI is no longer Army owned and is currently used for industrial activities.

6.6.2 SI Sampling and Results

Two groundwater samples were collected from two existing monitoring wells at the Building 632/738 CMF AOPI (Figure 6-5). TEAD-CMF-B26 is within the suspected release area and TEAD-CMF-C36 is downgradient from the Building 632/738 CMF.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for groundwater samples collected at the Building 632/738 CMF AOPI are summarized below and presented in Table 6-3 and Figure 6-6.

6.6.2.1 Groundwater

PFHxS and PFBS were detected at concentrations less than their respective SLs at both TEAD-CMF-B26 (estimated) and TEAD-CMF-36. In addition, PFOA was detected at a concentration less than the SL in TEAD-CMF-B26 (downgradient from Building 632/738).

PFOS, PFNA, and HFPO-DA were not detected at concentrations greater than the LODs in groundwater at the AOPI.

6.6.3 CSM

The Building 632/738 CMF AOPI is approximately 9.17 acres. The Building 632/738 CMF is a rectangular building. The ground surface surrounding Building 632/738 is either concrete, asphalt, or well-maintained grassy areas. The ground surface elevation is approximately 4,777 feet amsl, and groundwater was encountered at approximately 292 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

Metal plating operations were reportedly consolidated to Building 632/738 in 1992. Given the period of operation, PFAS-containing mist suppressants were likely used during metal plating activities. The primary release mechanism is the potential release of PFAS to soil related to historical metal plating operations potentially involving PFAS-containing mist suppressants. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the Building 632/738 CMF AOPI is not a viable pathway due to paved surfaces (i.e., approximately 90 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of the SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the majority of the AOPI is composed of impervious cover and has been largely reworked/redeveloped, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete.

Although groundwater is not currently used as a drinking water source at the Building 632/738 CMF, Target PFAS were detected at concentrations less than the SLs in groundwater and no groundwater use restrictions are in place at the AOPI. Therefore, the onsite groundwater exposure pathways are potentially complete. In addition, the groundwater exposure pathway for offsite residents is potentially complete because Target PFAS were detected at concentrations less than the SLs and potable wells are present downgradient from the TEAD-N boundary. Figure 6-7 presents the CSM for the Building 632/738 CMF AOPI.

6.6.4 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-3. Target PFAS Results and Screening for the Building 632/738 CMF AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-CMF-B26	TECMF-B26	WELL	319.00-319.00	04/21/2023	3.7 U	**1.1 J**	**1.9 J**	1.9 U	**2.3 J**	1.9 U
TEAD-CMF-C36	TECMF-C36	WELL	280.00-280.00	04/21/2023	3.7 U	**1.1 J**	**6.8**	1.9 U	1.9 U	1.9 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.7 COMBAT VEHICLE TEST FACILITY AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Combat Vehicle Test Facility AOPI.

6.7.1 AOPI Background

The Combat Vehicle Test Facility AOPI is located in the south quadrant of the property, along the southwestern boundary of the BRAC property adjacent to the Defense Reutilization and Marketing Office (DRMO) Storage Yard AOPI, and upgradient of the Metal Plating Operations and Building 619 AOPIs.

The Combat Vehicle Test Facility was constructed sometime between 1959 and 1966 and was used to determine specifics regarding the status of vehicles prior to repair, and to test vehicle performance following remanufacture (USAEC 1994). AFFF was used at the Combat Vehicle Test Facility to clean up fluid spills during vehicle testing. The facility also included a recycled industrial water tank near the center of the test track that received treated water from the Former IWTP for storage prior to reuse in the Maintenance and Supply Area. In addition, a ramped tank near the entrance of the facility could be filled with water for testing amphibious vehicles. The Former IWTP was designed to remove VOCs and SVOCs. Subsequently, waste received by the Former IWTP resulting from TEAD-N operational activities were likely not treated for PFAS. Therefore, any recycled industrial wastewater received, used, and/or disposed of at the Combat Vehicle Test Facility, could have released PFAS-containing wastewater. In addition, because AFFF was confirmed at the AOPI for use in cleaning up spills, PFAS-containing materials may have been used, stored, and/or disposed of at the Combat Vehicle Test Facility. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.7.2 SI Sampling and Results

A groundwater sample was collected from one existing monitoring well (TEAD-VTF-C23) within the suspected release area at the Combat Vehicle Test Facility AOPI (Figure 6-1). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for the groundwater sample collected at the Combat Vehicle Test Facility AOPI are summarized below and presented in Table 6-4 and Figure 6-2.

6.7.2.1 Groundwater

Target PFAS were not detected at concentrations greater than the LODs in the groundwater sample collected at the Combat Vehicle Test Facility AOPI.

6.7.3 Recommendation

Target PFAS were not detected in groundwater at the Combat Vehicle Test Facility AOPI; therefore, further investigation is not recommended.

Table 6-4. Target PFAS Results and Screening for the Combat Vehicle Test Facility AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-VTF-C23	TEVTF-C23	WELL	385.00-385.00	04/20/2023	3.9 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.8 DRMO STORAGE YARD AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the DRMO Storage Yard AOPI.

6.8.1 AOPI Background

The DRMO Storage Yard AOPI is located in the east quadrant of the property, along the eastern boundary of the BRAC property adjacent to the Combat Vehicle Test Facility AOPI, and upgradient of the Industrial Wastewater Piping System AOPI.

Beginning in the mid-1950s, the DRMO Storage Yard accepted and stored surplus and expired material prior to sale or reuse. Unused hazardous chemicals that were no longer required or were past their shelf life but could not be sold for use according to their intended purpose were stored as hazardous materials in Building 2001 or 2003 at the DRMO (USAEC 1994). According to personnel interviews, unused AFFF removed from firefighting equipment received at TEAD-N was taken to the DRMO for redistribution. Former fire department personnel reported that 5-gallon containers of AFFF were stored at the DRMO Storage Yard in the 1980s and 1990s. The AFFF was stored in metal containers, some of which were observed to be rusting. Furthermore, a former Fire Chief indicated that the fire department would obtain AFFF from the DRMO to use for training exercises. However, there was no indication that any of these training exercises were conducted at the TEAD-N BRAC property. Because AFFF was confirmed to be stored at the AOPI, PFAS-containing materials may have been used and/or stored at the DRMO Storage Yard. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.8.2 SI Sampling and Results

Three groundwater samples were collected from three existing monitoring wells at the DRMO Storage Yard AOPI (TEAD-DRM-C22, TEAD-DRM-C26, and TEAD-DRM-C32), as shown in Figure 6-8. TEAD-DRM-C32 is within the suspected release area. TEAD-DRM-C22 and TEAD-DRM-C26 are downgradient from the suspected release area.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for groundwater collected at the DRMO Storage Yard AOPI are summarized below and presented in Table 6-5 and Figure 6-9.

6.8.2.1 Groundwater

PFHxS was detected at estimated concentrations less than the SL at all three monitoring wells (TEAD-DRM-C22, TEAD-DRM-C26, and TEAD-DRM-C32). In addition, PFOA was detected at an estimated concentration less than the SL in TEAD-DRM-C26 (downgradient).

PFOS, PFBS, PFNA, and HFPO-DA were not detected at concentrations greater than the LODs in groundwater at the AOPI.

6.8.3 CSM

The DRMO Storage Area AOPI is approximately 62.27 acres. The area consists of a large, open, asphalt and gravel storage yard with several steel buildings. The DRMO Storage Yard is partially enclosed by a chain-link fence. The yard is traversed along its length by an access road and a railroad track. The ground surface elevation is approximately 4835 feet amsl, and groundwater was encountered at approximately

372 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

The DRMO Storage Yard reportedly stored AFFF in the 1980s and 1990s. Other PFAS-containing chemicals may have been stored at the DRMO Storage Yard since the time of its inception in the 1950s. Therefore, PFAS-containing releases potentially occurred at the DRMO. The primary release mechanism is the potential release of PFAS to surface soil. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the DRMO Storage Yard AOPI is limited due to paved surfaces (approximately 75 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of the SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the majority of the AOPI is composed of impervious cover and has been largely reworked/redeveloped, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete.

A groundwater restriction, not related to PFAS, is in place at this AOPI preventing its use for drinking water due to plumes of VOC groundwater contamination. The onsite groundwater exposure pathways are potentially complete because Target PFAS were detected at concentrations less than the SLs. In addition, the groundwater exposure pathway for offsite residents is potentially complete because potable wells are present downgradient from the TEAD-N boundary.

Figure 6-10 presents the CSM for the DRMO Storage Yard AOPI.

6.8.4 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-5. Target PFAS Results and Screening for the DRMO Storage Yard AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-DRM-C22	TEDRM-C22	WELL	376.00-376.00	04/20/2023	3.8 U	1.9 U	**2.6 J**	1.9 U	1.9 U	1.9 U
TEAD-DRM-C26	TEDRM-C26	WELL	368.00-368.00	04/20/2023	3.7 U	1.9 U	**3.2 J**	1.9 U	**1.1 J**	1.9 U
TEAD-DRM-C32	TEDRM-C32	WELL	397.00-397.00	04/20/2023	3.7 U	1.9 U	**2.8 J**	1.9 U	1.9 U	1.9 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.9 90-DAY DRUM STORAGE AREA AND DRUM STORAGE AREA AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the 90-Day Drum Storage Area and Drum Storage Area AOPI.

6.9.1 AOPI Background

The 90-Day Drum Storage Area and Drum Storage Area AOPI is located in the south quadrant of the facility along the southern boundary of the BRAC property. The AOPI consists of three distinct sections/storage areas. Part of the southernmost storage area and TEAD-N (Active Army) is upgradient of perimeter well PER-N11488 (Figure 6-1).

The 90-Day Drum Storage Yard (SWMU 28) was constructed in 1983 near the southern end of the TEAD-N BRAC property to store sealed drums on pallets for up to 90 days prior to disposal. According to the personnel interviews, wastes from the metal plating baths were drummed and taken to the 90-Day Drum Storage Area for disposal offsite during the late 1980s and 1990s. The Drum Storage Area (SWMU 29) is adjacent to the 90-Day Drum Storage Yard and was used to store empty drums before being returned to originating contractors. Empty drums were reportedly stored upside down to allow residual contents to drain and keep rainwater out. According to interviews, drums from the 90-Day Drum Storage Area were moved to the Drum Storage Area to avoid crossing the 90-day threshold (Tetra Tech 1996). Therefore, the potential exists that drums of metal plating waste were moved to the Drum Storage Area if they were approaching the 90-day storage limit. Building 576 in the southern portion of the Drum Storage Area was historically used for storing hazardous materials. Given the operational time frame of the metal plating operations at TEAD-N, PFAS-containing mist suppressants were likely used during metal plating operations; therefore, PFAS-containing materials may have been produced in the form of industrial waste resulting in the potential storage or such materials at the drum storage areas. This AOPI is no longer owned by the Army.

6.9.2 SI Sampling and Results

A groundwater sample was collected from one existing monitoring well (TEAD-DSA-C53F) downgradient from the suspected release area at the 90-Day Drum Storage Area and Drum Storage Area AOPI (Figure 6-1). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI. A perimeter well (TEAD-PER-N11488) sample was collected in the vicinity of the Drum Storage Areas AOPI (Figure 6-2); however, detections at this location could be indicative of contaminant migration from offsite and is discussed in Section 6.14.

The Target PFAS analytical results for the groundwater sample collected at the 90-Day Drum Storage Area and Drum Storage Area AOPI are summarized below and presented in Table 6-6 and Figure 6-2.

6.9.2.1 Groundwater

Target PFAS were not detected at concentrations greater than the LODs in any of the groundwater samples collected downgradient from the 90-Day Drum Storage Area and Drum Storage Area AOPI.

6.9.3 Recommendation

Target PFAS were not detected in groundwater at the 90 Day Drum Storage Area and Drum Storage Area AOPI; therefore, further investigation is not recommended.

Table 6-6. Target PFAS Results and Screening for the 90 Day Drum Storage Area and Drum Storage Area AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-DSA-C53F	TEDSA-C53F	WELL	328.00-328.00	04/21/2023	3.8 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.10 CHROMIC ACID/ALODINE DRYING BEDS AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Chromic Acid/Alodine Drying Beds AOPI.

6.10.1 AOPI Background

The Chromic Acid/Alodine Drying Beds AOPI is located in the west quadrant of the facility, downgradient from the Metal Plating Operations and Drum Storage Areas AOPIs.

The Chromic Acid/Alodine Drying Beds were used during the 1970s to dispose of chromic acid metal plating wastes generated in the Maintenance and Supply Area. PFAS-containing mist suppressants were likely used during the plating process given the metal plating period of operation. Therefore, PFAS-impacted material may have been disposed of at the Chromic Acid/Alodine Drying Beds AOPI. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.10.2 SI Sampling and Results

Two groundwater samples were collected from two existing monitoring wells within the suspected release area (TEAD-CAB-C35 and TEAD-CAB-C37), as shown in Figure 6-5. Upgradient and downgradient wells associated with nearby AOPIs (e.g., Metal Plating Operations AOPI and Building 632/738 CMF AOPI) capture additional results relative to Chromic Acid/Alodine Drying Beds due to proximity (Figure 6-2). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for groundwater collected at the Chromic Acid/Alodine Drying Beds AOPI are summarized below and presented in Table 6-7 and Figure 6-6.

6.10.2.1 Groundwater

PFOA and PFHxS were detected at estimated concentrations less than their respective SLs at both TEAD-CAB-C35 and TEAD-CAB-C37. In addition, PFBS was detected at an estimated concentration less than the SL in TEAD-CAB-C37.

PFOS, PFNA, and HFPO-DA were not detected at concentrations greater than the LODs in groundwater at the AOPI.

6.10.3 CSM

The Chromic Acid/Alodine Drying Beds AOPI is approximately 6.51 acres. The drying beds were composed of a group of four concrete pads configured in a square pattern, with two pads elevated approximately 2 feet above the others (Tetra Tech 1996). Each pad was between 12 and 15 feet square. A trench ran through the center of the two elevated pads that may have been used to drain liquid from the pads. The elevated pads were not surrounded by a berm. The two lower pads were slightly larger and surrounded by a berm to contain liquid. The former drying beds are in the center of a newly constructed asphalt lot. The former location exists beneath the asphalt surface and under approximately 12 feet of fill.

The ground surface elevation is approximately 4,780 feet amsl, and groundwater was encountered at approximately 318 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

The Chromic Acid/Alodine Drying Beds records indicate potentially PFAS-contaminated metal plating waste from the Maintenance and Supply Area were disposed of at the AOPI. The primary release mechanism is the potential release of PFAS to soil related to disposal of metal plating waste in the 1970s.

The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the Chromic Acid/Alodine Drying Beds AOPI is not a viable pathway due to paved surfaces (i.e., nearly 100 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of the SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the majority of the AOPI is composed of impervious cover and has been largely reworked/redeveloped, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete.

