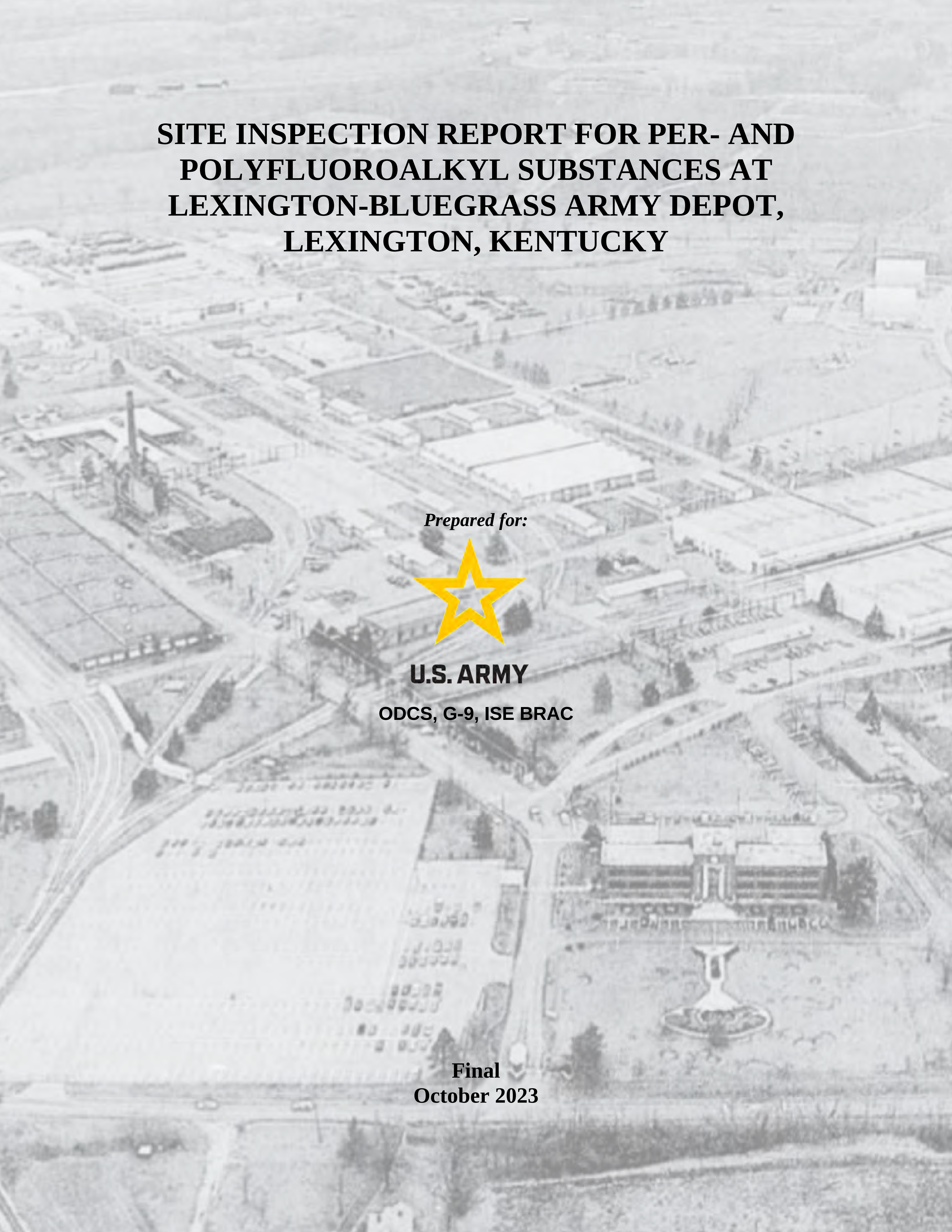
SITE INSPECTION REPORT FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT LEXINGTON-BLUEGRASS ARMY DEPOT, LEXINGTON, KENTUCKY



Prepared for:

U.S. ARMY

ODCS, G-9, ISE BRAC

Final
October 2023

SITE INSPECTION REPORT FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT LEXINGTON-BLUEGRASS ARMY DEPOT, LEXINGTON, KENTUCKY

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LIST OF ACRONYMS AND ABBREVIATIONS

%R	Percent Recovery
amsl	Above Mean Sea Level
AFFF	Aqueous Film-Forming Foam
AKGWA	Assembled Kentucky Ground Water Database
AOPI	Area of Potential Interest
APP	Accident Prevention Plan
Army	U.S. Army
BEC	BRAC Environmental Coordinator
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CoC	Chain-of-Custody
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DI	Deionized
DO	Dissolved Oxygen
DoD	U.S. Department of Defense
DUA	Data Usability Assessment
DQO	Data Quality Objective
ECOS	Environmental Conservation Online System
EDR	Environmental Data Resources, Inc.
EIS	Extracted Internal Standard
FCR	Field Change Request
FTA	Fire Training Area
GIS	Geographic Information Systems
GPS	Global Positioning System
HDPE	High-density Polyethylene
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid (aka GenX)
HQ	Hazard Quotient
ID	Identification
IDW	Investigation-Derived Waste
IPaC	Information for Planning and Consultation
ITRC	Interstate Technology Regulatory Council
IWTP	Industrial Wastewater Treatment Plant
KAR	Kentucky Administrative Regulation
KAW	Kentucky American Water Company
KDMA	Kentucky Department of Military Affairs
KGS	Kentucky Geological Survey
LBAD	Lexington-Bluegrass Army Depot
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
LTMOM	Long-Term Monitoring, Operation, and Maintenance
MDEQ	Michigan Department of Environmental Quality
MS	Matrix Spike
MSD	Matrix Spike Duplicate

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
ORP	Oxidation-Reduction Potential
OSD	Office of the Secretary of Defense
OSHA	Occupational Safety and Health Administration
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
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMP	Project Management Professional
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
REM	Registered Environmental Manager
RFI	RCRA Facility Investigation
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
T&E	Threatened and Endangered
TCLP	Toxicity Characteristic Leaching Procedure
U.S.C	United States Code
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
UN	United Nations
USACE	U.S. Army Corps of Engineers
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 nine areas of potential interest (AOPIs) at the former Lexington-Bluegrass Army Depot (LBAD) in Lexington, Kentucky (herein referred to as LBAD). AOPIs were identified during the PA phase for investigation through multimedia 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, soil, groundwater, sediment, and/or surface water samples were collected from the nine AOPIs. Supplementary groundwater, surface water, and sediment samples were also collected from monitoring wells and drainage locations at or near the LBAD boundary or between AOPIs to evaluate the potential for PFAS migration at the LBAD facility boundary or from post-BRAC transfer activities. The field investigation at LBAD was conducted in accordance with the Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Leidos 2022a) and UFP-QAPP Addendum (Leidos 2022b). 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 USEPAguidance 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 soil and 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, PFOS, PFOA, 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 above 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.

One or more of the Target PFAS were detected in at least one medium at eight of the nine AOPIs. Target PFAS concentrations exceeded SLs in groundwater at three AOPIs, one interior well between AOPIs, and wells along the LBAD facility boundary. Only PFOS, PFOA, and PFNA were detected in groundwater at concentrations that exceeded SLs. HFPO-DA was not detected at any AOPI. Figure ES-1 depicts the installation-wide map of AOPIs and PFAS groundwater and surface water results, including the distribution of SL exceedances and proximity to installation boundaries.

Table ES-1 summarizes the AOPIs investigated during the SI and recommendations for further investigation. In addition to the three AOPIs recommended for further investigation, it is also recommended to further investigate the presence of PFAS potentially migrating offsite, due to the presence of Target PFAS above SLs in groundwater and surface water along the southern and western boundaries.

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

AOPI Name	Exceedance of SLs		Recommendation
	Groundwater	Soil	
New Landfill	No	No	Further investigation not recommended
Industrial and Sanitary Waste Landfill	Yes	No	Further investigation recommended
Fire Training Area	No	No	Further investigation not recommended
IWTP Drying Beds	No	No	Further investigation not recommended
Building 126 IWTP and Building 135 Plating Operations	No	No	Further investigation not recommended
Building 105 Fire Distribution Testing Area	Yes	No	Further investigation recommended
Building 30 Former Fire Station	Yes	No	Further investigation recommended
Former Industrial Waste Lagoons	No	No	Further investigation not recommended
Building H Plating Operations	No	No	Further investigation not recommended
Further investigation is also recommended to evaluate the potential for offsite PFAS migration based on SL exceedances in groundwater and surface water along the western and southern boundaries of LBAD.			

Highlighted values indicate AOPIs with a recommendation for further investigation.

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 former Lexington Bluegrass Army Depot (LBAD) (herein referred to as LBAD) 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. §2700 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. LBAD is not on the National Priorities List (NPL), and the Army is responsible for compliance with CERCLA in accordance with Executive Order 12580, as amended.

Based on results of the LBAD PFAS PA (Leidos 2023), multiple areas of potential interest (AOPIs) were identified for investigation through multimedia sampling in an SI to determine whether a PFAS release occurred. LBAD is located in Lexington, Kentucky, as shown in Figure 1-1. The entire LBAD is referred to as the “site,” “facility,” or “installation” throughout this document. Any references to “off-site” refer to areas that were outside the original boundary of LBAD.

1.1 SCOPE AND OBJECTIVES

The overall objective of the SI is to determine the presence or absence of PFAS at each AOPI. The SI Report will use the findings from the PA in conjunction with soil, groundwater, surface water, and sediment 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 will evaluate and summarize 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 the LBAD UFP-QAPP Addendum (Leidos 2022b). The field activities followed site-specific sampling and health and safety protocols, as identified in the Programmatic Accident Prevention Plan (APP) (Leidos 2022c) and the LBAD Site Safety and Health Plan (Appendix A of the UFP-QAPP Addendum).

1.2 LBAD DESCRIPTION

LBAD is a former Army facility located in north-central Kentucky, in Fayette and Bourbon Counties. LBAD is immediately bounded on the east by Ware Road, on the south by the L&N Railroad, on the west by Briar Hill Road, and on the north by farmland (Leidos 2023). LBAD was recommended for closure by the 1988 BRAC Commission. The facility was subsequently transferred to the Commonwealth of Kentucky and renamed the Bluegrass Station with the Kentucky Department of Military Affairs (KDMA) as the caretaker (Leidos 2023). All portions of LBAD are now owned by the Commonwealth.

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)). The evaluated areas include fire stations, fire training areas (FTAs), landfills, wastewater treatment plants (WWTPs), photochemical processing facilities, pesticide facilities, vehicle maintenance shops, metal plating areas, chemical storage areas, wash racks, fire suppression systems, and laundry facilities. The

LBAD PFAS PA recommended nine 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 sizes of each area, are presented in Table 1-1 and illustrated in Figure 1-2.

Table 1-1. List of AOPIs at LBAD

AOPI Name	Dates of Operation	Size (acres)
New Landfill	1971 to 1980	18.39
Industrial and Sanitary Waste Landfill	1950 to 1970	15.01
Fire Training Area	1978 to unknown	0.35
IWTP Drying Beds	1965 to 1976	0.17
Building 126 IWTP and Building 135 Plating Operations	1950s to 1976	0.18
Building 105 Fire Distribution Testing Area	Approximately 1990 to unknown	0.08
Building 30 Former Fire Station	Approximately 1951 to 1994	0.18
Industrial Waste Lagoons	1965 to 1996	1.08
Building H Plating Operations	Approximately 1951 to 1994	0.17

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 LBAD. 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 LBAD AOPIs.
- ***Section 8. References—***This section lists the references that were used in the preparation of this report.
- ***Appendices***—Appendices A through J 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. Boring Logs and Well Construction Logs
  - Appendix E. Groundwater Protection Plan
  - Appendix F. Well Development Forms and Sampling and Calibration Logs
  - Appendix G. Monitoring Well Location Survey
  - Appendix H. Investigation-Derived Waste (IDW) Documents
  - Appendix I. Data Presentation Tables
  - Appendix J. Data Usability Assessment.