Although groundwater is not currently used as a drinking water source at the Chromic Acid/Alodine Drying Beds AOPI, Target PFAS were detected at concentrations less than the SLs in groundwater and no groundwater use restrictions are in place at the AOPI. Therefore, the onsite groundwater exposure pathways are potentially complete. In addition, the groundwater exposure pathway for offsite residents is potentially complete because Target PFAS were detected at concentrations less than the SLs and potable wells are present downgradient from the TEAD-N boundary.

Figure 6-11 presents the CSM for the Chromic Acid/Alodine Drying Beds AOPI.

6.10.4 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-7. Target PFAS Results and Screening for the Chromic Acid/Alodine Drying Beds AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-CAB-C35	TECAB-C35	WELL	323.00-323.00	04/21/2023	3.7 U	1.9 U	**3.1 J**	1.9 U	**1.7 J**	1.9 U
TEAD-CAB-C37	TECAB-C37	WELL	433.00-433.00	04/21/2023	3.7 U	**2.8 J**	**2.1 J**	1.9 U	**1.7 J**	1.9 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.11 INDUSTRIAL WASTEWATER PIPING SYSTEM AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Industrial Wastewater Piping System AOPI.

6.11.1 AOPI Background

The Industrial Wastewater Piping System AOPI is located in the east and south quadrants of the facility, downgradient from the DRMO Storage Yard and the Combat Vehicle Test Facility AOPIs. The AOPI is interspersed among the Metal Plating Operations, Building 602, Building 616, and Building 619 AOPIs. All samples directly correlated with the Industrial Wastewater Piping System for this SI are in the east quadrant.

Prior to 1988 and the completion of the Former IWTP, stormwater and industrial wastewater from throughout the TEAD-N BRAC property were received by a system of aboveground ditches and underground piping known as the Industrial Wastewater Piping System. Up to 125,000 gallons per day (gpd) of industrial wastewater flowed through the system (Ageiss 1994a). Upon completion of the Former IWTP in 1988, industrial wastewater disposal was transferred to a new system and the old Industrial Wastewater Piping System was used for stormwater only. The old drains were plugged to ensure future effluent would be treated by the Former IWTP and no longer combined with stormwater. The Industrial Wastewater Piping System was reported to have received metal plating and/or industrial waste related to AFFF use from numerous buildings across the TEAD-N BRAC property, which may have contained PFAS-containing waste. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.11.2 SI Sampling and Results

Six groundwater samples and two field duplicates were collected from six existing monitoring wells at the Industrial Wastewater Piping System AOPI (Figures 6-8 and 6-12). Five monitoring wells were within the suspected release area (TEAD-IPS-B54, TEAD-IPS-C20, TEAD-IPS-C34, TEAD-IPS-C41, and TEAD-IPS-C42F). One well (TEAD-IPS-C43F) was downgradient from the suspected release area.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for groundwater collected at the Industrial Wastewater Piping System AOPI are summarized below and presented in Table 6-8 and Figures 6-9 and 6-13.

6.11.2.1 Groundwater

PFOA, PFBS, and PFHxS were detected at concentrations less than their respective SLs in groundwater collected within the suspected release area.

PFHxS was detected in all five wells within the suspected release area: TEAD-IPS-B54, TEAD-IPS-C20 (estimated), TEAD-IPS-C34, TEAD-IPS-C41 (estimated), and TEAD-IPS-C42F (estimated). PFOA and PFBS were also detected in monitoring well TEAD-IPS-C34, which is closest to the upgradient Metal Plating Operations AOPI. In addition, PFOA was detected at an estimated concentration less than the SL at TEAD-IPS-B54.

Target PFAS were not detected at concentrations greater than the LODs in the downgradient well (TEAD-IPS-C43F).

PFOS, PFNA, and HFPO-DA were not detected at concentrations above the LODs in any of the groundwater samples collected at the Industrial Wastewater Piping System.

6.11.3 CSM

The Industrial Wastewater Piping System AOPI is approximately 239.94 acres and overlaps with several other AOPIs. Aboveground ditches and underground piping comprise the former Industrial Wastewater Piping System, which has been capped and abandoned in place. Limited sections of the underground piping have been cleaned and reused for fiberoptic lines. In addition to the Industrial Wastewater Piping System itself, this AOPI includes old connecting lines that were reused as part of the new wastewater line. These connecting lines are present at Buildings 600, 601, 602, 606, 610, 611, 612, 615, 620, and 637. The ground surface elevation ranges from approximately 4,755 to 4,809 feet amsl, and groundwater was encountered, at approximately 298 to 347 feet bgs. Surface water and sediment are not present at the AOPI, and groundwater flow is toward the north/northwest.

The Industrial Wastewater Piping System potentially received PFAS-impacted wastewater from AFFF use and/or metal plating operations. The primary release mechanism is the potential release of PFAS to soil related to discharge of AFFF and/or metal plating waste to the piping system. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to groundwater via desorption and dissolution.

Due to the commercial and industrial use of TEAD-N BRAC, the human receptors considered in the CSM are onsite workers with the potential to work at the AOPI and offsite residents living in the vicinity of the former TEAD-N BRAC.

Exposure to soil at the Industrial Wastewater Piping System AOPI is not a viable pathway due to paved surfaces (i.e., nearly 100 percent of surface), and access to exercise intrusive sampling activities was unavailable at the time of the SI. In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at the AOPI. Because Target PFAS were not detected above SLs in groundwater and the AOPI has been largely reworked/redeveloped, soil as a source of contamination is unlikely and the soil exposure pathway is incomplete.

A groundwater restriction, not related to PFAS, is in place at this AOPI preventing its use for drinking water due to plumes of VOC groundwater contamination. The onsite groundwater exposure pathways are potentially complete because Target PFAS were detected at concentrations less than the SLs. In addition, the groundwater exposure pathway for offsite residents is potentially complete because potable wells are present downgradient from the TEAD-N boundary.

Figure 6-14 presents the CSM for the Industrial Wastewater Piping System AOPI.

6.11.4 Recommendation

Detected concentrations of Target PFAS in groundwater do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-8. Target PFAS Results and Screening for the Industrial Wastewater Piping System AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-IPS-B54	TEIPS-B54	WELL	356.00-356.00	04/21/2023	3.8 U	1.9 U	**5.0**	1.9 U	**2.1 J**	1.9 U
TEAD-IPS-C20	TEIPS-C20	WELL	370.00-370.00	04/20/2023	3.7 U	1.9 U	**2.4 J**	1.9 U	**2.3 J**	1.9 U
TEAD-IPS-C34	TEIPS-C34	WELL	349.00-349.00	04/20/2023	3.5 U	**15**	**5.6**	1.8 U	**1.6 J**	1.8 U
TEAD-IPS-C41	TEIPS-C41	WELL	363.00-363.00	04/21/2023	3.9 U	2.0 U	**1.2 J**	2.0 U	2.0 U	2.0 U
TEAD-IPS-C42F	TEIPS-C42F	WELL	350.00-350.00	04/20/2023	3.7 U	1.9 U	**3.1 J**	1.9 U	1.9 U	1.9 U
	TEIPS-C42FFD	WELL	350.00-350.00	04/20/2023(D)	3.8 U	1.9 U	**3.5 J**	1.9 U	1.9 U	1.9 U
TEAD-IPS-C43F	TEIPS-C43F	WELL	329.00-329.00	04/20/2023	3.8 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
	TEIPS-C43FFD	WELL	329.00-329.00	04/20/2023(D)	4.3 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
(D) = Field duplicate sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.12 FORMER IWL AND DITCHES AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Former IWL and Ditches AOPI.

6.12.1 AOPI Background

The Former IWL and Ditches AOPI is located in the west quadrant of the facility, downgradient from the Drum Storage Areas, Chromic Acid/Alodine Drying Beds, and Building 632/738 CMF AOPIs.

Industrial wastewater from TEAD-N BRAC, including potentially PFAS-impacted wastewater from AFFF use and/or metal plating operations, was discharged through a series of outfalls into unlined drainage ditches (SWMU 30; partially investigated by Active Army). Until 1966, the drainage ditches culminated in land-spreading areas and gravel pits used for evaporation and infiltration. From 1966 to 1988, wastewater was routed to a 1.5-mile-long collector ditch and discharged to an abandoned gravel quarry (SWMU 2; partially investigated by Active Army) located northwest of the BRAC property. Upon completion of the Former IWTP in 1988, industrial wastewater disposal was transferred to a new system and only stormwater was discharged through the outfalls into the drainage ditches. The Former IWL and Ditches received potentially PFAS-impacted industrial wastewater from throughout the Maintenance and Supply Area from AFFF use and/or metal plating operations. This AOPI is no longer owned by the Army and is currently used for industrial activities.

6.12.2 SI Sampling and Results

A groundwater sample was collected from one existing monitoring well (TEWLD-A02A) within the suspected release area at the Former IWL and Ditches AOPI (Figure 6-5). Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

The Target PFAS analytical results for the groundwater sample collected at the Former IWL and Ditches AOPI are summarized below and presented in Table 6-9 and Figure 6-6.

6.12.2.1 Groundwater

Target PFAS were not detected at concentrations above the LODs in the groundwater sample collected at the Former IWL and Ditches.

As detailed in Section 6.14.2.1, Target PFAS SLs were exceeded in one perimeter well (TEAD-PER-A04), downgradient from the Former IWL and Ditches AOPI, on Active installation Army-owned property. The following information supports the recommendation that the SL exceedances observed at this well are not indicative of a source of PFAS greater than SLs at the Former IWL and Ditches AOPI:

- Target PFAS were not detected in monitoring well TEWLD-A02A collected within the AOPI boundary. TEAD-PER-A04 is outside the TEAD-N BRAC boundary.
- TEAD-PER-A04 was reported as dry in the 2021 Final Annual Groundwater Monitoring Report (Brice Engineering, LLC 2021). The condition of the well observed during this SI was very turbid with a soft bottom, which indicates the sample collected during this SI may not be representative of groundwater conditions.
- Samples collected from other perimeter wells in the vicinity of TEAD-PER-A04 (i.e., TEAD-PER-B22 and TEAD-PER-B27) during this SI had relatively low turbidity (<35 nephelometric turbidity units) and no SL exceedances.

- The Former IWL and Ditches AOPI was targeted for investigation in this SI because the area received potentially PFAS-containing wastewater discharge through the industrial wastewater piping system from operations at TEAD-N BRAC, including metal plating operations and AFFF use. However, PFAS did not exceed SLs in groundwater samples collected from the AOPIs that would source the PFAS-containing waste; therefore, it is concluded that wastewater from these areas of operation that discharged to the Former IWL and Ditches AOPI did not result in PFAS concentrations in groundwater greater than SLs.
- The IWL and Ditches AOPI from this SI includes only the footprint of the former IWL and Ditches that falls within the boundary of TEAD-N BRAC. The former IWL and Ditches AOPI extends past the BRAC property onto Active Army property and was investigated as part of the Active Army PFAS PA/SI (Arcadis 2022). The Active Army investigation included soil samples and groundwater samples from existing wells (one within and two downgradient from the Active Army's Former IWL and Ditches AOPI boundary). PFAS were detected in soil and groundwater, but no concentrations exceeded SLs.

6.12.3 Recommendation

Target PFAS were not detected in groundwater at the Former IWL and Ditches AOPI, and the information provided in Section 6.12.2 provides evidence this AOPI does not contribute to PFAS concentrations observed at a downgradient monitoring well on the adjacent Active Installation Army-owned property. Therefore, further investigation at this AOPI is not recommended.

Table 6-9. Target PFAS Results and Screening for the Former IWL and Ditches AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEWLD-A02A	TEWLD-A02A	WELL	294.00-294.00	04/21/2023	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.13 FORMER IWTP AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Former IWTP AOPI.

6.13.1 AOPI Background

The Former IWTP AOPI is located in the west quadrant of the facility, downgradient from the Drum Storage Areas AOPI, and in the vicinity of the Former IWL and Ditches AOPI.

The Former IWTP was built in 1987 to treat and reuse wastewater from the industrial activities at TEAD-N BRAC and began operations in 1988 with a design capacity of 160,000 gpd (Ageiss 1994a). The facility treated an average of 116,000 gpd, with almost 90 percent of the wastewater recycled back through the Maintenance and Supply Area and the remaining wastewater discharge to the Tooele public WWTP.

Treatment at the Former IWTP included air strippers for VOCs, a flocculator and clarifier for settling out metals, sand filters for filtering solids, and granular activated carbon (GAC) to remove VOCs and SVOCs (Montgomery Watson 1993). The Former IWTP ceased operation in 2015. During the first year of operation, used GAC from the Former IWTP was stored uncovered in open shipping containers (Ageiss 1994b). Some of this material was blown onto the ground in the western portion of the facility, resulting in the release of VOCs, SVOCs, and metals (cadmium, lead, and mercury) to surface soils (Montgomery Watson 1993). After the first year, used GAC was stored in closed containers at the Former IWTP prior to disposal. Additional details related to the storage, transport, and disposal of metals, solids, and sludge post-treatment have not been identified. A sewage sludge spill occurred at the Former IWTP in September 1994 when a sewage line broke and spilled sludge on the ground between Buildings 710 and 712 (Tetra Tech 1996). The Former IWTP was not designed to treat PFAS-containing waste; therefore, the industrial waste treated, and subsequently released, by the Former IWTP may have still been impacted by PFAS. This AOPI is no longer owned by the Army and is currently used for industrial purposes.

6.13.2 SI Sampling and Results

Groundwater samples were not collected from within the suspected release area at the Former IWTP AOPI; however, upgradient and downgradient wells associated with nearby AOPIs (e.g., Drum Storage Areas, Former IWL and Ditches) capture results relevant to the Former IWTP due to proximity (Figures 6-2 and 6-6). Although there are no monitoring wells within the Former IWTP AOPI, Target PFAS did not exceed SLs in groundwater samples collected from the AOPIs that would source the PFAS-containing waste that was discharged to the IWTP. Therefore, it is concluded that wastewater from these areas of operation that discharged to the Former IWTP AOPI did not result in PFAS concentrations in groundwater greater than SLs. The nearest downgradient wells to the Former IWTP AOPI are the perimeter wells discussed in Section 6.14.

Soil samples were not proposed as part of this SI, and surface water and sediment are not present at the AOPI.

6.13.3 Recommendation

Detected concentrations of Target PFAS in onsite groundwater near the Former IWTP AOPI do not exceed the SLs; therefore, further investigation is not recommended.

6.14 SUPPLEMENTARY ASSESSMENT OF FACILITY-WIDE AND BOUNDARY MIGRATION POTENTIAL

The following subsections describe the rationale and results of facility-wide and facility boundary samples collected at the former TEAD-N BRAC and provide recommendations based on results.

6.14.1 Background and Purpose

One of the goals of this SI was to determine the potential migration of PFAS at the former TEAD-N BRAC facility boundary. To accomplish this goal, groundwater samples were collected from existing monitoring wells at or near the former TEAD-N BRAC boundary.

6.14.2 Supplementary Sampling and Results

Figure ES-1 presents the locations of all perimeter groundwater samples collected from existing monitoring wells during the SI at the former TEAD-N BRAC property. In addition to the AOPI-specific locations described previously, the rationale for supplementary sampling locations is as follows:

- Eleven perimeter wells at or near the former TEAD-N BRAC boundary were sampled to further evaluate facility boundary conditions and potential for migration of PFAS to or from the facility:
    - TEAD-PER-B03, TEAD-PER-C12, TEAD-PER-C44, and TEAD-PER-C15 were sampled to evaluate Target PFAS concentrations in groundwater directly downgradient from (i.e., to the north of) the TEAD-N-BRAC property.
    - TEAD-PER-B22, TEAD-PER-B27, and TEAD-PER-A04 were sampled to evaluate Target PFAS concentrations in groundwater downgradient from (i.e., to the northwest of) the TEAD-N BRAC property. All three wells are on TEAD-N (Active Army).
    - TEAD-PER-C27 was sampled to evaluate Target PFAS concentrations in groundwater upgradient (i.e., from the east) of the TEAD-N BRAC property.
    - TEAD-PER-N11488, TEAD-PER-N12088, and TEAD-PER-N15097 were sampled to evaluate Target PFAS concentrations in groundwater directly upgradient (i.e., from the south/southwest) of the TEAD-N BRAC property.

The Target PFAS analytical results for the supplementary groundwater samples are summarized below and presented with all of the SI groundwater sample results in Table 6-10 and Figure ES-1.

6.14.2.1 Groundwater

Groundwater samples were collected from 11 existing monitoring wells along the former TEAD-N BRAC facility boundary.

Target PFAS were detected in five wells (TEAD-PER-A04, TEAD-PER-B22, TEAD-PER-B27, TEAD-PER-C12, and TEAD-PER-N11488). Target PFAS SLs were exceeded in one well (TEAD-PER-A04), which is on Active installation Army-owned property. In boundary well TEAD-PER-A04, the concentration of PFOS exceeded the SL of 4 ng/L with an estimated concentration of 9.8 ng/L, and the concentration of PFOA exceeded the SL of 6 ng/L with an estimated concentration of 19 ng/L.

PFNA and HFPO-DA were not detected at concentrations greater than the LODs in groundwater.

6.14.3 CSM

Surface water features are limited at TEAD-N due to the arid nature of the region, and surface water is not used as a drinking water source at TEAD-N. Drinking water for the TEAD-N BRAC property is supplied by Tooele City, which receives its water from a system of supply wells and springs. Tooele City operates several production wells that draw water from the valley east of the installation's eastern boundary (i.e., upgradient of TEAD-N). TEAD-N (Active Army) operates its own water supply and distribution system, located on the eastern side of the Tooele Valley, that is sourced from groundwater. Three potable supply wells (WW1, WW3, and WW4) and two non-potable wells (WW5 and WW6) are located at TEAD-N (USDOHHS 2003). One supply well (WW2), located on the BRAC parcel, has been abandoned.

TEAD geology consists of unconsolidated and semi-consolidated sequences of Tertiary- and Quaternary-aged sediments composed of a range from clay to coarse gravel. On average, groundwater is approximately 360 feet bgs and generally flows from southeast to northwest.

Although the primary release mechanism is to soil, exposure to soil is limited due to extensive impervious cover at the facility, and large-scale redevelopment and/or soil removal actions have been conducted throughout the site since closure. Based on review of aerial imagery, it is estimated that approximately 80 percent of the collective ground surface at the 12 AOPIs is paved surface, with six AOPIs being nearly 100 percent paved. In addition, the majority of existing pervious land has been reworked/redeveloped for commercial/industrial use since the time of closure. For this reason, and in accordance with the TEAD-N BRAC UFP-QAPP Addendum (Leidos 2023a), groundwater was the primary medium evaluated as a screening tool to determine the presence or absence of PFAS contamination at TEAD-N BRAC.

6.14.4 Recommendation

Detected concentrations of Target PFAS in groundwater on the former TEAD-N BRAC facility do not exceed the SLs. Exceedances of Target PFAS SLs occur in one perimeter well (TEAD-PER-A04), which is on the Active Army installation. The information presented in Section 6.12.2 supports the recommendation that the SL exceedances observed at this well do not warrant further investigation. Therefore, further investigation into the potential sources and offsite migration of PFAS from TEAD-N BRAC is not recommended.

Table 6-10. Target PFAS Results and Screening for Perimeter Wells

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA or GenX	PFBS	PFHxS	PFNA	PFOA	PFOS
Groundwater				Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
				Screening Levels	6	601	39	6	6	4
TEAD-PER-A04	TEPER-A04	WELL	252.00-252.00	04/20/2023	20 UJ	**11 J**	**9.8 J**	10 UJ	**19 J**	**9.8 J**
TEAD-PER-B03	TEPER-B03	WELL	265.00-265.00	04/20/2023	3.8 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
TEAD-PER-B22	TEPER-B22	WELL	367.00-367.00	04/20/2023	3.8 U	1.9 U	1.9 U	1.9 U	**1.3 J**	**1.8 J**
TEAD-PER-B27	TEPER-B27	WELL	261.00-261.00	04/20/2023	3.7 U	1.9 U	**1.2 J**	1.9 U	**1.1 J**	1.9 U
TEAD-PER-C12	TEPER-C12	WELL	310.00-310.00	04/20/2023	3.4 U	1.7 U	**1.1 J**	1.7 U	1.7 U	1.7 U
TEAD-PER-C15	TEPER-C15	WELL	335.00-335.00	04/20/2023	3.4 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
TEAD-PER-C27	TEPER-C27	WELL	420.00-420.00	04/21/2023	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
TEAD-PER-C44	TEPER-C44	WELL	290.00-290.00	04/20/2023	3.4 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
	TEPER-C44FD	WELL	290.00-290.00	04/20/2023(D)	3.8 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
TEAD-PER-N11488	TEPER-N11488	WELL	331.00-331.00	04/21/2023	3.6 U	**2.0 J**	**12**	1.8 U	**5.3**	1.8 U
TEAD-PER-N12088	TEPER-N12088	WELL	316.00-316.00	04/21/2023	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
TEAD-PER-N15097	TEPER-N15097	WELL	285.00-285.00	04/21/2023	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U

The SLs are the Residential Scenario SLs calculated using the USEPA RSL calculator provided in the July 2022 OSD Memorandum for Tap Water using an HQ = 0.1.
Bolded values denote detected concentrations.
Highlighted values indicate an exceedance of the SL.
(D) = Field duplicate sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

7. CONCLUSIONS AND RECOMMENDATIONS

An SI is conducted when the PA determines an AOPI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes groundwater sampling at AOPIs to determine whether 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 (40 CFR §300.420(5)). The SI Report used the findings from the PA in conjunction with groundwater sampling data for each AOPI to determine whether Target PFAS have been released to the environment and whether a release has affected or may affect specific human health targets.

Before the SI sampling, a preliminary CSM was developed in the PA for each AOPI based on an evaluation of existing records, personnel interviews, and site reconnaissance. The preliminary CSMs identified potential human receptors and exposure pathways for groundwater that is known to be used, or could realistically be used in the future, as a source of drinking water and identified potential soil exposure pathways. AOPIs were sampled during the SI at the former TEAD-N BRAC to further evaluate PFAS-related releases and identify the presence or absence of Target PFAS.

Target PFAS were detected at concentrations greater than the LODs in samples collected from 19 of 23 total groundwater wells, including detections at 6 of the 12 AOPIs (Metal Plating Operations, Building 619, Building 632/738 CMF, DRMO Storage Yard, Chromic Acid/Alodine Drying Beds, and Industrial Wastewater Piping System). Target PFAS concentrations did not exceed the SLs at any of the AOPIs.

Soil samples were not proposed as part of this SI due to limited exposure (i.e., paved surfaces), extensive redevelopment and/or reworking of the property, and access to exercise intrusive sampling activities was unavailable at the time of the SI. In addition, surface water and sediment were not present at any of the AOPIs.

Target PFAS were not detected above the LODs in groundwater at three of the AOPIs. PFNA and HFPO-DA were not detected above the LODs in any samples. In addition, three AOPIs did not have directly correlative samples associated with them and were evaluated using upgradient and downgradient wells associated with surrounding AOPIs.

The CSMs were updated for each AOPI where Target PFAS were detected at concentrations greater than the LODs. The updated CSMs detail site geological conditions; determine primary and secondary release mechanisms; identify potential human receptors; and detail complete, potentially complete, and incomplete exposure pathways for current and reasonably anticipated future exposure scenarios.

In the absence of soil data, groundwater from existing monitoring wells was assessed to evaluate the presence/absence of PFAS at each AOPI. The soil exposure pathway for onsite workers is potentially complete at one of six AOPIs comprising detections (i.e., DRMO Storage Yard AOPI) where Target PFAS were detected at concentrations less than the SLs in groundwater, and unpaved surfaces at the AOPI potentially consist of native soil. Although Target PFAS were detected at concentrations less than the SLs in groundwater at five other AOPIs, soil exposure pathways at those AOPIs are incomplete either due to extensive impervious surfaces or redevelopment and/or reworking of soil, significantly reducing the potential exposure to native soil at the AOPIs.

The onsite groundwater exposure pathway is potentially complete at six AOPIs where Target PFAS were detected at concentrations less than the SLs in groundwater. Four AOPIs are within a non-PFAS related groundwater use restriction area, and the exposure pathways are potentially complete for all six AOPIs because detected concentrations do not exceed the SLs. The groundwater exposure pathway for offsite residents is potentially complete for all six AOPIs because Target PFAS were detected in groundwater and a potential exists for migration to offsite groundwater wells downgradient from the TEAD-N BRAC boundary.

Surface water and sediment were not present at any AOPIs at TEAD-N BRAC.

SI sampling results were compared to the OSD risk-based SLs presented in Section 5 to determine if further investigation is warranted at each AOPI as follows:

- If the maximum detected concentration for a given analyte in soil or groundwater exceeds the SL, it is concluded that further investigation is warranted.
- If the maximum detected concentration is less than the SL, it is concluded that further investigation is not warranted.

Table 7-1 summarizes the conclusions and recommendations for each AOPI. No AOPIs are recommended for further investigation or evaluation.

Concentrations of Target PFAS exceeded SLs in one perimeter well (TEAD-PER-A04), which is adjacent to TEAD-N BRAC, on Active installation Army-owned property, downgradient from the Former IWL and Ditches AOPI. As presented in Section 6.12.2, observational and analytical data collected at this well and other wells within or adjacent to TEAD-N BRAC property support that AOPIs at TEAD-N BRAC do not contribute to PFAS concentrations greater than the SLs observed at this well. Data collected by the Army on the adjacent, active TEAD-N property support this conclusion.

Table 7-1. Summary of PFAS Detected and Recommendations

AOPI	Detection of HFPO-DA, PFBS, PFHxS, PFNA, PFOS, and/or PFOA	Recommendation and Rationale
	Groundwater	
Metal Plating Operations at Buildings 600, 609, 611, 614, 615, 618, 620, and 637	Detected	SLs not exceeded; further investigation not recommended at this time
Building 602 (Maintenance Shop)	–	SLs not exceeded in sample locations downgradient from AOPI; further investigation not recommended at this time
Building 616 (Fire Station)	–	SLs not exceeded in sample locations downgradient from AOPI; further investigation not recommended at this time
Building 619 (Vehicle Maintenance Facility)	Detected	SLs not exceeded; further investigation not recommended at this time
Building 632/738 CMF	Detected	SLs not exceeded; further investigation not recommended at this time
Combat Vehicle Test Facility	ND	Target PFAS not detected above LODs; further investigation not recommended at this time
DRMO Storage Yard	Detected	SLs not exceeded; further investigation not recommended at this time
90-Day Drum Storage Area and Drum Storage Area	ND	Target PFAS not detected above LODs; further investigation not recommended at this time
Chromic Acid/Alodine Drying Beds	Detected	SLs not exceeded; further investigation not recommended at this time
Industrial Wastewater Piping System	Detected	SLs not exceeded; further investigation not recommended at this time
Former IWL and Ditches	ND	Target PFAS not detected above LODs; further investigation not recommended at this time
Former IWTP	–	SLs not exceeded in sample locations downgradient from AOPI; further investigation not recommended at this time
The SL exceedance in groundwater along the western boundary of TEAD-N BRAC is located on Active Army property; therefore, further investigation is not recommended to evaluate the potential for offsite PFAS migration at the boundary.		