2. ENVIRONMENTAL SETTING

This section provides general information about LBAD, 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

LBAD is located at 5749 Briar Hill Road, Lexington, Kentucky, 40516, in Fayette and Bourbon Counties (Figure 1-1). While in operation, LBAD occupied approximately 780 acres and is 10 miles northeast of Lexington and adjacent to the village of Avon. It is bounded on the east by Ware Road, on the south by the L&N Railroad, on the west by Briar Hill Road, and on the north by farmland. Figure 2-1 depicts the LBAD site features.

2.2 SITE OPERATIONAL HISTORY

LBAD was originally established in June 1941 as a signal depot and used for the storage and overhaul of communications equipment. By the end of World War II, an administration building, 8 warehouses, a motor pool, a power plant, and 40 wood-framed buildings had been constructed. In the 1950s, an industrial maintenance shop, two warehouses, and seven housing units were constructed. Through the 1960s and 1970s, an additional 10 buildings were constructed, including an electronics and comminutions building, a security equipment maintenance facility, and seven warehouses. By 1995, approximately 113 buildings were present at LBAD, and in addition to communications equipment storage and overhaul services, it was a major storage depot for supplies such as dry cell batteries, clothing and textiles, tungsten, tin, quartz crystals, and crude rubber (Commonwealth of Kentucky 1995). Historical site activities included electroplating, stripping, cleaning, and coating of equipment; photographic processing; vehicle maintenance; printing; and fuel storage (Earth Tech 1994).

In 1988, the BRAC Commission recommended closure of LBAD. The facility was subsequently transferred to the Commonwealth of Kentucky and renamed the Bluegrass Station with KDMA as the caretaker.

Due to past waste disposal and industrial operations at LBAD, groundwater sampling and site inspections are presently conducted as part of a long-term monitoring plan at two waste management units, including the Southwest Waste Management Area (i.e., Old Landfill, Industrial and Sanitary Waste Landfill, Industrial Wastewater Treatment Plant (IWTP), Industrial Waste Lagoons, Building 27) and the Northeast Waste Management Area (i.e., New Landfill). Volatile organic compounds (VOCs) and metals are monitored in groundwater along with landfill inspections and surface water monitoring every 5 years, with the next event scheduled to be conducted in 2025 (SERES 2021).

2.3 DEMOGRAPHICS, PROPERTY TRANSFER, AND LAND USE

LBAD is bounded on the east by Ware Road, on the south by the L&N Railroad, on the west by Briar Hill Road, and on the north by farmland. The facility currently provides logistical and operational support to a number of government and private industry tenants. Prior to the construction of the LBAD facility, the property and surrounding area were primarily used for agricultural purposes.

The surrounding area is primarily rural, with some industrial activities along the southwestern boundary of the property. The 2020 U.S. census reported population for Fayette and Bourbon Counties was 322,570 and 20,252 people, respectively (U.S. Census Bureau 2021). Fayette County includes the metropolitan area of Lexington.

The transfer of LBAD to the Commonwealth began in September 1995, with 22 buildings and 1 parking lot. An additional 78 structures, or portions thereof, and utility lines in industrial portions of the facility were transferred in November 1997 (Jacobs 2003). Approximately 211 acres designated as recreational, which included the golf course and swimming pool, were transferred to the National Park Service in 1995 and then to the Department of Homeland Security in 2008. In 2013, this parcel was transferred to the Commonwealth under the management of KDMA and leased to the Department of Homeland Security. All portions of LBAD are now owned by the Commonwealth.

A facility-wide deed restriction for use of groundwater was implemented in 2006 due to past pesticide use and industrial and landfill operations (USAMC 2006). Land use restrictions were also implemented in 2006 for three landfill areas, the pesticide storage Building 303 (located in the former golf course parcel), and the remaining portion of the LBAD referred to as industrial. The land use restrictions require that no residential use be permitted at LBAD, the landfill areas must remain undisturbed, and recreational use is only permitted in the 211 acres of the former golf course parcel (excluding Building 303).

2.4 TOPOGRAPHY

LBAD is at an average elevation of approximately 958 feet above mean sea level (amsl) and is moderately sloped (EDR 2021). Elevations range from a high point of 1,010 feet amsl in the northeast of LBAD to 930 feet amsl in the southwest. The ground slope at the facility range from 1 to 3 percent with localized slopes as great as 5 percent. A northwest to southeast ridge runs through the facility (Jacobs 2003). The terrain is predominantly clear with hard surfaces, meadow, and some wooded areas. The surface topography at LBAD is presented in Figure 2-1.

2.5 GEOLOGY

LBAD is underlain by flat-lying rocks of Ordovician age, consisting primarily of alternating limestone and shale beds of the Lexington Limestone. Locally, the Lexington Limestone includes four members, from the top down: the Upper Tongue of the Tanglewood Limestone, the Millersburg Limestone, the Tanglewood Member, and the Grier Limestone Member. Each member is composed of interbedded shale and limestone of different proportions. The Upper Tongue of the Tanglewood Limestone is limited to the northern part of the facility and exposed at higher elevations where it may be capped by the remnants of the Clays Ferry Formation. The Millersburg Limestone is approximately 60 feet thick and underlays the majority of the facility. The Tanglewood Limestone is 30 to 35 feet thick where fully covered by the Millersburg Limestone. The Grier Limestone is the only member not exposed at the surface of LBAD. Investigations at the facility have identified the top of the Grier Limestone at depths ranging from 50 to 100 feet; however, its lower extent has not been investigated (Metcalf & Eddy 1995). Historical water supply wells at the facility reached as far as 151 feet and were set within the Grier Limestone. Bedrock is generally encountered between 4 and 8 feet below ground surface (bgs) at the facility.

Soil information obtained from the Natural Resources Conservation Service (NRCS) web soil survey indicates soils at LBAD are generally divided between a grouping of the Bluegrass, Maury, Lowell, Sandview, and Faywood silt loams in the northeast and either made or urban land in the southwest. Soils are moderately to well drained (NRCS 2021).

2.6 HYDROGEOLOGY

LBAD is located in the east-central part of the Inner Bluegrass Karst Region, which is characterized by sinkholes and underground drainage caused by dissolution of limestone rock. A 1995 groundwater investigation report (Metcalf & Eddy 1995) indicates the hydrogeologic setting includes three aquifer zones, each of which is impacted by the development of karst features. The three hydrogeologic zones include top of rock flow, a highly transmissive zone within the Tanglewood Member, and a more highly developed transmissive zone within both the Tanglewood Member and the underlying Grier Member.

A series of shallow, intermediate, and deep wells have been installed at the facility roughly targeting the three zones described above. Groundwater is encountered at varying elevations across the facility, ranging from above 990 feet elevation in zone 1, 990 to 940 feet elevation in zone 2 and below 940 feet elevation in zone 3. Wells located within topographic depressions and at lower elevations were more productive than wells at higher elevations. Wells located in the northeastern area of the facility were drilled much deeper than the rest of the facility to encounter water.

The groundwater flow direction generally follows the surface topography, with greater gradients present in topographic highs then flattening in topographic lows. A hydrogeologic divide exists in the northeastern portion of the facility where both groundwater and surface water on the northern side flows to the north to Hutchinson Creek and water on the southern side of the divide flows south to a tributary of Elkhorn Creek. The majority of groundwater flow at LBAD is to the south with gradients that flatten to as low as 0.004 feet per foot as it approaches the tributary of Elkhorn Creek (Metcalf & Eddy 1995). A downward vertical gradient between zones appears throughout most of the facility with a difference of as much as 56 feet between deep and shallow wells. A dye tracer study performed in the area of the Industrial and Sanitary Waste Landfill suggest that groundwater flow is slow and characteristic of fracture or granular flow rather than conduit flow, which is typical of karst aquifers (Metcalf & Eddy 1995). Groundwater contours are shown in Figure 2-2.

2.7 SURFACE WATER HYDROLOGY

The surface drainage system of the facility is composed of two ponds, several intermittent streams, and drainage ditches. Historically, two Industrial Waste Lagoons were also located on the facility; however, in 1996, they were removed and a rip-rap lined channel was constructed to collect and route stormwater drainage over the former waste lagoon area.

Surface drainage from the north-central and northwestern portions of the facility flows into an unnamed drainage channel that runs along the inside of the western boundary adjacent to Ware Road and ultimately discharges to Elkhorn Creek, approximately 1,000 feet south of the facility border. Drainage from the central and eastern portions of the facility flows through a stormwater drainage system that exits the facility at an outfall located along the southern facility edge. The discharged stormwater flows parallel to the southern property boundary and railroad tracks and combines with flow from the north-central and northwestern facility discharge to Elkhorn Creek. The remaining portions of the facility drain northeastwardly into Hutchinson Creek (Jacobs 2003).

Elkhorn Creek is the nearest surface water body located approximately 1,000 feet to the south of LBAD. Surface water from LBAD flows to an unnamed drainageway along the west of LBAD, which then discharged to Elkhorn Creek. Tributaries feeding Hutchinson Creek are approximately a quarter mile to the northeast of LBAD. A number of small wetland areas are located within or near the facility boundary. No areas of the facility are considered flood prone (EDR 2021). The surface water features at LBAD are presented in Figure 2-1.

2.8 WATER USAGE

Seven water supply wells existed at the facility, of which WSW-01, WSW-02, and WSW-03 were used for the potable water supply. The water supply was later supplemented by water purchased from the city of Lexington (Ebasco 1990). The seven supply wells were reportedly set within the Tanglewood Limestone member and were capable of producing 150 to 200 gallons per minute. Six supply wells were abandoned in 1999 according to Kentucky Geological Survey (KGS) records (KGS 2021), and WSW-08 is only to monitor groundwater quality. Kentucky-American Water Company (KAW) now supplies all water to LBAD and most of the surrounding area via intakes located along the Kentucky River and Jacobsen Reservoir (KAW 2020). A facility-wide deed restriction for use of groundwater was implemented in 2006 due to past pesticide use,industrial, and landfill operations (USAMC 2006).

An Environmental Data Resources, Inc. (EDR) report includes search results from a variety of environmental, state, city, and other publicly available databases for a referenced property. An EDR report was generated for LBAD, which identified 137 well records located within 1 mile of LBAD, most of which are monitoring wells or plugged monitoring wells. Data in the EDR report were verified using KGS's Water Well and Spring Interactive Map (KGS 2021) maintained by the Kentucky Groundwater Data Repository. The repository data were also used to increase the search distance to a 4-mile radius within which 387 well records were retrieved. Data maintained in the repository are assigned unique Assembled Kentucky Ground Water Database (AKGWA) record numbers and may include information for monitoring wells, water wells, and springs gathered by various state, Federal, and academic institutions. AKGWA records contained three domestic, eight agricultural, and two industrial well records within 1 mile of LBAD, which include the following:

- ***AKGWA 00006078—***An installation record for a 148-foot-deep industrial well installed on June 24, 1988, and owned by Prestress Services of Kentucky, Inc. and located 520 feet south-southeast of and downgradient from LBAD.
- ***AKGWA 00029700—***A 1993 inspection record, including a sample collected from the industrial well owned by Prestress Services of Kentucky, Inc. and located 480 feet to the south-southeast of and downgradient from LBAD.
- ***AKGWA 50002072—***The laboratory results for a 1985 bacterial pathogens test collected from a 78.7-foot-deep domestic well located 650 feet to the north and upgradient of LBAD. No additional information was provided in the database.
- ***AKGWA 50001026—***The record of a 78.7-foot-deep domestic well located 1,370 feet to the north-northwest and side-gradient of LBAD. No additional information was provided in the database.
- ***AKGWA 50002241—***The record of a domestic well located 3,200 feet to the north and upgradient of LBAD. No additional information was provided in the database.
- ***AKGWA 4027, 4038, 4039, and 4040—***These four wells are used for agricultural purposes and were owned by the Georgia Vegetable Co Farm when installed in 1987. The total depths of these wells range from 125 to 1,107 feet bgs and are located between 2,760 and 5,000 feet to the east and side-gradient of LBAD.
- ***AKGWA 53407, 53417, 65837, and 69161—***These four wells are used for agricultural purposes and owned by private individuals. The total depths of these wells range from 240 to 300 feet bgs and are located between 2,890 and 3,300 feet to the southwest of and downgradient from LBAD.

The remaining records retrieved between a 1- and 4-mile radius of LBAD described 20 domestic, 1 commercial, 32 agricultural, and 7 records with an unknown use.

2.9 ECOLOGICAL PROFILE

LBAD consisted of approximately 780 acres when in operation. The southwestern portion of LBAD is heavily developed. The northern and eastern portions of LBAD are less developed and more open fields. LBAD was largely cleared of trees for the development of a golf course and areas in which military exercises could be conducted (USAEC 1994). The habitat is predominantly mowed fields with a few clusters of native and ornamental trees near the administrative and industrial areas in the southeastern portion of LBAD, and along the intermittent stream north of the Creech Army Airfield Heliport and on the western boundary. The vegetation is predominantly grasses (primarily Kentucky bluegrass [*Poa pratensis*]). Abundant tree species include white ash (*Fraxinus americana*), hickory (*Carya spp.*), maple (*Acer spp.*), sycamore (*Platanus occidentalis*), and black locust (*Robinia pseudoacacis*) (U.S. Army 1994).

The aquatic environment at LBAD consists of small intermittent streams and ditches, two Industrial Waste Lagoons, and two man-made ponds (Lake Elder and Golf Course Lake). The main intermittent stream is a channelized unnamed tributary of the Elkhorn Creek, which runs along the southwestern edge of LBAD (USAEC 1994). The National Wetlands Inventory (NWI) indicates the ponds are man-made, permanently flooded freshwater ponds. The Industrial Waste Lagoons include freshwater pond and emergent wetland habitat (NWI 2023).

Wildlife at LBAD include those species that prefer old growth and edge habitat and are common to central Kentucky. Eastern cottontail rabbit (*Sylvilagus floridanus*), fox squirrel (*Sciurus niger*), grey squirrel (*Sciurus carolinensis*), and groundhog (*Marmota monax*) are several of the species known to occur at the site. Bobwhite quail (*Colinus virginianus*) may be found in moderate numbers (U.S. Army 1994).

The U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) tool identified four federally listed threatened and endangered (T&E) bat species, three clam species, and one flowering plant species as potentially occurring on or near LBAD. These species include the gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), clubshell (*Pleurobema clav*a), fanshell (*Cyprogenia stegaria*), rabbitsfoot (*Quadrula cylindrica cylindrica*), and Short's bladderpod (*Physaria globose*). The T&E candidate species, the monarch butterfly (*Danaus plexippus*), was also identified by IPaC as potentially occurring at LBAD (USFWS 2023). The potential for these T&E and candidate species to occur does not mean they are present at LBAD. No federally listed T&E species are known to occur at LBAD (Earth Tech 1995).

Thirteen migratory birds of particular concern are identified by the iPaC tool as potentially occurring on or near LBAD. These birds include species such as the bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), red-headed woodpecker (*Melanerpes erythrocephalus*), and lesser yellowlegs (*Tringa flavipes*) (USFWS 2023).

2.10 CLIMATE

The average temperature at LBAD is 54.7°F, which is slightly lower than the Kentucky average temperature of 55.6°F and similar to the national average temperature of 54.5°F. The annual rainfall amount is 44.27 inches, with 78.89 days of 0.1 inch or more of precipitation. The annual snowfall amount is 6.36 inches with 8.06 days of 1 inch or more of snow. Average wind speed for the area is 16.82 miles per hour (USA.com 2021).

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 document for the field investigation activities and procedures used for the LBAD 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

The 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 LBAD sample locations were determined based on current site conditions (i.e., groundwater flow direction), presence of site media (e.g., sediment and surface water may not be sampled at a given site), 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 LBAD was conducted in accordance with the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b). The field activities employed to execute the Programmatic UFP-QAPP and LBAD UFP-QAPP Addendum are described below and include any variances or deviations.

3.2 SAMPLE DESIGN AND RATIONALE

Nine AOPIs were investigated during the LBAD SI to determine the presence or absence of PFAS in the environment. Information inputs from the preliminary CSMs presented on Worksheet #10 of the LBAD UFP-QAPP Addendum (Leidos 2022b) are the basis for sample design at each AOPI. All samples were analyzed for the Target PFAS list of 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).

The general approach for determining the presence or absence of PFAS at an AOPI consisted of installation of two monitoring wells, one each within and downgradient from the AOPI; collection of two groundwater samples; collection of three soil samples from three soil borings; and collection of one co-located surface water and sediment sample, if these media were present. In addition, groundwater samples from existing monitoring wells were collected where proximal to AOPIs or the facility boundary, and new monitoring wells were installed and sampled to delineate data gaps between AOPIs and the facility boundary.

Each location that was sampled, with a unique set of coordinates, was assigned a specific site location: LBAD-XXX-## (e.g., LBAD-NLF-01).

Where:

- XXX = abbreviation for the AOPI being sampled
- ## = the sequential number of each sample location within the AOPI.

For existing monitoring wells, the sequential number of each sample location (##) will be replaced with the existing monitoring well identifier (ID) (e.g., the site location ID for monitoring well MW-23 is LBAD-NLF-MW-23).

Each sample that was collected received a unique sample number, related to the site ID above, in the format of LBXXX##-ZZzz.

Where:

- XXX = abbreviation for the AOPI being sampled
- ## = the sequential number of each sample location within the AOPI
- ZZ = sample media (i.e., MW = groundwater, SS = surface soil, SB = subsurface soil, SW = surface water, SD = sediment)
- zz = the sequence number for the sample at the location.

For existing monitoring wells, the unique sample number used LBXXX where XXX is the abbreviation for the AOPI that was sampled followed by the monitoring well ID (e.g., the sample ID for MW-23 is LBNLF-MW23).

QA/QC samples are denoted according to the sample type. Rinsate blanks, field duplicates, matrix spike (MS), and matrix spike duplicate (MSD) samples will be denoted by appending "RB," "FD," "MS," and "MSD," respectively, to the parent sample ID (e.g., LBNLF03-SB02FD, LBNLF01-SW01MS, LBNLF01-SS01RB). Field blanks and potable/source water blanks were named using the format of LBAD-YY##.

Where:

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

Newly installed monitoring wells will be named using the format MW-###.

Where:

- ### = the sequential number of each monitoring well at the AOPI beginning with 200 (e.g., MW-200, MW-201).

3.3 FIELD INVESTIGATION ACTIVITIES

The locations and methods of sample collection under the SI are described in the following sections. Sampling procedures adhered to the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b), with relevant information summarized below.

Sampling activities at LBAD included collecting surface and subsurface soil samples from soil borings, installing permanent groundwater monitoring wells, conducting one round of groundwater samples from new and existing groundwater monitoring wells, and collecting sediment and surface water samples where these media were present. Samples were analyzed for 26 PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) procedures compliant with DoD Quality Systems Manual (QSM) Version 5.4, Table B-15 (DoD 2021) to determine the presence or absence of Target PFAS. Eighty-two samples were collected among the 9 AOPIs, including 23 existing monitoring well groundwater samples, 16 new and temporary monitoring well groundwater samples, 10 surface soil samples, 24 subsurface soil samples, 4 surface water samples, and 5 sediment samples. A breakdown of samples collected at each AOPI is provided in Table 3-1. Prior to beginning sampling, site reconnaissance and utility clearance were performed. Sampling was completed at one AOPI before moving to the next AOPI when feasible. 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. LBAD AOPI SI Sample Collection

AOPI Name	Soil Samples	Groundwater Samples	Sediment Samples	Surface Water Samples
New Landfill	0 SS / 0 SB	10	3	2
Industrial and Sanitary Waste Landfill	0 SS / 0 SB	6	1	1
Fire Training Area	1 SS / 6 SB	1	0	0
IWTP Drying Beds	0 SS / 2 SB	1	0	0
Building 126 IWTP and Building 135 Plating Operations	0 SS / 2 SB	1	0	0
Building 105 Fire Distribution System Testing Area	2 SS / 5 SB	2	0	0
Building 30 Former Fire Station	3 SS / 5 SB	6	0	0
Industrial Waste Lagoons	2 SS / 2 SB	8	1	1
Building H Plating Operations	2 SS / 2 SB	4	0	0
Total	**10 SS / 24 SB**	**39**	**5**	**4**

SS = Surface soil sample
SB = Subsurface soil sample

3.4 FIELD PROCEDURES

The following sections describe utilities clearance, monitoring well installation and development procedures, field procedures for sampling each medium, borehole abandonment, and location survey. 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 investigation 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 Utility Clearance

Prior to initiating intrusive activities, the Field Manager coordinated underground utility clearances for the nine AOPIs through KDMA and Kentucky811 “Call Before You Dig.” All AOPIs were on property managed by KDMA. As part of the utility clearance process, individual utility companies were consulted, as needed; each area was visually inspected to verify that utilities had been marked; and the Field Manager looked for signs of unidentified utilities, including overhead utilities, and completed a Subsurface Clearance Checklist prior to initiating drilling operations. In addition, as part of field activities and prior to conducting powered drilling within 25 feet of known or suspected subsurface utilities, the boreholes were excavated using a low-impact technique (hand auger) to a minimum of 5 feet bgs or until bedrock was exposed where present within 5 feet bgs.

3.4.2 Bulk Source Water Sampling

Bulk source water samples were collected from the facility to identify an acceptable water source for drilling and decontamination, as described below. Sample LBAD-SRC-02 was collected from the Building 20 hydrant on June 29, 2022, and INF-01 was collected from an outdoor spigot at Building 147 on August 1, 2022. Prior to collection of samples, each water source was opened and allowed to run for a minimum of 1 minute before filling laboratory-supplied, Trizma®-preserved high-density polyethylene (HDPE) bottles. Water from the Building 147 spigot did not contain concentrations of PFAS above the limit of detection (LOD) and is referred to as “PFAS-free source water.” The PFAS-free source water from the Building 147 spigot was used for small equipment decontamination procedures (e.g., groundwater sampling equipment and other small field equipment) and small-scale field uses (e.g., hydrating bentonite chips). Water from the Building 20 hydrant contained concentrations of PFAS above the LOD but below limits of quantitation (LOQs) and SLs. With U.S. Army Corps of Engineers (USACE) approval, the Building 20 hydrant water was used for drilling activities and associated decontamination procedures under the condition that at least one time the amount of any water used during well installation was extracted (in addition to three times the standing well volume) and containerized as IDW for treatment and/or offsite disposal. In scenarios where three times the standing well volume could not be removed during well development, the well was purged dry and sampled upon sufficient recharge. Water from the Building 20 hydrant is referred to as the "approved onsite bulk water source" when referring to these outlined activities. Differences between the use of these water sources correlates directly to the volume of water required for the activity in question. Results are provided in Appendix I (Table I-19).

3.4.3 Soil Boring Installation and Sampling

All soil samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b). QC samples, including, duplicates, rinsate blanks, and MS/MSDs, were also collected.