– Not Collected
ND = Not Detected

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FIGURES

Screening Levels from the July 2022 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA)	6	23
Perfluorobutanesulfonic acid (PFBS)	601	1900
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	6	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
GW = Groundwater, SW = Surfacewater,
SO = Soil, SD = Sediment
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
J+ = The analyte was positively identified; the result is an estimated concentration and may be biased high

TEAD-IPS-C34 (GW)	
Analyte	349 ft.
PFBS (ng/L)	15
PFHxS (ng/L)	5.6
PFOA (ng/L)	1.6 J

TEAD-CMF-C36 (GW)	
Analyte	280 ft.
PFBS (ng/L)	1.1 J
PFHxS (ng/L)	6.8

TEAD-PER-C44 (GW)		
Analyte	290 ft.	290 ft.(D)
ND		

TEAD-PER-C12 (GW)	
Analyte	310 ft.
PFHxS (ng/L)	1.1 J

TEAD-IPS-C43F (GW)		
Analyte	329 ft.	329 ft.(D)
ND		

TEAD-PER-C15 (GW)	
Analyte	335 ft.
ND	

TEAD-IPS-C42F (GW)		
Analyte	350 ft.	350 ft.(D)
PFHxS (ng/L)	3.1 J	3.5 J

TEAD-CMF-B26 (GW)	
Analyte	319 ft.
PFBS (ng/L)	1.1 J
PFHxS (ng/L)	1.9 J
PFOA (ng/L)	2.3 J

TEAD-PER-B03 (GW)	
Analyte	265 ft.
ND	

TEAD-PER-B27 (GW)	
Analyte	261 ft.
PFHxS (ng/L)	1.2 J
PFOA (ng/L)	1.1 J

TEAD-PER-A04 (GW)	
Analyte	252 ft.
PFBS (ng/L)	11 J
PFHxS (ng/L)	9.8 J
PFOA (ng/L)	19 J
PFOS (ng/L)	9.8 J

TEAD-IPS-C41 (GW)	
Analyte	363 ft.
PFHxS (ng/L)	1.2 J

TEAD-IPS-B54 (GW)	
Analyte	356 ft.
PFHxS (ng/L)	5
PFOA (ng/L)	2.1 J

TEAD-PER-B22 (GW)	
Analyte	367 ft.
PFOA (ng/L)	1.3 J
PFOS (ng/L)	1.8 J

TEAD-CAB-C37 (GW)	
Analyte	433 ft.
PFBS (ng/L)	2.8 J
PFHxS (ng/L)	2.1 J
PFOA (ng/L)	1.7 J

TEAD-DRM-C26 (GW)	
Analyte	368 ft.
PFHxS (ng/L)	3.2 J
PFOA (ng/L)	1.1 J

TEAD-CAB-C35 (GW)	
Analyte	323 ft.
PFHxS (ng/L)	3.1 J
PFOA (ng/L)	1.7 J

TEAD-IPS-C20 (GW)	
Analyte	370 ft.
PFHxS (ng/L)	2.4 J
PFOA (ng/L)	2.3 J

TEAD-DRM-C32 (GW)	
Analyte	397 ft.
PFHxS (ng/L)	2.8 J

TEAD-MPF-C51F (GW)	
Analyte	334 ft.
PFHxS (ng/L)	1.9 J
PFOA (ng/L)	1.2 J

TEAD-PER-C27 (GW)	
Analyte	420 ft.
ND	

TEWLD-A02A (GW)	
Analyte	294 ft.
ND	

TEAD-DRM-C22 (GW)	
Analyte	376 ft.
PFHxS (ng/L)	2.6 J

TEAD-MPF-C50F (GW)	
Analyte	348 ft.
PFBS (ng/L)	1.0 J
PFHxS (ng/L)	2.0 J
PFOA (ng/L)	2.5 J

TEAD-PER-N15097 (GW)	
Analyte	285 ft.
ND	

TEAD-MPF-C19 (GW)	
Analyte	358 ft.
PFHxS (ng/L)	2.6 J
PFOA (ng/L)	2.0 J

TEAD-DSA-C53F (GW)	
Analyte	328 ft.
ND	

TEAD-MPF-C52 (GW)		
Analyte	442 ft.	442 ft.(D)
PFBS (ng/L)	1.4 J	1.4 J
PFHxS (ng/L)	5	5.5
PFOA (ng/L)	2.5 J	2.6 J

TEAD-PER-N12088 (GW)	
Analyte	316 ft.
ND	

TEAD-VTF-C23 (GW)	
Analyte	385 ft.
ND	

TEAD-PER-N11488 (GW)	
Analyte	331 ft.
PFBS (ng/L)	2.0 J
PFHxS (ng/L)	12
PFOA (ng/L)	5.3

TEAD-MPF-C47F (GW)	
Analyte	367 ft.
PFHxS (ng/L)	4.5
PFOA (ng/L)	2.1 J

TEAD-619-C48F (GW)	
Analyte	366 ft.
PFBS (ng/L)	1.9 J
PFHxS (ng/L)	5.6
PFOA (ng/L)	4.4

TEAD-MPF-C21 (GW)	
Analyte	371 ft.
PFBS (ng/L)	22
PFHxS (ng/L)	2.1 J

Industrial Wastewater Piping System (SWMU 49)
Former Industrial Waste Lagoons and Ditches (SWMU 30/SWMU 2)
Chromic Acid/Alodine Drying Beds (SWMU 51)
CMF
IWTP
Combat Vehicle Test Facility
DRMO Storage Yard (SWMU 26)
Drum Storage Areas (SWMU 28/SWMU 29)
616
602
619

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the July 2022 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Legend

- BRAC Parcel Boundary
- Industrial Wastewater (IWW) Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Surface Water
- Active Installation Boundary
- Metal Plating Ops at Building
- Sample Existing Monitoring Well (23)
- Sample Existing Perimeter Well (11)
- Existing Monitoring Well
- Groundwater Flow Direction
- Surface Water Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Groundwater flow directions are from the 2021 Final Annual Groundwater Monitoring.

2,000 1,000 0 2,000 Feet

UT STATE PLANE CENTRAL (NAD83)

Area Shown

US Army Corps of Engineers

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SUMMARY OF TARGET PFAS IN GROUNDWATER
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE ES-1 | DATE: 8/8/2023

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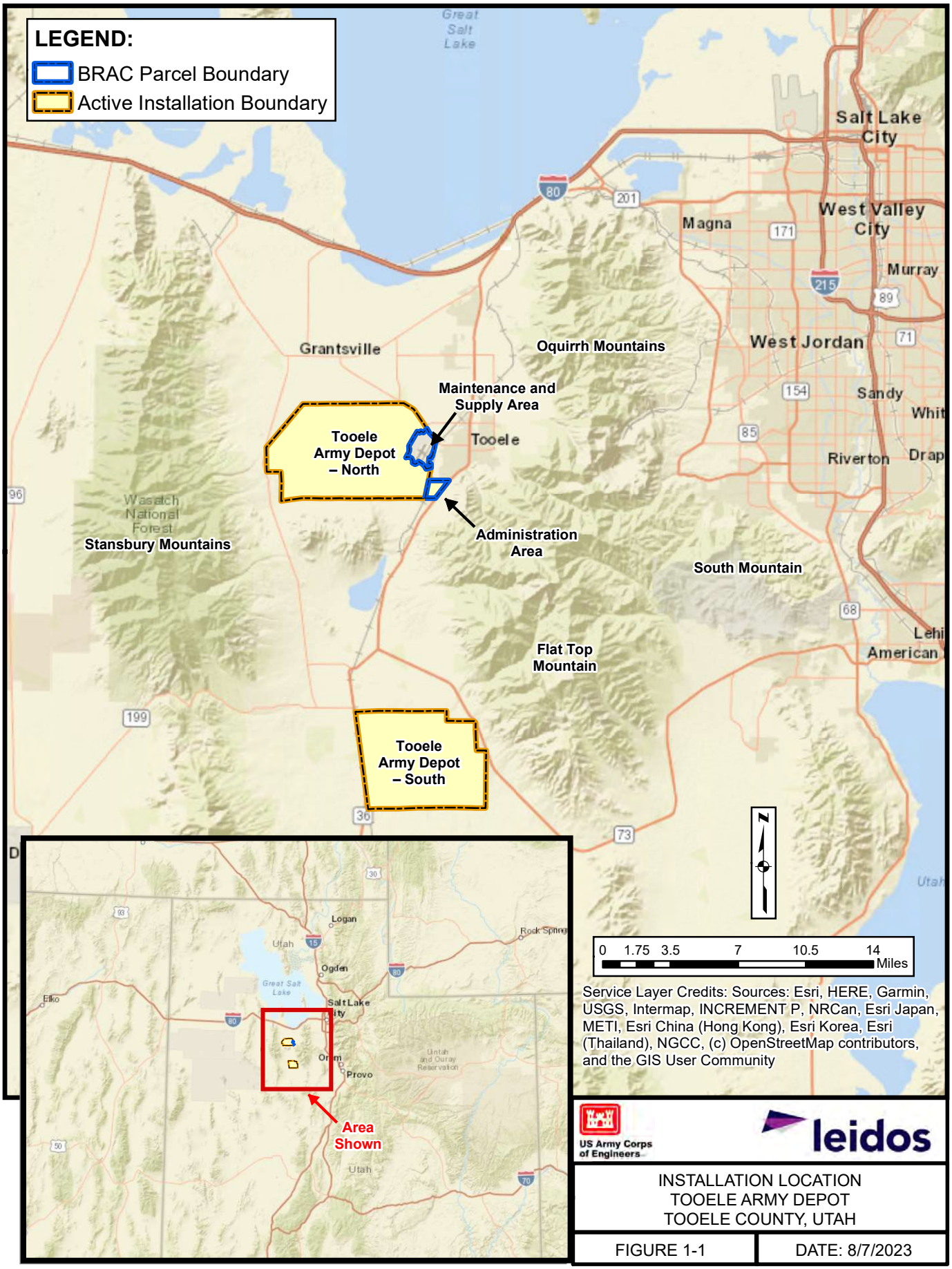
LEGEND:
BRAC Parcel Boundary
Active Installation Boundary
Great Salt Lake
Salt Lake City
West Valley City
Magna
Murray
West Jordan
Sandy
Riverton
Grantsville
Oquirrh Mountains
Maintenance and Supply Area
Tooele Army Depot – North
Tooele
Administration Area
Wasatch National Forest
Stansbury Mountains
South Mountain
Flat Top Mountain
Tooele Army Depot – South
Lehi
American
80
201
171
215
89
71
154
85
68
73
199
36
96
Logan
Ogden
Salt Lake City
Provo
Utah
Elko
Area Shown
0 1.75 3.5 7 10.5 14
Miles
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
US Army Corps of Engineers
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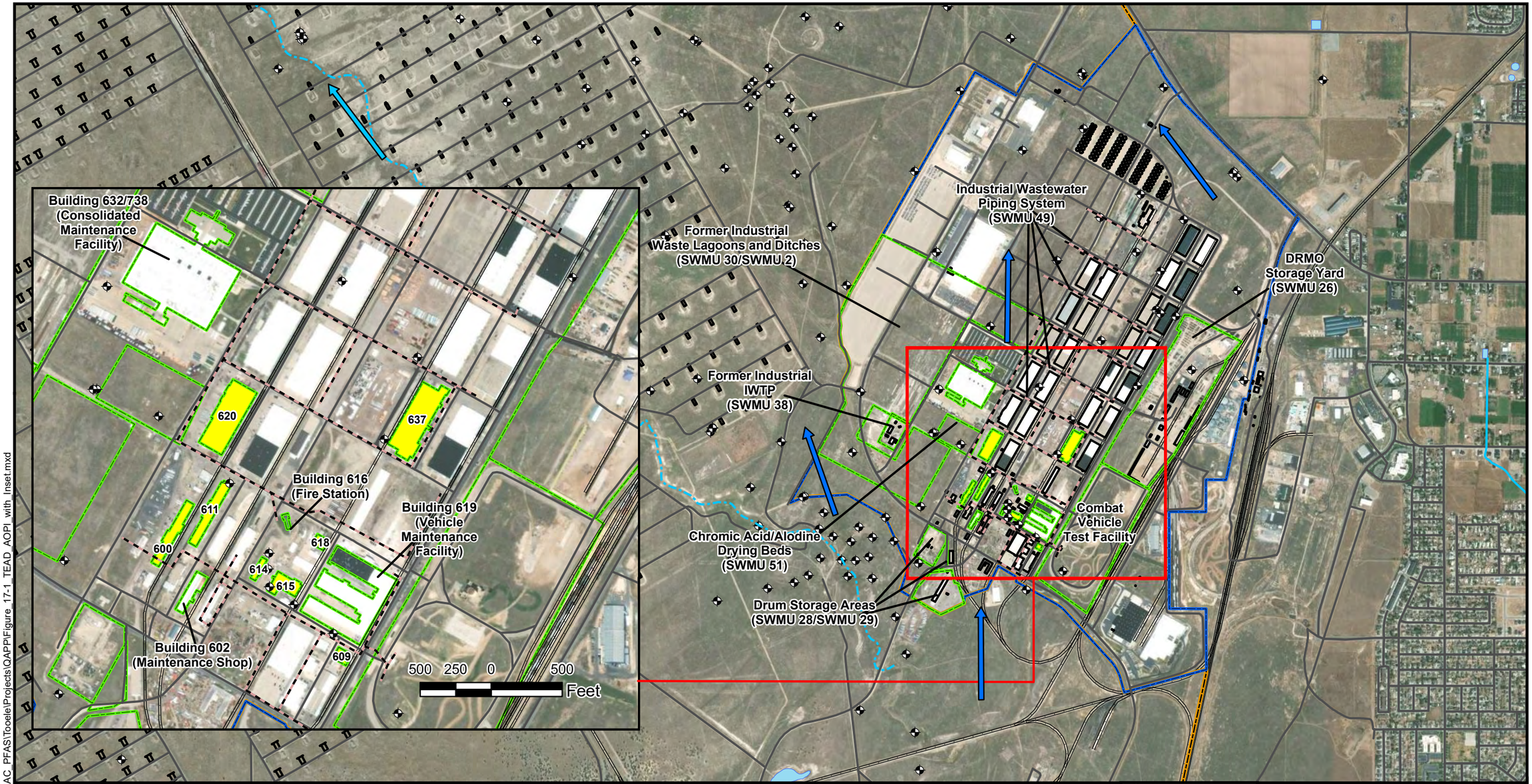
INSTALLATION LOCATION
TOOELE ARMY DEPOT
TOOELE COUNTY, UTAH
FIGURE 1-1
DATE: 8/7/2023



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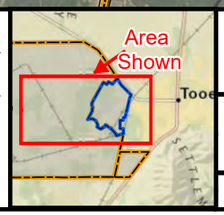
Legend

- BRAC Parcel Boundary
- Industrial Wastewater (IWW) Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- Surface Water
- Buildings
- Active Installation Boundary
- Metal Plating Ops at Building
- Existing Monitoring Well
- River/Stream (Perennial)
- Stream (Intermittent)
- Groundwater Flow Direction
- Surface Water Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Groundwater flow directions are from the 2021 Final Annual Groundwater Monitoring.

2,000 1,000 0 2,000
Feet

UT STATE PLANE CENTRAL (NAD83)



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AOPI LOCATIONS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 1-2 | DATE: 8/8/2023

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Legend

- Road
- Railroad
- River/Stream (Perennial)
- Stream (Intermittent)
- Groundwater Flow Direction
- Surface Water Flow Direction
- TEAD-N BRAC Boundary
- Active Installation Boundary
- Building

ContourElevation (ft)

- 4160 - 4670
- 4670 - 4770
- 4770 - 4870
- 4870 - 4970
- 4970 - 5070
- 5070 - 5180

Notes:
1. Data Sources: USGS National Elevation Dataset (NED), USGS National Hydrography Dataset (NHD).
2. Groundwater flow directions are from the 2021 Final Annual Groundwater Monitoring Report, Tooele Army Depot North (Brice 2022).
3. Background Source: ESRI World Imagery (Vivid/Maxar, 4/2020).