Soil samples were collected in disposable, PFAS-free Geoprobe® core bags. If necessary for utility clearance, the top 5 feet of a soil boring were collected with a stainless steel hand auger. Each soil core was logged for lithology in accordance with USACE guidance and recorded on a drilling log (drilling logs are provided in Appendix D). All soil sample intervals were homogenized in disposable HDPE bags prior to placing the soil into laboratory supplied HDPE sample bottles. Sample bottles were labeled and sealed in Ziploc® bags and placed on wet ice for cooling to ≤6°C. Additional details on protocols for obtaining soil samples are outlined on Worksheet #18 and the Leidos SOP "Soil Sampling" provided in the Programmatic UFP-QAPP (Leidos 2022a).

Surface soil samples were collected from the 0- to 1-foot bgs interval. Surface soil samples were not collected from soil borings located in gravel, asphalt, or concrete unless native soil was identified below the material in sufficient volume for collection of an analytical sample. Surface soil sample depths did not exceed 1 foot bgs.

A maximum of two subsurface soil samples were collected from each soil boring. During the advancement of the soil borings, continuous soil cores were collected for recording lithology and documenting visual observations. Subsurface soil samples were collected as grab samples from 2-foot intervals, and the interval from which the sample was collected was recorded on the boring log. Samples for laboratory analysis were biased toward organic-rich zones, as PFAS may sorb to organics. If evidence of discernibly organic material was not observed, the first subsurface soil sample was collected from the central interval within the soil boring. A second subsurface soil sample was collected immediately above the water table to evaluate the potential for leaching. In the event groundwater or bedrock was encountered at less than 5 feet bgs, only one subsurface soil sample was collected immediately above the water table.

Soil borings were abandoned following sample collection by backfilling the borehole with bentonite chips. Bentonite chips were hydrated using the onsite sourced PFAS-free source water. Surface restoration matched the surrounding surface (e.g., concrete or grass).

3.4.4 Monitoring Well Installation and Development

Permanent monitoring wells were installed at each AOPI using a sonic drill rig with a 4-inch inner core barrel and 6-inch outer core barrel. The outer core barrel was advanced into the first 2 to 5 feet of bedrock to seal off overburden material. The inner core barrel was then advanced to the desired depth of the borehole.

Wells were constructed with new, pre-cleaned, 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) riser and 0.010-inch slot size screen. The well screen was placed to intersect the first water-bearing fracture observed in the bedrock during drilling. The well annulus was then filled using a sand pack extending to at least 2 feet above the top of the well screen. A minimum of 2 feet of bentonite seal was placed above the sand pack. A 2-foot sand choker was placed above the bentonite, and the remainder of the well annulus was filled with Portland-type cement using the tremie-grout method. The wells were finished at the ground surface by installing a protective stick-up casing placed within a 2- by 2-foot concrete apron and surrounded with an array of four bollards. Well locations LBAD-IDB-01/MW-209 and LBAD-IPO-01/MW-210 were finished with a flush-mount well cover set in a 2- by 2-foot concrete apron. Well construction diagrams for newly installed monitoring wells are included in Appendix D. During well installation and construction activities, the driller maintained a Groundwater Protection Plan in accordance with Kentucky Administrative Regulation (KAR) 401 KAR 5:037 (Appendix E).

Monitoring wells were not installed at either location LBAD-NLF-01 or LBAD-NLF-02. Neither location produced sufficient water at anticipated depths to be completed as monitoring wells. Boreholes were abandoned using Portland-type cement grout placed in the borehole using the tremie grout method. Bentonite chips were hydrated using the onsite sourced PFAS-free source water.

After installation, the new monitoring wells were developed by the pump and surge method. Development ended once water quality parameters met the stabilization criteria established in the LBAD UFP-QAPP Addendum (Leidos 2022b). A calibrated Horiba U5000, Model U-52 was used to collect water quality parameters (i.e., temperature, specific conductivity, pH, dissolved oxygen [DO], turbidity, oxidation-reduction potential [ORP]). Monitoring well MW-203 repeatedly dewatered during development and was considered developed once a minimum of three well volumes of water were evacuated from the well. Newly installed monitoring well MW-202 was pumped dry numerous times during well development activities over the course of 2 weeks and yielded insufficient water to meet development criteria. The existing wells were purged of one well volume of water in an effort to evacuate stagnant water from the well due to the potential historical use of PFAS-containing sampling equipment at the facility. Well development forms are provided in Appendix F.

3.4.4.1 Monitoring Well Sampling

All groundwater samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b). Samples were collected once water quality parameters met the stabilization criteria established in the Programmatic UFP-QAPP (Leidos 2022a). A calibrated Horiba U5000, Model U-52 was used to collect water quality parameters (i.e., temperature, specific conductivity, pH, DO, turbidity, ORP). QC samples, including equipment blanks, duplicates, and MS/MSDs, were also collected.

Groundwater was sampled by the low-flow drawdown method using stainless-steel bladder pumps in newly installed permanent and existing monitoring wells. Wells MW-72, MW-1134, and MW-202 were sampled using a bailer due to slow recovery following purging or well development. A grab groundwater sample was collected with a bailer from the open rock borehole at location LBAD-NLF-02 following borehole dewatering until dry.

Prior to sampling, static water level measurements were collected to the nearest 0.01 foot. Following completion of monitoring well purging and stabilization, samples were collected in laboratory-supplied, Trizma®-preserved HDPE bottles. All samples were collected and handled while wearing clean non-powdered, disposable nitrile gloves. Sample bottles were labeled and sealed in Ziploc® bags and placed on wet ice for cooling to 4°C (±2°C). New, clean nitrile gloves were donned prior to each new sample collection. 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.

3.4.4.2 Location Survey

Environmental sample locations and notable site features were located and mapped using a portable Trimble global positioning system (GPS) unit capable of achieving ± 3 feet accurate results. GPS data were transferred for use in ArcGIS mapping applications during data evaluation and reporting.

Newly installed permanent monitoring wells were surveyed by a state-licensed surveyor to determine coordinates and elevations of the new monitoring wells and for inclusion into the geographic information system (GIS) database. Coordinates and elevations for monitoring wells were established with an accuracy of ±0.1 foot horizontally and ±0.01 foot vertically. Horizontal coordinates were in the Kentucky State Plane South, North American Datum of 1983 coordinate system. The vertical coordinates were based on North American Vertical Datum of 1988. Monitoring well survey data are included in Appendix G.

3.4.5 Surface Water and Sediment Sampling

All sediment/surface water samples were collected in accordance with the procedures outlined in the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b). QC samples, including equipment blanks, duplicates, and MS/MSDs, were also collected.

Surface water samples were collected directly from the selected locations by submerging the laboratory-supplied, Trizma®-preserved HDPE sample bottle just below the water surface, being careful to avoid sediment agitation. Following sample collection, a calibrated Horiba U5000, Model U-52 was used to collect water quality parameters (i.e., temperature, specific conductivity, pH, DO, turbidity, ORP).

Following the collection of surface water samples, sediment samples were collected directly from the selected locations from 0 to 6 inches bgs using decontaminated stainless steel hand augers. Sediment sampling was performed after surface water sampling to avoid sediment in the surface water sample. All sediment samples were homogenized in disposable HDPE bags prior to placing the sediment into laboratory-supplied HDPE sample containers. Sample containers were labeled, sealed in Ziploc® bags, and placed on wet ice for cooling to 4°C (±2°C). The co-located surface water and sediment sample LBAD-NLF-06 was relocated to the northernmost limit of the property boundary where the surface water channel was identified in the field; however, because insufficient surface water was present, only sediment was sampled at this location.

Observation and measurements taken during surface water and sediment sampling were recorded on the sediment/surface water sampling forms provided in Appendix F.

3.4.6 Equipment Calibration

Equipment including a photoionization detector (MiniRAE 3000) and a water quality instrument (Horiba U-5000, Model U-52) were 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 forms provided in Appendix F.

3.4.7 Deviations and Field Change Requests

Field Change Request (FCR) 2022-01 was initiated to reflect updated guidance from the *Memorandum for Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program* (DoD 2022a). This memorandum updated guidance expanding the target analyte list to include HFPO-DA as well as account for changes in the May 2022 USEPA regional screening levels (RSLs) for PFAS. This approved FCR accounts for the most current available SLs presented in this SI Report and mitigates a potential data gap with the previous exclusion of HFPO-DA. FCR 2022-01 is included in the LBAD UFP-QAPP Addendum (Leidos 2022b).

No instances of field modification impacting project scope and/or data usability/quality were encountered during the SI fieldwork. Activities were completed per the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b). The following minor deviations from the UFP-QAPPs were observed during field activities and summarized for USACE in daily field notes:

- The quantities of samples varied from Table 17-1 of the LBAD UFP-QAPP Addendum (Leidos 2022b). The deviation in sample quantities is a result of actual field conditions, including pavement in place of surface soil and the presence of a shallow groundwater or bedrock at select AOPIs. Surface soil samples and subsurface soil samples were collected as detailed on Worksheet #18 of the LBAD UFP-QAPP Addendum (Leidos 2022b), which specified samples of pavement and saturated soils would not be collected.
    - Two planned surface soil samples (LBAD-FTA-01, LBAD-FTA-03) were not collected due to the presence of pavement and gravel at the surface.
    - Eight planned subsurface soil samples were not collected. The top of rock was encountered at shallow depths at soil boring locations LBAD-FFS-03 (4 feet bgs), LBAD-HPO-01 (4.5 feet bgs), LBAD-FDT-01 (3 feet bgs), LBAD-IWL-01 (3.8 feet bgs), and LBAD-IWL-02 (5 feet bgs). Groundwater was encountered at 4 feet bgs at boring location LBAD-HPO-03. A surface soil and one subsurface soil sample were collected; however, because subsurface soil sample intervals would have overlapped or were too close to be practical, a second subsurface soil sample was not collected.
- The sample location at LBAD-NLF-06 was collected at the western edge of the LBAD property line where this drainage feature was observed, achieving LBAD UFP-QAPP Addendum (Leidos 2022b) objectives. No recognizable drainage feature was apparent at the headwater where this tributary is mapped onsite. Wet sediment was collected; however, surface water could not be collected at this location because insufficient water was present to collect a co-located sample.
- The anticipated shallow water-bearing zone was not encountered in the New Landfill AOPI despite deeper depths drilled. In addition, the formation in this area exhibited slow infiltration rates. As a result, borings for MW-200 and MW-201 were advanced into bedrock, purged, and left open for 24 hours to evaluate infiltration potential. A grab groundwater sample was collected from the MW-201 borehole via bailer. The MW-200 borehole did not contain a sufficient volume of water for sample collection. No well was installed at either borehole, and the boreholes were subsequently abandoned.
- At the time of drilling new monitoring wells, one well volume of drilling water used during drilling activities was removed rather than three volumes as specified in the LBAD UFP-QAPP Addendum (Leidos 2022b), due to larger volumes of drilling water required than anticipated. One volume of drilling water used during drilling activities at ISL-04/MW-206 was removed during both drilling and well development activities.

3.5 DECONTAMINATION PROCEDURES

To ensure that chemical analysis results reflected 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 LBAD UFP-QAPP Addendum (Leidos 2022b). The non-disposable sampling equipment used to conduct sampling activities (e.g., drilling rods, groundwater pumps, water level meters) was decontaminated before sampling activities began, between locations, between sampling events, 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 Environmental Quality

(MDEQ) (MDEQ 2018). Wastewater generated from decontamination activities was handled as IDW. Decontamination water was combined with well development and sampling purge water and managed as one medium.

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

Decontamination of downhole drill rig equipment was completed prior to use, between locations, and after final use before departing the site. Non-dedicated tools and rods were scrubbed and pressure washed in a temporary containment structure with the approved onsite bulk source water/biodegradable detergent (e.g., Liquinox®). Equipment was scrubbed using polyethylene or PVC brushes to remove particulates. Following this scrub, the equipment was rinsed with the approved onsite bulk source water.

3.6 DISPOSITION OF FIELD INVESTIGATION-DERIVED WASTE

The IDW generated during the SI at LBAD included solids (e.g., soil, sediment, sludges, well construction materials, Geoprobe® core bags) and liquids (e.g., drilling fluid, development and purge water, decontamination rinse water). These materials were managed in accordance with the IDW Management Plan provided in Appendix B of the LBAD UFP-QAPP Addendum (Leidos 2022b).

All containers used to hold any amount of IDW, including temporary containers, were properly labeled as soon as they were filled in accordance with the IDW Management Plan, provided in Appendix B of the LBAD UFP-QAPP Addendum (Leidos 2022b). Liquid wastes were contained in above ground tanks and solid wastes were ultimately placed in United Nations (UN)-approved, 55-gallon drums for storage, transport, and disposal. Permanent labels for the drums included a unique container number, a description of the contents (i.e., soil or wastewater), the fill date, the source location, the generator's name (i.e., LBAD), and a telephone number for the generator's point of contact (i.e., the LBAD BRAC Environmental Coordinator [BEC]). Each bucket, carboy, or aboveground tank used to temporarily store liquid IDW was marked "Nonpotable Water" or "Decontamination Waste" to comply with requirements of the IDW Management Plan included in Appendix B of the LBAD UFP-QAPP Addendum (Leidos 2022b) and Occupational Safety and Health Administration (OSHA) hazard communication standards.

Liquid IDW was temporarily stored in above ground tanks and was sampled for characterization once a representative volume of water was collected from each AOPI. A grab groundwater sample was collected from the valve assembly of the aboveground tanks and placed directly into sample bottles. The KDMA WWTP operator was contacted prior to the sampling to determine parameters required for disposal of groundwater from the facility potentially containing PFAS and other suspected contaminants based on the site history and previous investigations. In addition to the analyte list presented in the IDW Management Plan provided in Appendix B of the LBAD UFP-QAPP Addendum (Leidos 2022b), chloride, ammonia, metals, and select VOCs and semivolatile organic compounds (SVOCs) were analyzed to meet facility WWTP discharge requirements. Sample results were reviewed and approved by KDMA for discharge to the KDMA WWTP. Copies of the correspondence outlining KDMA WWTP discharge approvals recorded via email are provided in Appendix H. Approximately 10,000 gallons of liquid IDW were discharged to the WWTP between September 9 and 12, 2022. Once the aboveground tanks were empty of liquid, the remaining sludge was removed and placed in UN-approved, 55-gallon drums.

The contents of the solid IDW drums were sampled for characterization and profiling. A solid waste sample was composited by collecting aliquots from the solid waste drums using a decontaminated stainless steel hand auger. The solids were homogenized in an HDPE plastic bag and then placed into laboratory-supplied sample containers. 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) VOCs, TCLP SVOCs, TCLP metals, TCLP pesticides, TCLP herbicides, pH, and flashpoint.

On January 17, 2023, US Ecology removed the solid IDW waste drums from LBAD for disposal. Drums containing sludge IDW was removed from LBAD on January 31, 2023. Both solid and sludge was disposed of at 49350 N I-94 Service Drive in Bellville, Michigan, at the Wayne Disposal, Inc. Site #2 Landfill and Michigan Disposal Waste Treatment Plant, respectively. Soiled personal protective equipment (PPE) was bagged and disposed of as municipal waste. Copies of the waste manifests and certificates of disposal are provided in Appendix H.

4. DATA ANALYSIS AND QUALITY ASSURANCE SUMMARY

This section summarizes the QA/QC program and laboratory chemical analysis program implemented as part of the LBAD SI field activities (40 CFR 300.420(c)(4)). Additional information on these procedures is presented in the LBAD UFP-QAPP Addendum (Leidos 2022b).

Merit Laboratories, Inc., located in East Lansing, Michigan, was the analytical laboratory under contract for the analysis of PFAS during the LBAD 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 J provides the data usability assessment (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 number. The sample custodian labeled each container with its sample ID number, 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 LBAD SI conforms to the analytical requirements presented in the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b) 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 included in Appendix J.

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 LBAD UFP-QAPP Addendum (Leidos 2022b).

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 (%R) 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 %R 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 LBAD field investigation. A discussion of field QC is presented on Worksheet #20 of the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b).

Table 4-1. Frequency of Field QC Samples for LBAD 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 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 J) was prepared.

4.5 QUALITY ASSURANCE SUMMARY

A comprehensive QA/QC program was implemented during the sampling event in August and September 2022 at LBAD. 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 LBAD UFP-QAPP Addendum (Leidos 2022b). Consistent with the data quality requirements established in the Programmatic UFP-QAPP (Leidos 2022a) and LBAD UFP-QAPP Addendum (Leidos 2022b) 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 found in the DUA (Appendix J). 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 J).

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 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 LBAD UFP-QAPP Addendum (Leidos 2022b) 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. Overall completeness was 89 percent based on field conditions that precluded the collection of samples from several soil locations. Analytical completeness, based on valid data points generated, was 98 percent.

4.5.7 Data Usability Assessment

Data that have been qualified as estimated (i.e., J, J+, J-, UJ) during validation indicate accuracy, precision, or sensitivity QC measurements may have exceeded criteria, but the results are considered valid. Data that were recommended for exclusion during validation (qualified X) and subsequently rejected (qualified R) by the project decision team were not used during the evaluation of project objectives.

5. SITE INSPECTION SCREENING LEVELS

Detected concentrations of Target PFAS in samples collected during this SI are compared to residential scenario SLs calculated using the USEPA RSL calculator for soil and the tap water criteria for groundwater and a target hazard quotient (HQ) of 0.1, as published in the 2022 OSD Memorandum (DoD 2022a). This SI uses the SLs and a target HQ of 0.1 to evaluate Target PFAS concentrations. These SLs (Table 5-1) are used to evaluate the data and determine if further 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 and surface water data. The residential soil SLs are used to evaluate soil and sediment data. Laboratory results are reported to two significant figures.

6. SITE INSPECTION RESULTS

This section presents the background, summary of analytical results, and the CSM for each AOPI at LBAD where Target PFAS were detected. Sampled media and QA/QC samples were analyzed for the list of 26 PFAS specified on Worksheet #11 of 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 tables for all PFAS analyzed using approved methods are provided in Appendix I.

In addition to the samples collected at the nine AOPIs, supplementary groundwater, surface water, and sediment samples were collected during this SI to investigate the potential for offsite migration of PFAS at or near the LBAD facility boundary and assess the presence of PFAS between AOPIs and from potential post-BRAC aqueous film-forming foam (AFFF) sources identified during the PA. A discussion of PFAS results at the facility boundary and facility-wide is presented in Section 6.11.

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 above the LOD in soil, groundwater, surface water, or sediment. 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 human receptors.

The CSMs evaluated 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 in for soil where Target PFAS are detected. The remaining exposure pathway designations were 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 below 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 constituents other than PFAS because the LUCs are not specific to Target PFAS.
- ***Incomplete*** – Human exposure pathways are considered incomplete for media where Target PFAS have not been detected at concentrations greater than the LODs. A facility-wide deed restriction, affecting all AOPIs detailed below, for use of groundwater was implemented in 2006 due to past pesticide use and industrial and landfill operations (USAMC 2006). Land use restrictions were also implemented in 2006 for three landfill areas, the pesticide storage Building 303 (located in the former golf course parcel), and the remaining portion of LBAD referred to as industrial. The land use restrictions require that no residential use be permitted at LBAD, the landfill areas must remain undisturbed, and recreational use is only permitted in the 211 acres of the former golf course parcel (excluding Building 303).

6.2 NEW LANDFILL AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the New Landfill AOPI.

6.2.1 AOPI Background

The New Landfill was used between 1971 and 1980. No lining was installed during construction. Wastes buried at the landfill reportedly contained plating waste, paints, infectious waste, and sewage sludge (Earth Tech 1994). During closure, a clay and soil cap was placed over the landfill; however, delineation of the landfill boundaries was incomplete, and a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was needed to delineate the extent of the landfill (Metcalf & Eddy 1994). A landfill cap and cover system complying with both solid waste landfill closure and Federal requirements for hazardous waste landfill closure was constructed over the landfill in October 1995 (SERES 2021). Long-term monitoring of the landfill is conducted under the Site-wide Long-Term Monitoring, Operation, and Maintenance (LTMOM) Plan Addendum No. 2 (Shaw 2009).

6.2.2 SI Sampling and Results

Groundwater, surface water, and sediment samples were collected from the New Landfill AOPI at the following locations (Figure 6-1):

- Groundwater samples were collected at three existing monitoring wells associated with the New Landfill AOPI to evaluate Target PFAS concentrations downgradient from (LBAD-NLF-MW-67, LBAD-NLF-MW-68) and immediately upgradient of (LBAD-NLF-72) the AOPI.
- Groundwater samples were collected from five existing monitoring wells (MW-23, MW-43i, MW-58, MW-1009, MW-1135) to evaluate PFAS concentrations in groundwater at or near the eastern and northern boundaries of LBAD. In addition, one sample from a newly installed monitoring well (LBAD-NLF-03/MW-202) and a groundwater grab sample from the open rock borehole at soil boring LBAF-NLF-02 were collected to evaluate PFAS concentrations in groundwater between the AOPI and current PFAS uses at LBAD. Results from these samples are presented in the facility-wide groundwater discussion in Section 6.11.
- Co-located surface water and sediment samples were collected from two locations downstream from surface water flow from the suspected release area (LBAD-NLF-04, LBAD-NLF-05). A sediment sample was collected downstream from surface water flow from the suspected release area at location LBAD-NLF-06; however, surface water could not be collected at this location because insufficient water was present.

The Target PFAS analytical results for groundwater, surface water, and sediment samples collected at the New Landfill AOPI are summarized below and presented in Table 6-1 and Figure 6-2.

6.2.2.1 Groundwater

PFOS and PFOA were detected in groundwater samples at estimated concentrations below the SLs in two wells downgradient from the suspected release area (LBAD-NLF-MW-67, LBAD-NLF-MW-68). No Target PFAS were detected in groundwater in the well upgradient of the suspected release area (LBAD-NLF-72). PFBS, PFNA, PFHxS, and HFPO-DA were not detected at concentrations above the LODs in groundwater samples. Groundwater sample results from MW-23, MW-43i, MW-58, MW-1009, MW-1135, LBAD-NLF-03/MW-202, and LBAF-NLF-02, which were collected to measure Target PFAS concentrations between AOPIs and near the LBAD boundary downgradient from the New Landfill AOPI, are discussed in Section 6.11.2.

6.2.2.2 Surface Water

PFOA (estimated concentration) and PFBS were detected below SLs in the surface water sample collected at location LBAD-NLF-05. PFOS, PFNA, PFHxS, and HFPO-DA were not detected at concentrations above the LODs in surface water samples.

6.2.2.3 Sediment

PFOS was detected at estimated concentrations below its SL from downgradient sampling locations LBAD-NLF-05 and LBAD-NLF-06. PFOA was detected at estimated concentrations from the field duplicate sample collected at locations LBAD-NLF-05 and LBAD-NLF-06. PFNA was detected at estimated concentrations at locations LBAD-NLF-05 and LBAD-NLF-06. None of the Target PFAS detected in sediment exceeded their respective SLs. PFBS, PFHxS, and HFPO-DA were not detected at concentrations above the LODs in the sediment samples.