1,000 500 0 1,000 Feet

N

Area Shown

Grantsville Tooele

US Army Corps of Engineers

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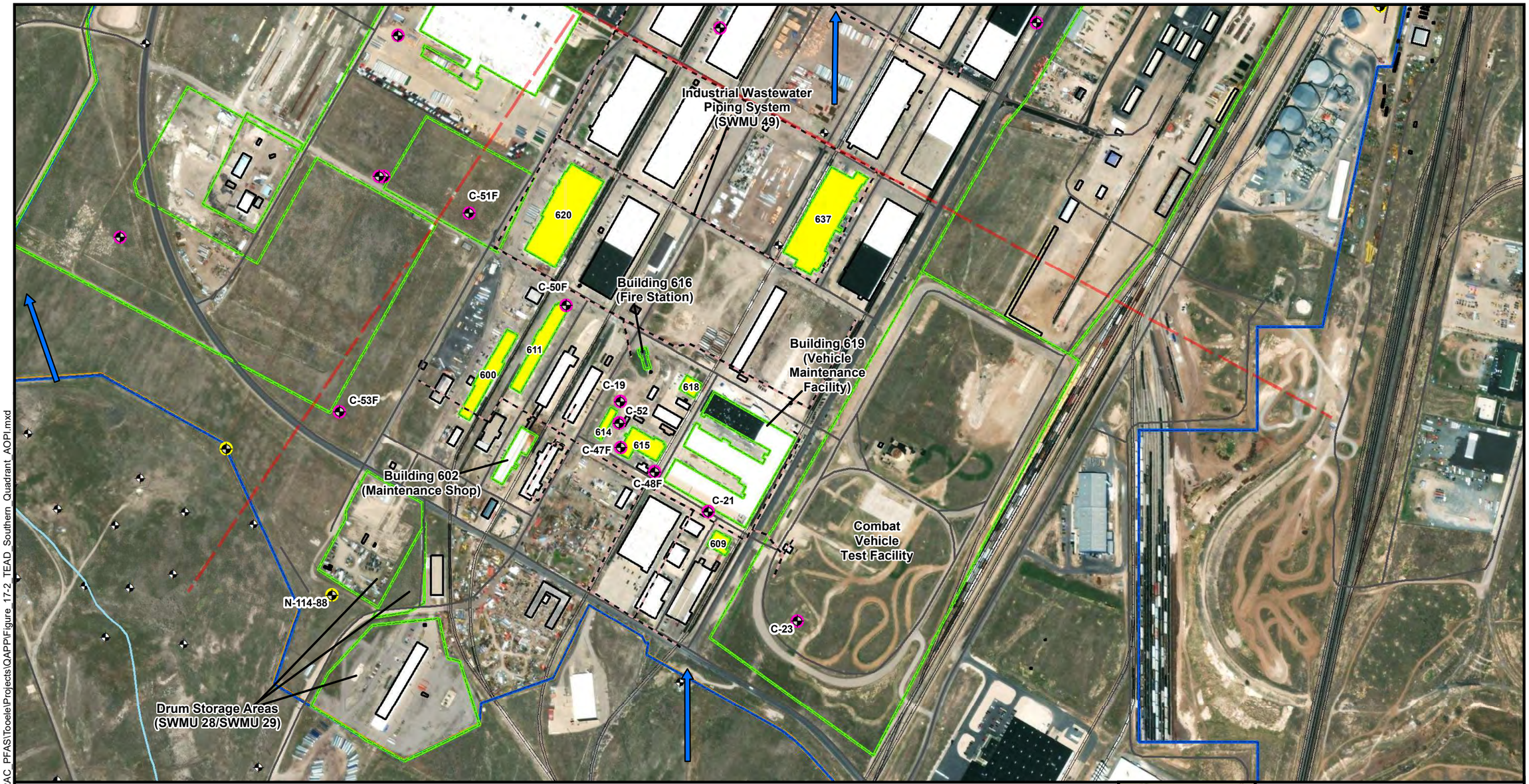
SITE FEATURES
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 2-1 | DATE: 8/7/2023



Legend

- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Building
- Active Installation Boundary
- Metal Plating Ops at Building
- South Quadrant
- Existing Monitoring Well
- Sample Existing Monitoring Well (9) [3]
- Sample Existing Perimeter Well (1) [3]
- Groundwater Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent south quadrant sample plan and sample count.

500 250 0 500 Feet

UT STATE PLANE CENTRAL (NAD83)

Area Shown

US Army Corps of Engineers

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SOUTH QUADRANT AOPI
SAMPLE LOCATIONS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-1 | DATE: 6/30/2023

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TEAD-MPF-C51F (GW)	
Analyte	**334 ft.**
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	1.8 U
PFHxS (ng/L)	1.9 J
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.2 J
PFOS (ng/L)	1.8 U

TEAD-MPF-C50F (GW)	
Analyte	**348 ft.**
HFPO-DA or GenX (ng/L)	3.4 U
PFBS (ng/L)	1.0 J
PFHxS (ng/L)	2.0 J
PFNA (ng/L)	1.7 U
PFOA (ng/L)	2.5 J
PFOS (ng/L)	1.7 U

TEAD-MPF-C19 (GW)	
Analyte	**358 ft.**
HFPO-DA or GenX (ng/L)	3.5 U
PFBS (ng/L)	1.8 U
PFHxS (ng/L)	2.6 J
PFNA (ng/L)	1.8 U
PFOA (ng/L)	2.0 J
PFOS (ng/L)	1.8 U

TEAD-DSA-C53F (GW)	
Analyte	**328 ft.**
HFPO-DA or GenX (ng/L)	3.8 U
PFBS (ng/L)	1.9 U
PFHxS (ng/L)	1.9 U
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.9 U
PFOS (ng/L)	1.9 U

TEAD-619-C48F (GW)	
Analyte	**366 ft.**
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	1.9 J
PFHxS (ng/L)	5.6
PFNA (ng/L)	1.8 U
PFOA (ng/L)	4.4
PFOS (ng/L)	1.8 U

TEAD-MPF-C52 (GW)		
Analyte	**442 ft.**	**442 ft.(D)**
HFPO-DA or GenX (ng/L)	3.6 U	3.5 U
PFBS (ng/L)	1.4 J	1.4 J
PFHxS (ng/L)	5	5.5
PFNA (ng/L)	1.8 U	1.8 U
PFOA (ng/L)	2.5 J	2.6 J
PFOS (ng/L)	1.8 U	1.8 U

TEAD-MPF-C21 (GW)	
Analyte	**371 ft.**
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	22
PFHxS (ng/L)	2.1 J
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.8 U
PFOS (ng/L)	1.8 U

TEAD-PER-N11488 (GW)	
Analyte	**331 ft.**
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	2.0 J
PFHxS (ng/L)	12
PFNA (ng/L)	1.8 U
PFOA (ng/L)	5.3
PFOS (ng/L)	1.8 U

TEAD-MPF-C47F (GW)	
Analyte	**367 ft.**
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	1.8 U
PFHxS (ng/L)	4.5
PFNA (ng/L)	1.8 U
PFOA (ng/L)	2.1 J
PFOS (ng/L)	1.8 U

TEAD-VTF-C23 (GW)	
Analyte	**385 ft.**
HFPO-DA or GenX (ng/L)	3.9 U
PFBS (ng/L)	2.0 U
PFHxS (ng/L)	2.0 U
PFNA (ng/L)	2.0 U
PFOA (ng/L)	2.0 U
PFOS (ng/L)	2.0 U

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
GW = Groundwater
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the July 2022 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Screening Levels from the July 2022 OSD Memo		
Chemical	**Residential Tap Water (ng/L)**	**Residential Soil (µg/kg)**
Hexafluoropropylene oxide dimer acid (HFPO-DA)	6	23
Perfluorobutanesulfonic acid (PFBS)	601	1900
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	6	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

Industrial Wastewater Piping System (SWMU 49)
Building 616 (Fire Station)
Building 619 (Vehicle Maintenance Facility)
Building 602 (Maintenance Shop)
Drum Storage Areas (SWMU 28/SWMU 29)
Combat Vehicle Test Facility
C-51F
C-50F
C-53F
C-19
C-52
C-47F
C-48F
C-21
C-23
N-114-88
620
611
600
618
614
615
609

Legend

- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Building
- Active Installation Boundary
- Metal Plating Ops at Building
- South Quadrant
- Existing Monitoring Well
- Sample Existing Monitoring Well (9) [3]
- Sample Existing Perimeter Well (1) [3]
- Groundwater Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent south quadrant sample plan and sample count.

500 250 0 500 Feet

UT STATE PLANE CENTRAL (NAD83)

Area Shown

US Army Corps of Engineers
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SOUTH QUADRANT AOPI SAMPLE RESULTS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-2 | DATE: 11/30/2023

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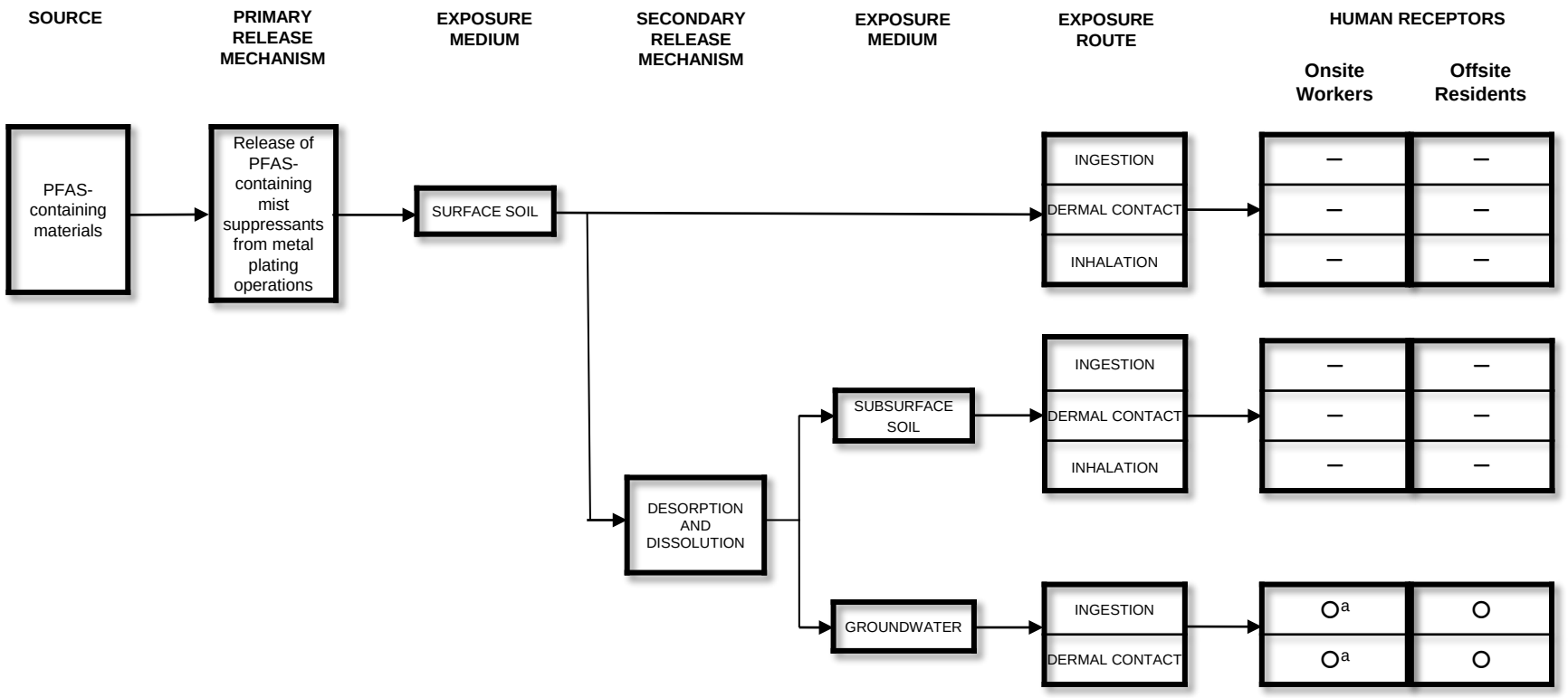


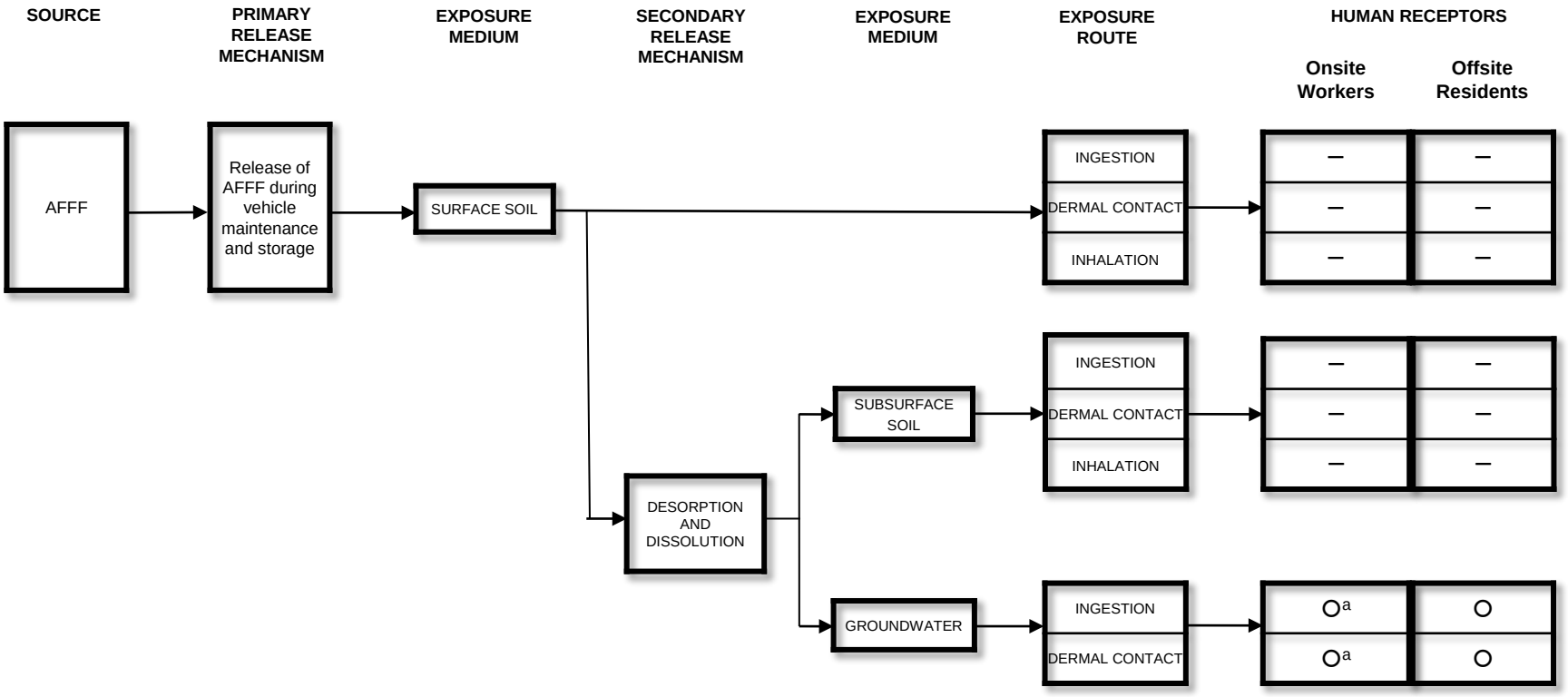
● Complete exposure pathway

○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are unrelated to PFAS, the pathway is potentially complete.