6.2.3 CSM

The New Landfill AOPI is approximately 18.39 acres. The area is vegetated and fully enclosed by a chain-link fence. The landfill is maintained in accordance with the Site-wide LTMOM Plan Addendum No. 2 (Shaw 2009). The ground surface elevation of the New Landfill AOPI is approximately 1,040 feet amsl at its peak.

The New Landfill AOPI is located on a topographic high point, and surface water runoff generally flows to the east, south, or west, ultimately encountering channels or storm drains that discharge to the unnamed tributary of Elkhorn Creek to the southwest. A small fraction of surface water drains east into an unnamed tributary, which also feeds Elkhorn Creek.

Soil information obtained from the NRCS web soil survey indicates soils in this area of LBAD are generally divided between a grouping of the Bluegrass, Maury, Lowell, Sandview, and Faywood silt loam. The subsurface geology at the New Landfill was characterized during the SI as consisting of silt clay with some sand. Bedrock was encountered at approximately 14 feet bgs and was explored to 44 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 18 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the southwest (SERES 2021).

Wastes buried at the landfill reportedly included plating waste from the facility chrome plating operations. The primary release mechanism is the potential release of PFAS-containing materials from the unlined landfill into subsurface soil. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from landfilled materials to the bedrock and groundwater through leaching and percolation. Migration of contamination from the landfill by seeps and springs may discharge to surface water.

LUCs restricting landfill cap and soil disturbance and groundwater use are currently in place at the New Landfill. However, as the LUCs are based on non-PFAS specific contaminants, the onsite soil and groundwater exposure pathways are considered potentially complete for the duration of the current restrictions because Target PFAS were detected in groundwater at concentrations less than the SLs. A potentially complete groundwater exposure pathway exists for offsite residents because Target PFAS were detected in groundwater below the SLs, and groundwater wells are present within 1 mile of LBAD (including six downgradient wells). Because Target PFAS were detected in surface water and sediment below the SLs at the New Landfill AOPI, the surface water and sediment exposure pathways for onsite workers are potentially complete. Surface water that leaves LBAD enters an unnamed tributary of Elkhorn Creek, which flows to the Kentucky River several miles downstream and is used as a drinking water source by KAW; therefore, the surface water and sediment exposure pathways are potentially complete for offsite residents and recreators. Figure 6-3 presents the CSM for the New Landfill AOPI.

6.2.4 Recommendation

Detected concentrations of Target PFAS in groundwater, surface water, and sediment at the New Landfill AOPI were below the SLs; therefore, further investigation is not recommended.

Table 6-1. Target PFAS Results and Screening for the New Landfill AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	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**
LBAD-NLF-MW-67	LBNLF-MW67	WELL	18.00-18.00	08/08/2022	<0.88 U	<0.88 U	<0.88 U	<0.88 U	**1.4 J**	**1.5 J**
LBAD-NLF-MW-68	LBNLF-MW68	WELL	15.00-15.00	08/09/2022	<0.86 U	<0.86 U	<0.86 U	<0.86 U	**1.4 J**	**1.2 J**
LBAD-NLF-MW-72	LBNLF-MW72	WELL	15.00-15.00	08/06/2022	<0.86 U	<0.86 U	<0.86 U	<0.86 U	<0.86 U	<0.86 U
Surface Water				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-NLF-04	LBNLF04-SW01	SWTR	0.00-0.00	08/03/2022	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-NLF-05	LBNLF05-SW01	SWTR	0.00-0.00	08/05/2022	<0.86 U	**16**	<0.86 U	<0.86 U	**1.2 J**	<0.86 U
	LBNLF05-SW01FD	SWTR	0.00-0.00	08/05/2022 (D)	<0.86 U	**17**	<0.86 U	<0.86 U	**1.1 J**	<0.86 U
Sediment				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-NLF-04	LBNLF04-SD01	SEDI	0.00-0.50	08/03/2022	0.053 U	0.053 U	0.053 U	0.053 U	0.053 U	0.053 U
LBAD-NLF-05	LBNLF05-SD01	SEDI	0.00-0.50	08/05/2022	0.062 U	0.062 U	0.062 U	**0.068 J**	0.062 U	0.062 U
	LBNLF05-SD01FD	SEDI	0.00-0.50 (D)	08/05/2022	0.049 U	0.049 U	0.049 U	**0.082 J**	**0.061 J**	**0.062 J**
LBAD-NLF-06	LBNLF06-SD01	SEDI	0.00-0.50	08/03/2022	0.081 U	0.081 U	0.081 U	**0.11 J**	**0.13 J**	**0.18**

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 INDUSTRIAL AND SANITARY WASTE LANDFILL AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Industrial and Sanitary Waste Landfill AOPI.

6.3.1 AOPI Background

The Industrial and Sanitary Waste Landfill was unlined and used between 1950 and 1970. Wastes disposed of in the landfill reportedly contained solvents, metal plating sludge, transformer fluids, sandblasting dust containing chrome, and sewage sludge. Combustible materials were burned at the landfill before burial (Earth Tech 1994). The landfill was closed in 1983 and capped with a clay and soil cover; however, delineation of the landfill boundaries was incomplete, and conducting an RFI was necessary to delineate the extent of the landfill (Metcalf & Eddy 1994). A landfill cap and cover system complying with both solid waste landfill closure and Federal requirements for hazardous waste landfill closure was constructed over the landfill in October 1995 (SERES 2021). Long-term monitoring of the landfill is conducted under the Site-wide LTMOM Plan Addendum No. 2 (Shaw 2009).

6.3.2 SI Sampling and Results

Groundwater, surface water, and sediment samples were collected from the Industrial and Sanitary Waste Landfill AOPI at the following locations (Figure 6-4):

- Groundwater samples were collected from one existing well (LBAD-ISL-MW-18) and one newly installed well (LBAD-ISL-01/MW-203) immediately downgradient from and side-gradient of the AOPI.
- Groundwater samples were collected from four additional newly installed monitoring wells to evaluate PFAS concentrations upgradient of the AOPI (LBAD-ISL-02/MW-204), upgradient between the AOPI and areas of potential current PFAS use (LBAD-ISL-03/MW-205), and side-gradient between the AOPI and areas of potential current PFAS use (LBAD-ISL-04/MW-206, LBAD-ISL-05/MW-207). Results from these samples are presented in the facility-wide groundwater discussion in Section 6.11.
- One co-located surface water and sediment sample was collected at location LBAD-ISL-06, which is downstream from surface water flow from the AOPI.

The Target PFAS analytical results for groundwater, surface water, and sediment collected at the Industrial and Sanitary Waste Landfill AOPI are summarized below and presented in Table 6-2 and Figure 6-5.

6.3.2.1 Groundwater

PFOA and PFBS were detected in one well (LBAD-ISL-MW-18) downgradient from (southeast of) the suspected release area. PFOA was detected at 32 ng/L, which exceeds the SL of 6 ng/L. PFBS was detected at an estimated concentration below its SL. PFOS, PFNA, PFHxS, and HFPO-DA were not detected above the LODs in any of the groundwater samples at the Industrial and Sanitary Waste Landfill. None of the Target PFAS were detected in groundwater in the well immediately downgradient from and side-gradient of the AOPI (LBAD-ISL-01/MW-203).

Two groundwater wells sampled during this SI at the FTA AOPI are located immediately downgradient from the Industrial and Sanitary Waste Landfill AOPI. Target PFAS were not detected above the LODs in the samples collected from those two wells.

Groundwater sample results from LBAD-ISL-02/MW-204, LBAD-ISL-03/MW-205, LBAD-ISL-04/MW-206, and LBAD-ISL-05/MW-207, which were collected to measure Target PFAS concentrations upgradient and side-gradient of the Industrial and Sanitary Waste Landfill AOPI between other areas of potential PFAS use, are discussed in Section 6.11.2.

6.3.2.2 Surface Water

PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in the surface water sample (LBISL06-SW01) collected downgradient from (northwest of) the suspected release area at the Industrial and Sanitary Waste Landfill AOPI. HFPO-DA was not detected above the LOD. Concentrations of two Target PFAS exceeded the SLs: PFOS was detected at 4.4 ng/L (SL of 4 ng/L), and PFOA was detected at 34 ng/L (SL of 6 ng/L). Detections of PFBS, PFNA, and PFHxS did not exceed SLs.

6.3.2.3 Sediment

PFOS, PFOA, and PFNA were detected below their respective SLs in the sediment sample collected at LBISL06-SD01, west of the suspected release area at the Industrial and Sanitary Waste Landfill AOPI. PFBS, PFHxS, and HFPO-DA were not detected above the LODs.

6.3.3 CSM

The Industrial and Sanitary Waste Landfill AOPI is approximately 15.01 acres. The area is vegetated and fully enclosed by a chain-link fence. The landfill is maintained in accordance with the Site-wide LTMOM Plan Addendum No. 2 (Shaw 2009). The ground surface elevation of the Industrial and Sanitary Waste Landfill AOPI is approximately 990 feet amsl. Surface water runoff follows the topography, which slopes to the west and southwest toward the unnamed tributary of Elkhorn Creek. The Industrial Sanitary Waste Landfill AOPI is located immediately upgradient of the FTA AOPI. Soil and groundwater samples collected at the FTA are discussed in Section 6.4.3.

The subsurface geology at the Industrial and Sanitary Waste Landfill was characterized during the SI as consisting of silty clay with sand and gravel. Bedrock was encountered between approximately 5 and 12 feet bgs and was explored to 70 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 36 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the southwest (SERES 2021).

Wastes buried at the landfill reportedly included plating waste from the facility chrome plating operations. The primary release mechanism is the potential release of PFAS-containing materials from the unlined landfill into subsurface soil. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from landfilled materials to the bedrock and groundwater through leaching and percolation. Migration of contamination from the landfill by seeps and springs may discharge to surface water.

LUCs restricting landfill cap and soil disturbance and groundwater use are currently in place at the Industrial and Sanitary Waste Landfill. The soil and groundwater exposure pathways onsite are potentially complete because the LUCs are not PFAS-specific. A potentially complete groundwater exposure pathway exists for offsite residents because Target PFAS were detected above the SLs in groundwater and groundwater wells are present within 1 mile of LBAD. The surface water and sediment exposure pathways for onsite workers are considered complete because Target PFAS were detected in exceedance of the SLs in surface water. The surface water and sediment exposure pathways for offsite residents and recreators are also potentially complete, as surface water that leaves LBAD enters an unnamed tributary of Elkhorn Creek, which flows to the Kentucky River several miles downstream and is used as a drinking water source by KAW. Figure 6-6 presents the CSM for the Industrial and Sanitary Waste Landfill.

6.3.4 Recommendation

Detected concentrations of Target PFAS in one groundwater and one surface water sample at the Industrial and Sanitary Waste Landfill exceed the SLs; therefore, further investigation is recommended.

Table 6-2. Target PFAS Results and Screening for the Industrial and Sanitary Waste Landfill AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	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**
LBAD-ISL-01	LBISL01-MW203	WELL	40.00-40.00	08/24/2022	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-ISL-MW-18	LBISL-MW18	WELL	60.00-60.00	08/08/2022	<0.85 U	**0.85 J**	<0.85 U	<0.85 U	**32**	<0.85 U
Surface Water				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-ISL-06	LBISL06-SW01	SWTR	0.00-0.00	08/06/2022	<0.86 U	**180**	**7.9**	**2.4**	**34**	**4.4**
Sediment				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-ISL-06	LBISL06-SD01	SEDI	0.00-0.50	08/06/2022	0.094 U	0.094 U	0.094 U	**0.24**	**0.84**	**0.26**

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
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.

6.4 FIRE TRAINING AREA AOPI

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

6.4.1 AOPI Background

The FTA is an approximate 50- by 100-foot area where scrap lumber was burned as early as 1978 and continued until the burning of general refuse was banned (Ebasco 1990). During capping of the Industrial and Sanitary Waste Landfill, portions of the FTA were excavated and placed in the landfill prior to cap construction, and some of the FTA area is presently covered by the cap (Sverdrup 1998). The fire protection services at the facility prior to BRAC transfer included pumper-type fire trucks that were equipped with "foam" tanks (U.S. Army 1994). Based on the FTA's period of operation and the presence of "foam" tanks at the fire department during that period, it is likely that AFFF firefighting foam was used at the FTA. Therefore, the FTA was included as an AOPI during the PA. The exact details and frequency of fire training activities at the FTA are not available.

6.4.2 SI Sampling and Results

Soil and groundwater samples were collected from the FTA AOPI at the following locations (Figure 6-4):

- Seven soil samples and one QC duplicate were collected from three soil borings (LBAD-FTA-01, LBAD-FTA-02, LBAD-FTA-03). Portions of the FTA were covered within the cap of the Industrial and Sanitary Waste Landfill; therefore, the boring at LBAD-FTA-01 was placed as close as practical to the edge of the landfill cap. Boring locations LBAD-FTA-02 and LBAD-FTA-03 were located at the western and eastern ends of the suspected release area, respectively. A surface soil sample and three subsurface soil samples were collected at boring location LBAD-FTA-02. Surface soil was not present at the other two soil boring locations, and only two subsurface soil samples were collected from each location.
- One groundwater sample was collected from a new monitoring well (LBD-FTA-01/MW-208) installed immediately downgradient from the AOPI.

The PFAS analytical results for soil and groundwater samples collected at the FTA AOPI are summarized below and presented in Table 6-3 and Figure 6-5. Sediment and surface water are not present at this AOPI.

6.4.2.1 Soil

PFOS, PFOA, PFNA, and PFHxS were detected at estimated concentrations below the SLs in the one surface soil sample (LBAD-FTA-02) collected to the southwest of the AOPI. Target PFAS were not detected in soil samples collected at LBAD-FTA-01 or LBAD-FTA-03. PFBS and HFPO-DA were not detected at concentrations above the LODs in soil samples. No Target PFAS were detected at concentrations above the LODs in subsurface soil.

6.4.2.2 Groundwater

Target PFAS were not detected at concentrations above the LODs in the groundwater sample collected at LBD-FTA-01/MW-208.

6.4.3 CSM

The FTA AOPI is approximately 0.35 acres. The FTA is mostly covered in grass with some loose and fractured asphalt spread throughout. The ground surface elevation of the FTA AOPI is approximately

980 feet amsl. Portions of the FTA may contain ponded water during precipitation events. The area slopes to the south-southeast.

The subsurface geology at the FTA was characterized during the SI as consisting of clay with silt, sand, and gravel. Bedrock was encountered at approximately 10 feet bgs and was explored to 60 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 45 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the southwest (SERES 2021).

A portion of the FTA AOPI overlaps with the Industrial and Sanitary Waste Landfill cap, and the AOPI is immediately downgradient from the Industrial and Sanitary Waste Landfill AOPI. As LUCs are in place at the Industrial and Sanitary Waste Landfill, the overlapping portions of the FTA AOPI will follow that of the Industrial and Sanitary Waste Landfill's CSM (Section 6.3.3).

Due to the fire training activities, the surface soil at the FTA is the source media for potential PFAS contamination. The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the FTA. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through leaching and percolation.

Target PFAS were detected in surface soil at concentrations below the SLs to the southwest of FTA AOPI. Therefore, the onsite worker soil exposure pathways are potentially complete. As detected concentrations in soil do not exceed the SLs and Target PFAS were not detected above the LODs in groundwater, the groundwater exposure pathways are incomplete. Figure 6-7 presents the CSM for the FTA AOPI.

6.4.4 Recommendation

Detected concentrations of Target PFAS in soil at the FTA AOPI do not exceed the SLs; therefore, further investigation is not recommended.

Table 6-3. Target PFAS Results and Screening for the Fire Training Area AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-FTA-01	LBFTA01-SB02	BORE	6.00-8.00	08/19/2022	0.064 UJ	0.064 UJ	0.064 UJ	0.064 UJ	0.064 UJ	0.064 UJ
	LBFTA01-SB03	BORE	8.00-10.00	08/19/2022	0.066 UJ	0.066 UJ	0.066 UJ	0.066 UJ	0.066 UJ	0.066 UJ
LBAD-FTA-02	LBFTA02-SS01	BORE	0.00-1.00	08/19/2022	0.058 UJ	0.058 UJ	**0.061 J**	**0.066 J**	**0.33 J**	**1.5 J**
	LBFTA02-SB02	BORE	2.50-4.50	08/19/2022	0.063 UJ	0.063 UJ	0.063 UJ	0.063 UJ	0.063 UJ	0.063 UJ
	LBFTA02-SB03	BORE	6.00-8.00	08/19/2022	0.059 UJ	0.059 UJ	0.059 UJ	0.059 UJ	0.059 UJ	0.059 UJ
	LBFTA02-SB03FD	BORE	6.00-8.00 (D)	08/19/2022	0.055 UJ	0.055 UJ	0.055 UJ	0.055 UJ	0.055 UJ	0.055 UJ
LBAD-FTA-03	LBFTA03-SB02	BORE	4.00-6.00	08/19/2022	0.060 UJ	0.060 UJ	0.060 UJ	0.060 UJ	0.060 UJ	0.060 UJ
	LBFTA03-SB03	BORE	8.00-10.00	08/19/2022	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-FTA-01	LBFTA01-MW208	WELL	41.50-41.50	09/12/2022	<0.88 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 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.
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.

6.5 IWTP DRYING BEDS AOPI

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

6.5.1 AOPI Background

In 1965, an IWTP was constructed for treatment of the wastewater from the Building 135 Plating Operations. Sludge generated from the IWTP was pumped across the street from the IWTP to two drying beds located to the north of Building 135. The dried sludge was disposed of onsite at the Industrial and Sanitary Waste Landfill (Ebasco 1990). The drying beds ceased operation in 1976. The drying beds and associated transfer lines were remediated and removed between 1996 and 1997 (Sverdrup 1996).

6.5.2 SI Sampling and Results

Soil and groundwater samples were collected from the IWTP Drying Beds AOPI at the following locations (Figure 6-8):

- Two subsurface soil samples and one field duplicate were collected outside the extent of previously remediated (excavated) area at the AOPI at one soil boring location (LBAD-IDB-01) to target residual PFAS concentrations. Surface soil is not present at this location because it is within a paved parking lot.
- One groundwater sample was collected from one new, permanent monitoring well (LBIDB01-MW209) installed at soil boring location LBAD-IDB-01.

The Target PFAS analytical results for soil and groundwater samples collected at the IWTP Drying Beds AOPI are summarized below and presented in Table 6-4 and Figure 6-9. Surface water and sediment are not present at this AOPI.

6.5.2.1 Soil

Target PFAS were not detected at concentrations above the LODs in soil samples collected at location LBAD-IDB-01.

6.5.2.2 Groundwater

Target PFAS were not detected at concentrations above the LODs in groundwater sample collected at location LBAD-IDB-01.

6.5.3 Recommendation

Target PFAS were not detected at the IWTP Drying Beds AOPI in soil or groundwater; therefore, further investigation is not recommended.

Table 6-4. Target PFAS Results and Screening for the IWTP Drying Beds AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-IDB-01	LBIDB01-SB01	BORE	1.00-2.00	08/22/2022	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ
	LBIDB01-SB01FD	BORE	1.00-2.00 (D)	08/22/2022	0.069 UJ	0.069 UJ	0.069 UJ	0.069 UJ	0.069 UJ	0.069 UJ
	LBIDB01-SB02	BORE	8.00-9.00	08/22/2022	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ	0.068 UJ
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-IDB-01	LBIDB01-MW209	WELL	65.00-65.00	09/15/2022	<0.83 U	<0.83 U	<0.83 U	<0.83 U	<0.83 U	<0.83 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
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.

6.6 BUILDING 126 IWTP AND BUILDING 135 PLATING OPERATIONS AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 126 IWTP and Building 135 Plating Operations AOPI.

6.6.1 AOPI Background

Building 135 contained a plating shop, which operated between the 1950s and 1976. Originally, the wastewater generated from plating activities was discharged from floor drains to the storm sewers leading to the tributary of Elkhorn Creek (Earth Tech 1994). The IWTP (Building 126) was constructed in 1965 and is located adjacent to the Building 135 plating room. The IWTP treated the effluent from the plating operations and then discharged to the Industrial Waste Lagoons for additional removal of settleable solids. The plant consisted of a cyanide treatment tank, chromate treatment tank, neutralizing tank, and primary settling tank. The IWTP was removed and contaminated soils remediated between 1996 and 1997 (Sverdrup 1998). The floor of the plating shop consisted of acid-resistant bricks on top of a concrete floor over an aggregate base. A gravel-filled pit once existed in the northwestern corner. Between 1998 and 1999, the building interior and soil beneath the floor of the plating shop were remediated (USAMC 2006).

6.6.2 SI Sampling and Results

Soil and groundwater samples were collected from the Building 126 IWTP and Building 135 Plating Operations AOPI at the following locations (Figure 6-8):

- Two subsurface soil samples were collected from one boring (LBAD-IPO-01) outside the extent of the previously remediated (excavated) area at the AOPI to target residual PFAS concentrations.
- One groundwater sample was collected at one new, permanent monitoring well (LBIPO01-MW210) installed at soil boring location LBAD-IPO-01.

The Target PFAS analytical results for soil and groundwater samples collected at the Building 126 IWTP and Building 135 Plating Operations AOPI are summarized below and presented in Table 6-5 and Figure 6-9. Surface water and sediment are not present at this AOPI.

6.6.2.1 Soil

Target PFAS were not detected at concentrations above the LOD in the soil samples collected at this AOPI.

6.6.2.2 Groundwater

PFOS, PFOA, PFBS, and PFHxS were detected in groundwater at the Building 126 IWTP and Building 135 Plating Operations AOPI. PFOS, PFOA (estimated), PFBS, and PFHxS were detected at concentrations below their respective SLs. PFNA and HFPO-DA were not detected at concentrations above the LODs.

6.6.3 CSM

The Building 126 IWTP and Building 135 Plating Operations AOPI is approximately 0.18 acres. The area where the Building 126 IWTP was located is presently covered with asphalt and/or concrete. The interior of the Building 135 Plating Operations is concrete. The ground surface elevation of the AOPI is approximately 970 feet amsl and slopes to the southeast. The Building 126 IWTP and Building 135 Plating Operations AOPI is located downgradient from the IWTP Drying Beds AOPI.

The subsurface geology at the Building 126 IWTP and Building 135 Plating Operations was characterized during the SI as consisting of silty clay with gravel. Bedrock was encountered at approximately 10 feet bgs and was explored to 10 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 5 feet bgs at the AOPI, and the groundwater yield was greater when compared to other areas of the installation. Based on previous environmental monitoring, groundwater flows to the southwest (SERES 2021).

Wastewater from plating activities at Building 125 was discharged to either floor drains or to subsurface piping leading to Building 126. The primary release mechanism is the potential release of PFAS-containing materials into subsurface soil from underground piping. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to the bedrock and groundwater through leaching and percolation.

The soil exposure pathway is incomplete, as no Target PFAS were detected in soil samples and the concentrations detected in groundwater do not exceed the SLs. The onsite groundwater exposure pathways are potentially complete for the duration of the current groundwater use restriction because Target PFAS were detected at concentrations greater than the LOD in groundwater and the current groundwater restrictions are not specific to PFAS. A potentially complete groundwater exposure pathway exists for offsite residents because groundwater wells are present within 1 mile of LBAD (including six downgradient wells). Figure 6-10 presents the CSM for the Building 126 IWTP and Building 135 Plating Operations AOPI.