Figure 6-3. Human Health CSM for Metal Plating Operations AOPI



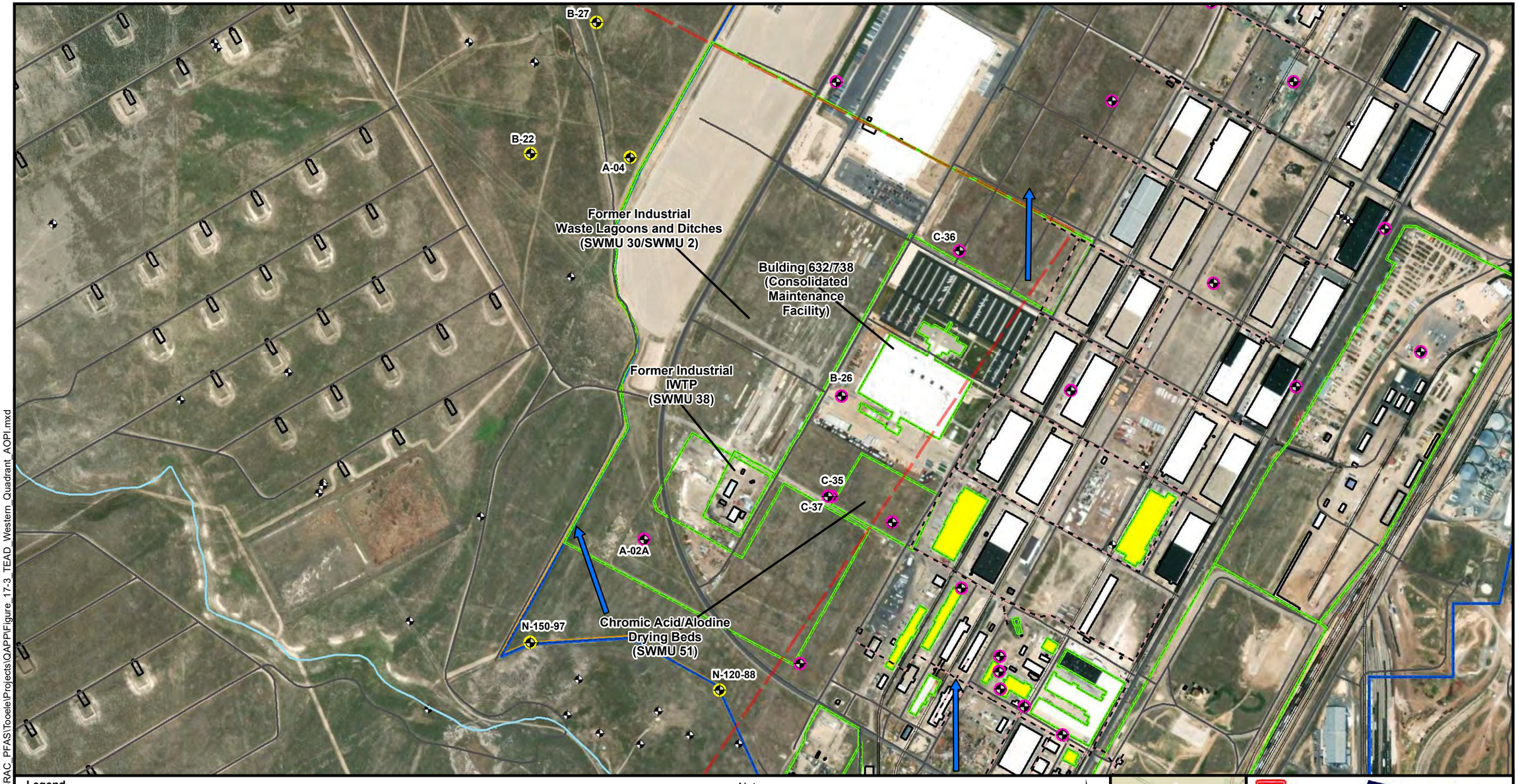
● Complete exposure pathway

O Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are unrelated to PFAS, the pathway is potentially complete.

Figure 6-4. Human Health CSM for Building 619 (Vehicle Maintenance Facility) AOPI



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Legend

- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Building
- Active Installation Boundary
- Metal Plating Ops at Building
- West Quadrant
- Existing Monitoring Well
- Sample Existing Monitoring Well (5) [3]
- Sample Existing Perimeter Well (5) [3]
- Groundwater Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent west quadrant sample plan and sample count.

1,000 500 0 1,000 Feet

UT STATE PLANE CENTRAL (NAD83)

US Army Corps of Engineers

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WEST QUADRANT AOPI SAMPLE LOCATIONS

TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-5 | DATE: 10/11/2023

TEAD-PER-B22 (GW)	
Analyte	367 ft.
HFPO-DA or GenX (ng/L)	3.8 U
PFBS (ng/L)	1.9 U
PFHxS (ng/L)	1.9 U
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.3 J
PFOS (ng/L)	1.8 J

TEAD-PER-A04 (GW)	
Analyte	252 ft.
HFPO-DA or GenX (ng/L)	20 UJ
PFBS (ng/L)	11 J
PFHxS (ng/L)	9.8 J
PFNA (ng/L)	10 UJ
PFOA (ng/L)	19 J
PFOS (ng/L)	9.8 J

TEAD-PER-B27 (GW)	
Analyte	261 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	1.9 U
PFHxS (ng/L)	1.2 J
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.1 J
PFOS (ng/L)	1.9 U

TEAD-CMF-C36 (GW)	
Analyte	280 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	1.1 J
PFHxS (ng/L)	6.8
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.9 U
PFOS (ng/L)	1.9 U

TEAD-CMF-B26 (GW)	
Analyte	319 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	1.1 J
PFHxS (ng/L)	1.9 J
PFNA (ng/L)	1.9 U
PFOA (ng/L)	2.3 J
PFOS (ng/L)	1.9 U

TEWLD-A02A (GW)	
Analyte	294 ft.
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	1.8 U
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.8 U
PFOS (ng/L)	1.8 U

TEAD-PER-N15097 (GW)	
Analyte	285 ft.
HFPO-DA or GenX (ng/L)	3.6 U
PFBS (ng/L)	1.8 U
PFHxS (ng/L)	1.8 U
PFNA (ng/L)	1.8 U
PFOA (ng/L)	1.8 U
PFOS (ng/L)	1.8 U

TEAD-PER-N12088 (GW)	
Analyte	316 ft.
HFPO-DA or GenX (ng/L)	4.0 U
PFBS (ng/L)	2.0 U
PFHxS (ng/L)	2.0 U
PFNA (ng/L)	2.0 U
PFOA (ng/L)	2.0 U
PFOS (ng/L)	2.0 U

TEAD-CAB-C35 (GW)	
Analyte	323 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	1.9 U
PFHxS (ng/L)	3.1 J
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.7 J
PFOS (ng/L)	1.9 U

TEAD-CAB-C37 (GW)	
Analyte	433 ft.
HFPO-DA or GenX (ng/L)	3.7 U
PFBS (ng/L)	2.8 J
PFHxS (ng/L)	2.1 J
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.7 J
PFOS (ng/L)	1.9 U

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
GW = Groundwater
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the July 2022 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level

Screening Levels from the July 2022 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
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Perfluorobutanesulfonic acid (PFBS)	601	1900
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	6	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

B-27
B-22
A-04
C-36
B-26
C-35
C-37
A-02A
N-150-97
N-120-88

Former Industrial Waste Lagoons and Ditches (SWMU 30/SWMU 2)
Bulding 632/738 (Consolidated Maintenance Facility)
Former Industrial IWTP (SWMU 38)
Chromic Acid/Alodine Drying Beds (SWMU 51)

Legend
- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Building
- Active Installation Boundary
- Metal Plating Ops at Building
- West Quadrant
- Existing Monitoring Well
- Sample Existing Monitoring Well (5) [3]
- Sample Existing Perimeter Well (5) [3]
- Groundwater Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent west quadrant sample plan and sample count.

1,000 500 0 1,000 Feet

UT STATE PLANE CENTRAL (NAD83)

Area Shown

US Army Corps of Engineers

leidos

WEST QUADRANT AOPI SAMPLE RESULTS

TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-6 | DATE: 11/30/2023

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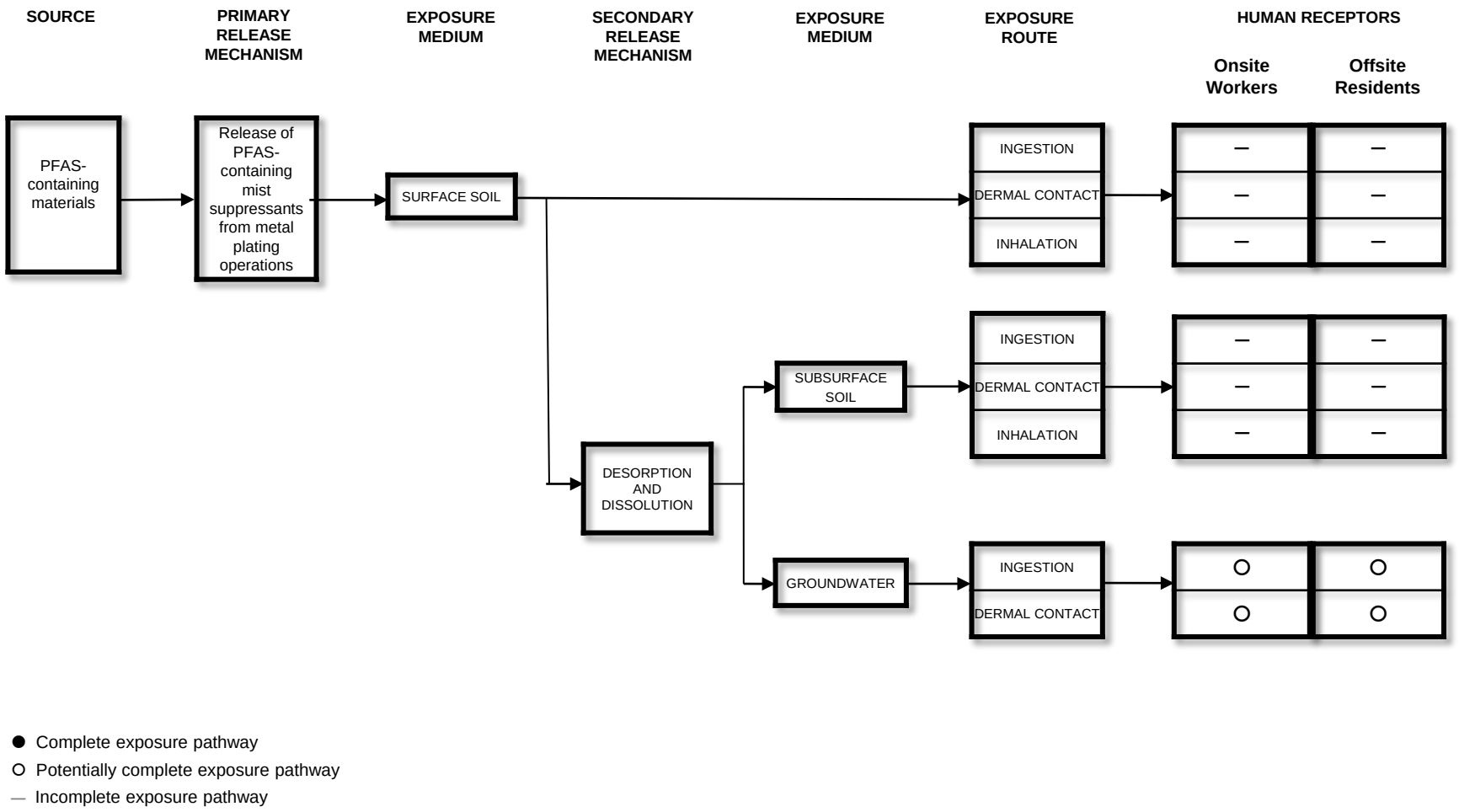
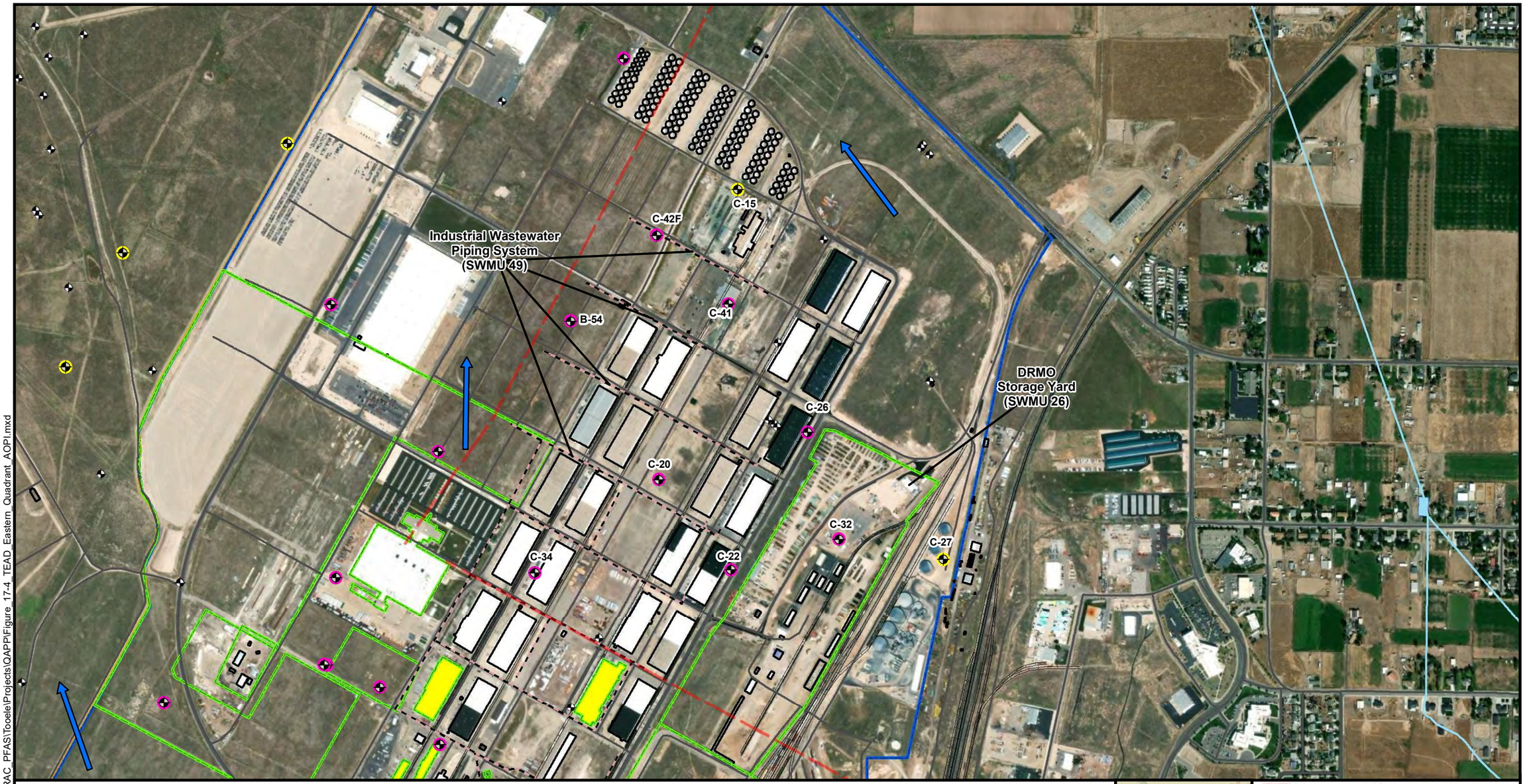


Figure 6-7. Human Health CSM for Building 632/738 CMF AOPI



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Legend

- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- River/Stream
- Surface Water
- Building
- Active Installation Boundary
- Metal Plating Ops at Building
- East Quadrant
- Existing Monitoring Well
- Sample Existing Monitoring Well (9) [3]
- Sample Existing Perimeter Well (1) [3]
- Groundwater Flow Direction

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent east quadrant sample plan and sample count.

1,000 500 0 1,000 Feet

UT STATE PLANE CENTRAL (NAD83)

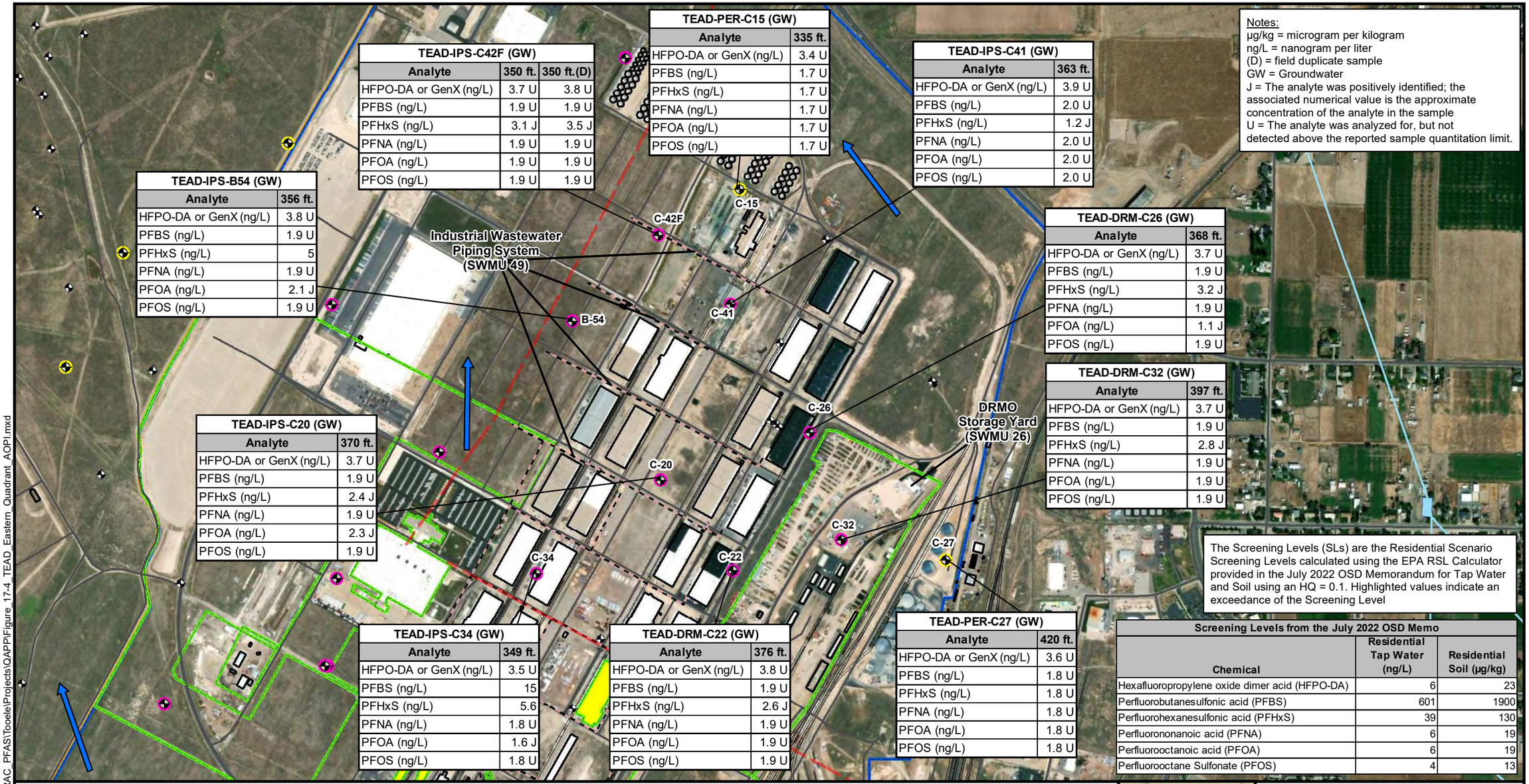
Area Shown

US Army Corps of Engineers

leidos

EAST QUADRANT AOPI
SAMPLE LOCATIONS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-8 | DATE: 8/7/2023


TEAD-IPS-C42F (GW)
Analyte | 350 ft. | 350 ft.(D)
HFPO-DA or GenX (ng/L) | 3.7 U | 3.8 U
PFBS (ng/L) | 1.9 U | 1.9 U
PFHxS (ng/L) | 3.1 J | 3.5 J
PFNA (ng/L) | 1.9 U | 1.9 U
PFOA (ng/L) | 1.9 U | 1.9 U
PFOS (ng/L) | 1.9 U | 1.9 U
TEAD-PER-C15 (GW)
Analyte | 335 ft.
HFPO-DA or GenX (ng/L) | 3.4 U
PFBS (ng/L) | 1.7 U
PFHxS (ng/L) | 1.7 U
PFNA (ng/L) | 1.7 U
PFOA (ng/L) | 1.7 U
PFOS (ng/L) | 1.7 U
TEAD-IPS-C41 (GW)
Analyte | 363 ft.
HFPO-DA or GenX (ng/L) | 3.9 U
PFBS (ng/L) | 2.0 U
PFHxS (ng/L) | 1.2 J
PFNA (ng/L) | 2.0 U
PFOA (ng/L) | 2.0 U
PFOS (ng/L) | 2.0 U
TEAD-IPS-B54 (GW)
Analyte | 356 ft.
HFPO-DA or GenX (ng/L) | 3.8 U
PFBS (ng/L) | 1.9 U
PFHxS (ng/L) | 5
PFNA (ng/L) | 1.9 U
PFOA (ng/L) | 2.1 J
PFOS (ng/L) | 1.9 U
TEAD-DRM-C26 (GW)
Analyte | 368 ft.
HFPO-DA or GenX (ng/L) | 3.7 U
PFBS (ng/L) | 1.9 U
PFHxS (ng/L) | 3.2 J
PFNA (ng/L) | 1.9 U
PFOA (ng/L) | 1.1 J
PFOS (ng/L) | 1.9 U
TEAD-DRM-C32 (GW)
Analyte | 397 ft.
HFPO-DA or GenX (ng/L) | 3.7 U
PFBS (ng/L) | 1.9 U
PFHxS (ng/L) | 2.8 J
PFNA (ng/L) | 1.9 U
PFOA (ng/L) | 1.9 U
PFOS (ng/L) | 1.9 U
TEAD-IPS-C20 (GW)
Analyte | 370 ft.
HFPO-DA or GenX (ng/L) | 3.7 U
PFBS (ng/L) | 1.9 U
PFHxS (ng/L) | 2.4 J
PFNA (ng/L) | 1.9 U
PFOA (ng/L) | 2.3 J
PFOS (ng/L) | 1.9 U
TEAD-IPS-C34 (GW)
Analyte | 349 ft.
HFPO-DA or GenX (ng/L) | 3.5 U
PFBS (ng/L) | 15
PFHxS (ng/L) | 5.6
PFNA (ng/L) | 1.8 U
PFOA (ng/L) | 1.6 J
PFOS (ng/L) | 1.8 U
TEAD-DRM-C22 (GW)
Analyte | 376 ft.
HFPO-DA or GenX (ng/L) | 3.8 U
PFBS (ng/L) | 1.9 U
PFHxS (ng/L) | 2.6 J
PFNA (ng/L) | 1.9 U
PFOA (ng/L) | 1.9 U
PFOS (ng/L) | 1.9 U
TEAD-PER-C27 (GW)
Analyte | 420 ft.
HFPO-DA or GenX (ng/L) | 3.6 U
PFBS (ng/L) | 1.8 U
PFHxS (ng/L) | 1.8 U
PFNA (ng/L) | 1.8 U
PFOA (ng/L) | 1.8 U
PFOS (ng/L) | 1.8 U
Industrial Wastewater Piping System (SWMU 49)
DRMO Storage Yard (SWMU 26)
C-15
C-42F
C-41
B-54
C-26
C-20
C-32
C-27
C-34
C-22
Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
(D) = field duplicate sample
GW = Groundwater
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.
The Screening Levels (SLs) are the Residential Scenario Screening Levels calculated using the EPA RSL Calculator provided in the July 2022 OSD Memorandum for Tap Water and Soil using an HQ = 0.1. Highlighted values indicate an exceedance of the Screening Level
Screening Levels from the July 2022 OSD Memo
Chemical | Residential Tap Water (ng/L) | Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA) | 6 | 23
Perfluorobutanesulfonic acid (PFBS) | 601 | 1900
Perfluorohexanesulfonic acid (PFHxS) | 39 | 130
Perfluorononanoic acid (PFNA) | 6 | 19
Perfluorooctanoic acid (PFOA) | 6 | 19
Perfluorooctane Sulfonate (PFOS) | 4 | 13
Legend
BRAC Parcel Boundary
Industrial Wastewater Piping System
Potential IWW Piping AOPI
Area of Potential Interest (AOPI)
Railroad
Road
River/Stream
Surface Water
Building
Active Installation Boundary
Metal Plating Ops at Building
East Quadrant
Existing Monitoring Well
Sample Existing Monitoring Well (9) 3
Sample Existing Perimeter Well (1) 3
Groundwater Flow Direction
Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent east quadrant sample plan and sample count.
1,000 500 0 1,000 Feet
UT STATE PLANE CENTRAL (NAD83)
Area Shown
US Army Corps of Engineers
leidos
EAST QUADRANT AOPI SAMPLE RESULTS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH
FIGURE 6-9
DATE: 11/30/2023
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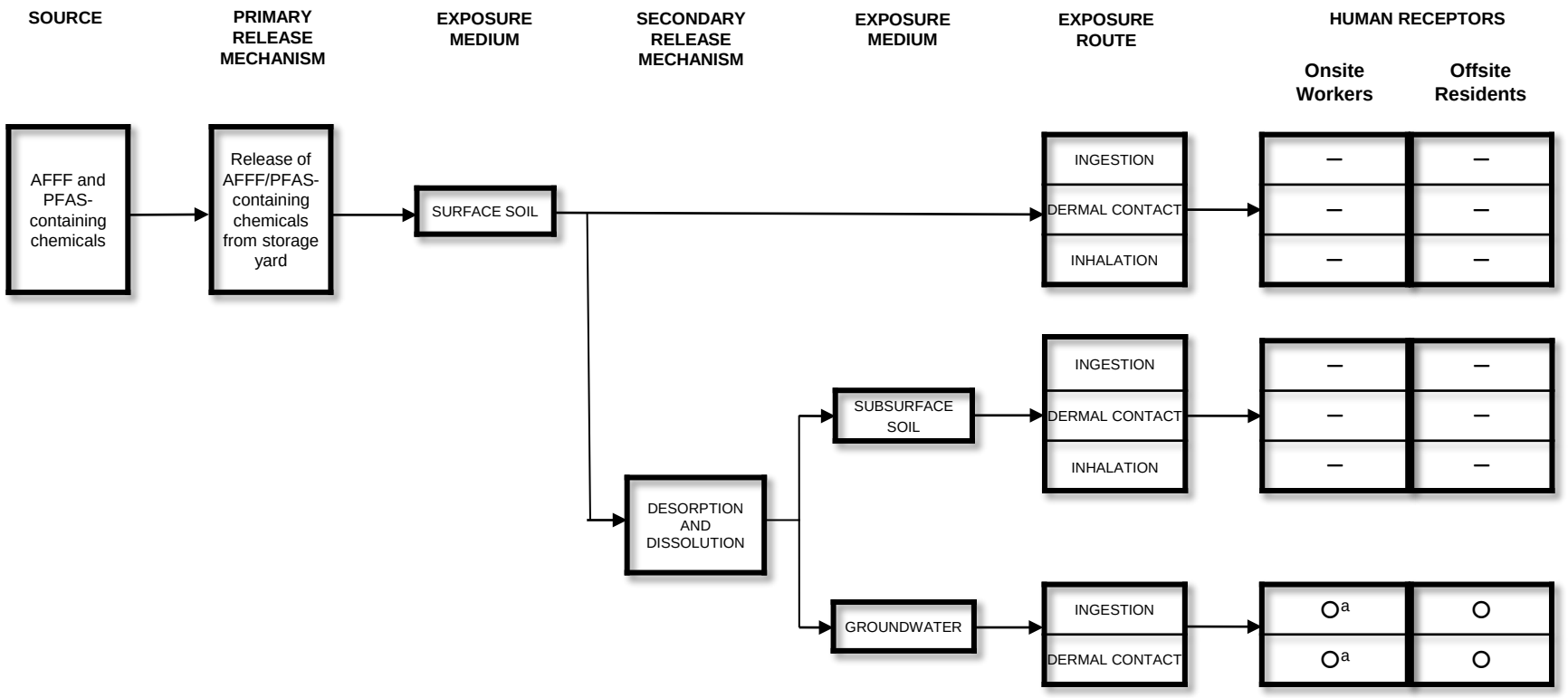


● Complete exposure pathway

○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are unrelated to PFAS, the pathway is potentially complete.

Figure 6-10. Human Health CSM for DRMO Storage Yard AOPI

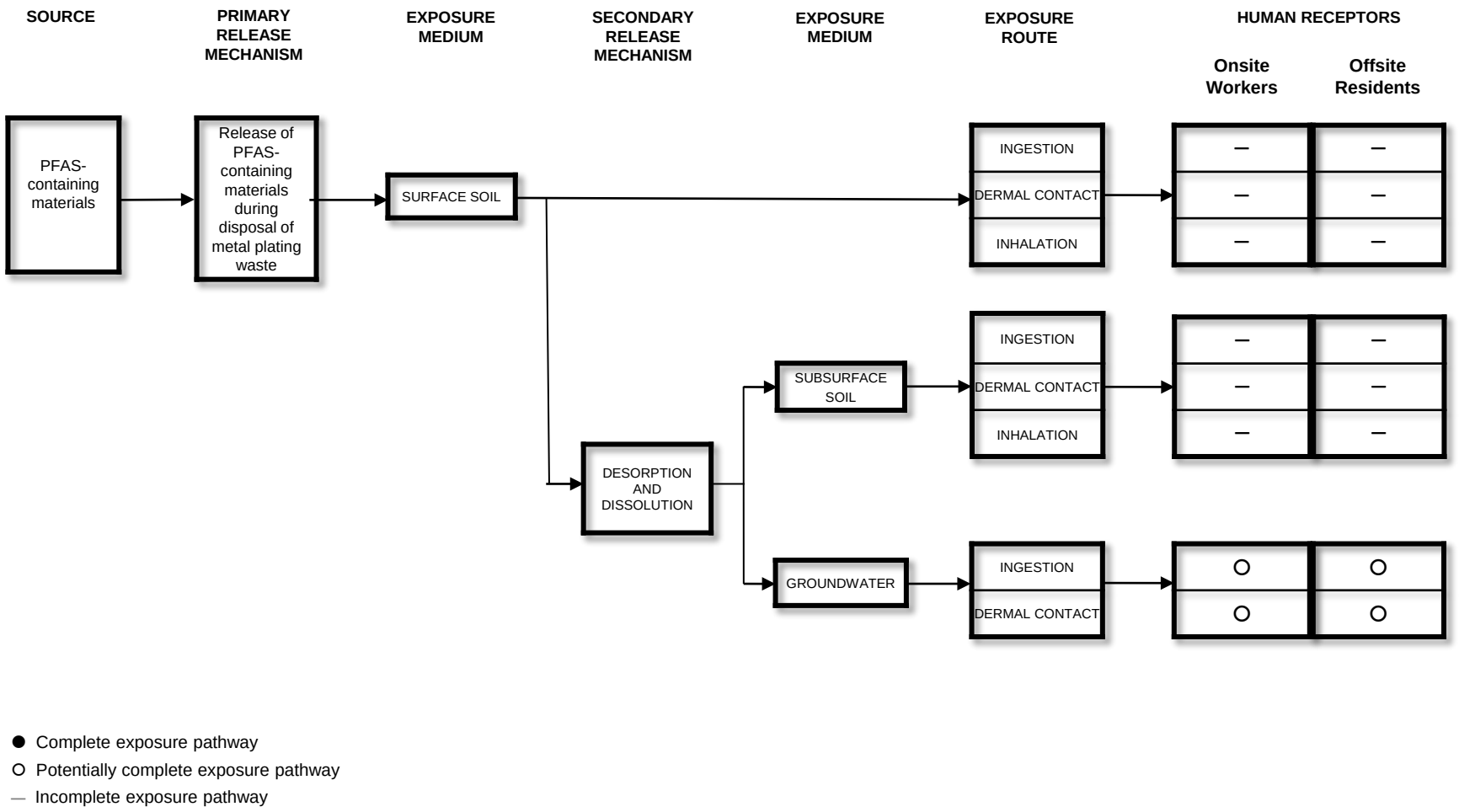
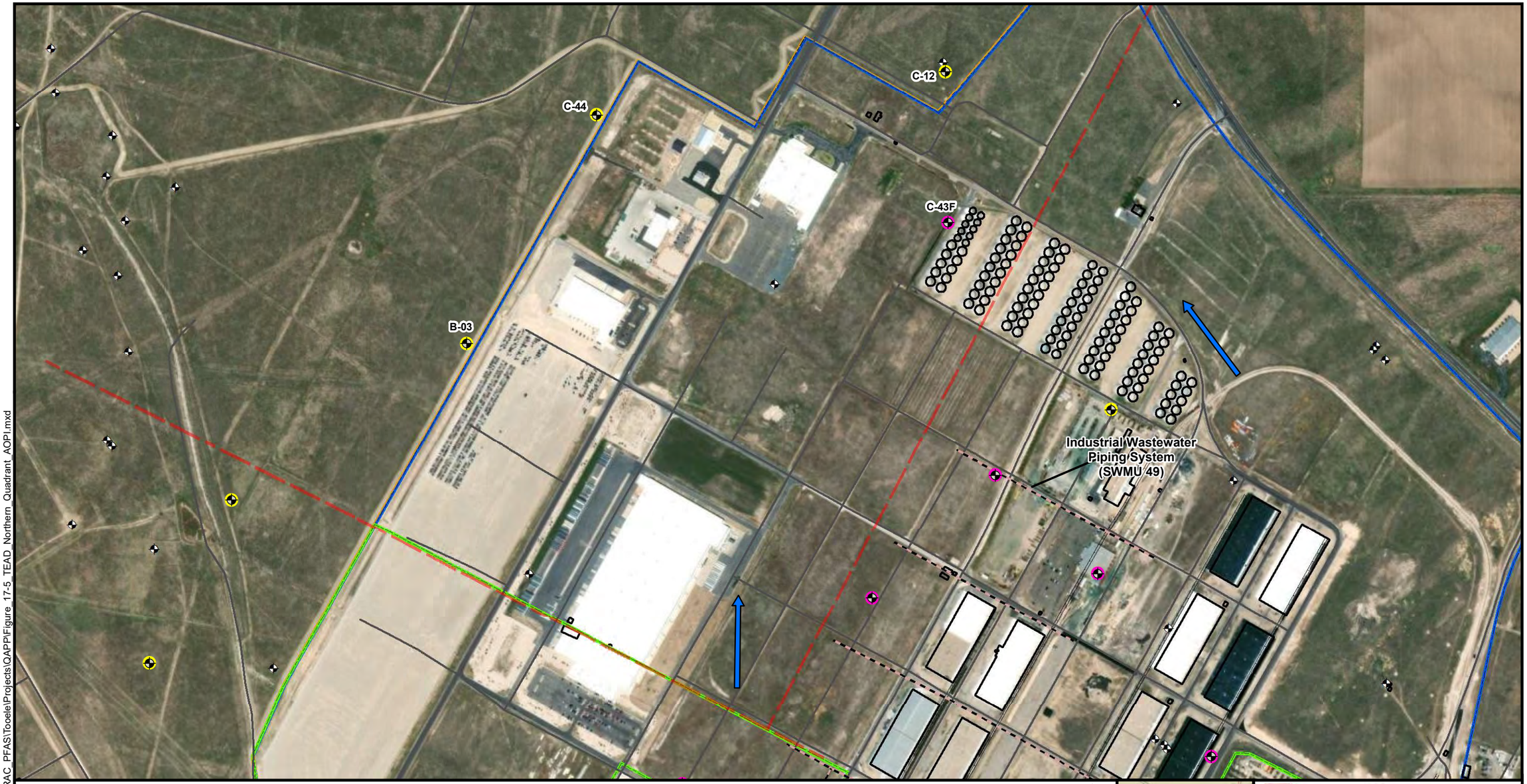


Figure 6-11. Human Health CSM for Chromic Acid/Alodine Drying Beds AOPI



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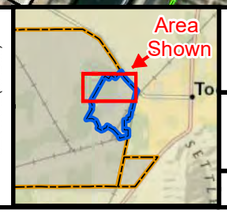
Legend

- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroads
- Roads
- Buildings
- Active Installation Boundary
- North Quadrant
- Existing Monitoring Wells
- Groundwater Flow Direction
- Sample Existing Monitoring Well (1)[3]
- Sample Existing Perimeter Well (3)[3]

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022)
2. USGS National Hydrography Dataset (NHD)
3. Labeled sample locations represent north quadrant sample plan and sample count

500 250 0 500
Feet

UT STATE PLANE CENTRAL (NAD83)



US Army Corps of Engineers

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NORTH QUADRANT AOPI
SAMPLE LOCATIONS
TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-12 | DATE: 8/7/2023

TEAD-PER-C44 (GW)		
Analyte	290 ft.	290 ft.(D)
HFPO-DA or GenX (ng/L)	3.4 U	3.8 U
PFBS (ng/L)	1.7 U	1.9 U
PFHxS (ng/L)	1.7 U	1.9 U
PFNA (ng/L)	1.7 U	1.9 U
PFOA (ng/L)	1.7 U	1.9 U
PFOS (ng/L)	1.7 U	1.9 U

TEAD-PER-C12 (GW)	
Analyte	310 ft.
HFPO-DA or GenX (ng/L)	3.4 U
PFBS (ng/L)	1.7 U
PFHxS (ng/L)	1.1 J
PFNA (ng/L)	1.7 U
PFOA (ng/L)	1.7 U
PFOS (ng/L)	1.7 U

TEAD-IPS-C43F (GW)		
Analyte	329 ft.	329 ft.(D)
HFPO-DA or GenX (ng/L)	3.8 U	4.3 U
PFBS (ng/L)	1.9 U	2.2 U
PFHxS (ng/L)	1.9 U	2.2 U
PFNA (ng/L)	1.9 U	2.2 U
PFOA (ng/L)	1.9 U	2.2 U
PFOS (ng/L)	1.9 U	2.2 U

TEAD-PER-B03 (GW)	
Analyte	265 ft.
HFPO-DA or GenX (ng/L)	3.8 U
PFBS (ng/L)	1.9 U
PFHxS (ng/L)	1.9 U
PFNA (ng/L)	1.9 U
PFOA (ng/L)	1.9 U
PFOS (ng/L)	1.9 U

C-44
C-12
C-43F
B-03
Industrial Wastewater Piping System (SWMU 49)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
(D) = field duplicate sample
GW = Groundwater
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

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Screening Levels from the July 2022 OSD Memo		
Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA)	6	23
Perfluorobutanesulfonic acid (PFBS)	601	1900
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Perfluorononanoic acid (PFNA)	6	19
Perfluorooctanoic acid (PFOA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13

Legend
- BRAC Parcel Boundary
- Industrial Wastewater Piping System
- Potential IWW Piping AOPI
- Area of Potential Interest (AOPI)
- Railroad
- Road
- Building
- Active Installation Boundary
- North Quadrant
- Existing Monitoring Well
- Groundwater Flow Direction
- Sample Existing Monitoring Well (1)[3]
- Sample Existing Perimeter Well (3)[3]

Notes:
1. Background Imagery: ESRI World Imagery (Vivid/Maxar,11/2022).
2. USGS National Hydrography Dataset (NHD).
3. Labeled sample locations represent north quadrant sample plan and sample count.

500 250 0 500 Feet

UT STATE PLANE CENTRAL (NAD83)

Area Shown

US Army Corps of Engineers

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NORTH QUADRANT AOPI SAMPLE RESULTS

TOOELE ARMY DEPOT – NORTH
TOOELE, UTAH

FIGURE 6-13 | DATE: 11/30/2023

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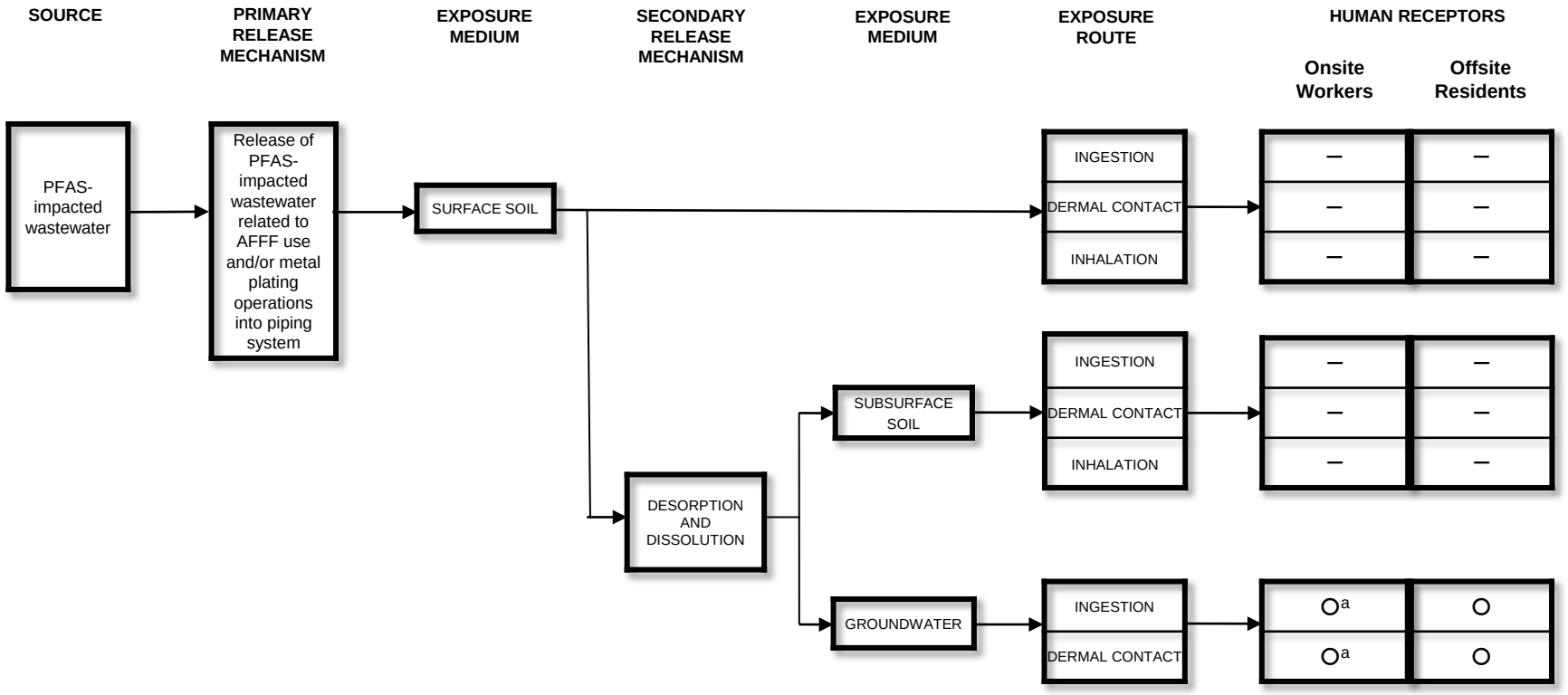

● Complete exposure pathway

○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are unrelated to PFAS, the pathway is potentially complete.

Figure 6-14. Human Health CSM for Industrial Wastewater Piping System AOPI