6.6.4 Recommendation

Target PFAS were not detected in soil and detected concentrations of Target PFAS were below the SLs in groundwater; therefore, further investigation is not recommended at the Building 126 IWTP and Building 135 Plating Operations AOPI.

Table 6-5. Target PFAS Results and Screening for the Building 126 IWTP and Building 135 Plating Operations AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-IPO-01	LBIPO01-SB01	BORE	2.00-4.00	08/29/2022	0.036 UJ	0.036 UJ	0.036 UJ	0.036 UJ	0.036 UJ	0.036 UJ
	LBIPO01-SB02	BORE	4.00-6.00	08/29/2022	0.057 UJ	0.057 UJ	0.057 UJ	0.057 UJ	0.057 UJ	0.057 UJ
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-IPO-01	LBIPO01-MW210	WELL	5.00-5.00	09/15/2022	<0.88 U	**2.3**	**2.3**	<0.88 U	**1.4 J**	**1.9**

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.
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.

6.7 BUILDING 105 FIRE DISTRIBUTION TESTING AREA AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 105 Fire Distribution Testing Area AOPI.

6.7.1 AOPI Background

Building 105 was a maintenance and operations building used as a fire distribution system testing area (Ebasco 1990). Is not clear exactly what maintenance occurred in the building. An overhead machine lift and trench drains are located inside. Trench drains are located in the floor along the eastern end of the building, and a concrete basin is located to the east of the building. The fire distribution system testing may have included activities such as fire training and nozzle testing with firefighting foams. The LBAD pumper-type fire trucks were equipped with "foam" tanks, and the testing area may have been used for this purpose.

6.7.2 SI Sampling and Results

Soil and groundwater samples were collected from the Fire Distribution Testing Area AOPI at the following locations (Figure 6-11):

- Seven soil samples and one QC duplicate sample were collected from three soil borings. Two borings (LBAD-FDT-01 [surface soil and one subsurface soil sample] and LBAD-FDT-02 [surface soil and two subsurface soil samples]) are located downgradient from the suspected release area. Two subsurface samples and a field duplicate were collected at location LBAD-FDT-03, where no surface soil was present because the area was paved asphalt.
- Two groundwater samples and one field duplicate sample were collected from two new wells installed downgradient from the suspected release area at LBAD-FDT-01 and LBAD-FDT-02.

The Target PFAS analytical results for soil and groundwater samples collected at the Building 105 Fire Distribution Testing Area AOPI are summarized below and presented in Table 6-6 and Figure 6-12. Surface water and sediment are not present at this AOPI.

6.7.2.1 Soil

Target PFAS were not detected above the LODs in any of the soil samples collected at the Fire Distribution Testing Area AOPI.

6.7.2.2 Groundwater

PFOS, PFOA, PFBS, and PFHxS were detected in groundwater at one location (LBAD-FDT-02) in the Fire Distribution Testing Area AOPI. PFOS and PFOA were detected above their respective SLs in the groundwater from sample location LBAD-FDT-02. PFOS was detected at 9.1 ng/L, which exceeds the 4 ng/L SL, while PFOA was detected at an estimated concentration of 6.1 ng/L, which exceeds the 6 ng/L SL. PFBS and PFHxS were also detected at location LBAD-FDT-02 at concentrations below their respective SLs. PFNA and HFPO-DA were not detected above the LODs.

6.7.3 CSM

The Building 105 Fire Distribution Testing Area AOPI is approximately 0.08 acres. Building 105 is a metal-framed building constructed on concrete. To the north of Building 105 is a concrete parking area. Grassy areas are to the east, south, and west of Building 105. The ground surface elevation of the AOPI is approximately 955 feet amsl and slopes to the southeast.

The subsurface geology at the Fire Distribution Testing Area was characterized during the SI as consisting of clay with sand, silt, and gravel. Bedrock was encountered at approximately 7 feet bgs and was explored to 45 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered between approximately 14 and 34 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the southwest (SERES 2021).

Maintenance and/or testing of fire distribution equipment within or around Building 105 may have involved the use of PFAS-containing foams. The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the AOPI. Release to the subsurface soil from trench drains or wastewater gathered in the concrete basin may have occurred. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through leaching and percolation.

Although Target PFAS were not detected in soil samples, the soil exposure pathways at the Building 105 Fire Distribution System Testing Area are potentially complete, as Target PFAS were detected in groundwater at concentrations that exceed the SLs. The onsite groundwater exposure pathways are potentially complete because the groundwater restrictions are not specific to PFAS. A potentially complete groundwater exposure pathway exists for offsite residents because Target PFAS were detected in groundwater above the SLs, and groundwater wells are present within 1 mile of LBAD (including six downgradient wells). Surface water and sediment exposure pathways for offsite residents and recreators are potentially complete because of the SL exceedances in groundwater and the potential for groundwater connectivity/discharge to surface water offsite. Figure 6-13 presents the CSM for the Building 105 Fire Distribution Testing Area AOPI.

6.7.4 Recommendation

Detected concentrations of Target PFAS in groundwater exceed the SLs; therefore, further investigation is recommended.

Table 6-6. Target PFAS Results and Screening for the Building 105 Fire Distribution Testing Area AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-FDT-01	LBFDT01-SS01	BORE	0.00-1.00	08/02/2022	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U
	LBFDT01-SB02	BORE	2.00-3.00	08/02/2022	0.092 U	0.092 U	0.092 U	0.092 U	0.092 U	0.092 U
LBAD-FDT-02	LBFDT02-SS01	BORE	0.00-1.00	08/30/2022	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ
	LBFDT02-SB02	BORE	3.00-5.00	08/30/2022	0.085 UJ	0.085 UJ	0.085 UJ	0.085 UJ	0.085 UJ	0.085 UJ
	LBFDT02-SB03	BORE	7.00-9.00	08/30/2022	0.092 UJ	0.092 UJ	0.092 UJ	0.092 UJ	0.092 UJ	0.092 UJ
LBAD-FDT-03	LBFDT03-SB01	BORE	3.00-5.00	08/30/2022	0.045 UJ	0.045 UJ	0.045 UJ	0.045 UJ	0.045 UJ	0.045 UJ
	LBFDT03-SB02	BORE	7.00-9.00	08/30/2022	0.096 UJ	0.096 UJ	0.096 UJ	0.096 UJ	0.096 UJ	0.096 UJ
	LBFDT03-SB02FD	BORE	7.00-9.00 (D)	08/30/2022	0.098 UJ	0.098 UJ	0.098 UJ	0.098 UJ	0.098 UJ	0.098 UJ
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-FDT-01	LBFDT01-MW211	WELL	33.90-33.90	09/12/2022	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ
	LBFDT01-MW211FD	WELL	33.90-33.90	09/12/2022 (D)	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ
LBAD-FDT-02	LBFDT02-MW212	WELL	23.00-23.00	09/14/2022	<0.88 U	**2.1**	**1.6 J**	<0.88 U	**6.1 J+**	**9.1**

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.
J+ = The analyte was positively identified; the result is an estimated concentration and may be biased high.
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.

6.8 BUILDING 30 FORMER FIRE STATION AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Building 30 Former Fire Station AOPI.

6.8.1 AOPI Background

The Former Fire Station is a one-story building with a basement and presently contains several office spaces used by the Kentucky State Police. Floor plans detailing the layout for *Fire Station 30 Heating*, dated December 12, 1951, show that the station had three drive-in bays in the center of the building where firefighting apparatus was stored (LBAD 1951a). A smaller garage building and parking area are located behind the former fire station. A 10- by 10-foot wash rack lies between the former fire station and the garage and consists of a concrete basin with a garden hose. Precise dates of operation are not available for the fire station; however, the fire protection services at the facility prior to BRAC transfer included two pumper-type fire trucks that were each equipped with 40-gallon “foam” tanks (U.S. Army 1994).

6.8.2 SI Sampling and Results

Soil and groundwater samples were collected from the Building 30 Former Fire Station AOPI at the following locations (Figure 6-14):

- Eight soil samples were collected from three soil borings (LBAD-FFS-01, LBAD-FFS-02, LBAD-FFS-03) downgradient from the suspected release area at this AOPI. One surface soil sample and two subsurface soil samples were collected from LBAD-FFS-01 and LBAD-FFS-02. At LBAD-FFS-03, one surface soil sample and only one subsurface soil sample were collected because the top of rock was encountered at 4 feet bgs.
- Groundwater samples were collected from two existing and one newly installed monitoring well associated with the Building 30 Former Fire Station AOPI. The paired wells LBAD-FFS-MW-55 and LBAD-FFS-MW-55D are located downgradient from the suspected release area. Monitoring well LBAD-FFS-MW-55D was sampled at 65 feet bgs to evaluate the potential vertical gradient of Target PFAS concentrations. One new, permanent monitoring well (LBAD-FFS-MW-213) was installed downgradient from the suspected release area at soil boring location LBAD-FFS-01.
- Three additional monitoring wells were sampled during the SI to assess the presence or migration of PFAS between AOPIs and along the southern border of LBAD. Well LBAD-FFS-MW-41 is located near the southern boundary of LBAD, farther downgradient from the Building 30 Former Fire Station AOPI, and LBAD-FFS-MW-48 and LBAD-FFS-MW-48D are located side-gradient (to the east). Well LBAD-FFS-MW-48D was sampled at 55 feet bgs to evaluate the potential vertical gradient of Target PFAS concentrations. Results from these wells are detailed in the facility-wide groundwater discussion in Section 6.11.

The Target PFAS analytical results for soil and groundwater samples collected at the Building 30 Former Fire Station AOPI are summarized below and presented in Table 6-7 and Figure 6-15. Surface water and sediment are not present at this AOPI.

6.8.2.1 Soil

PFOS, PFOA, PFBS, PFNA, and PFHxS were detected below their respective SLs in soil samples at the Building 30 Former Fire Station AOPI. PFOS and PFOA were detected at concentrations below their respective SLs in surface soil and subsurface soil samples collected at all three soil borings (LBAD-FFS-01, LBAD-FFS-02, and LBAD-FFS-03). PFNA was detected at concentrations below the SLs in surface soil and subsurface soil samples collected at LBAD-FFS-01. PFBS and PFHxS were also detected below the SLs in subsurface soil collected at LBAD-FFS-01. PFBS was detected at estimated concentrations below the SL in surface soil at LBAD-FFS-03, while PFHxS was detected at concentrations below the SL in both surface soil and subsurface soil at this location. HFPO-DA was not detected at concentrations above the LOD in soil.

6.8.2.2 Groundwater

PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in groundwater at the Building 30 Former Fire Station AOPI. PFOA was detected at concentrations that exceed the SL of 6 ng/L downgradient from the suspected release area in all three wells: LBAD-FFS-01/MW-213 (32 ng/L), LBAD-FFS-MW-55 (6.2 ng/L), and LBAD-FFS-MW-55D (30 ng/L). PFOS, PFBS, PFNA, and PFHxS were detected below the SLs, with the highest concentrations of each being detected at LBAD-FFS-MW-55D (sample depth of 65 feet bgs). HFPO-DA was not detected at concentrations above the LOD in groundwater.

Sample results from existing monitoring wells LBAD-FFS-MW-41, LBAD-FFS-MW-48, and LBAD-FFS-MW-48D, which were collected to measure Target PFAS concentrations between AOPIs and near the LBAD boundary downgradient from the Building 30 Former Fire Station AOPI, are discussed in Section 6.11.2.

6.8.3 CSM

The Building 30 Former Fire Station AOPI is approximately 0.18 acres. The ground surface elevation of the AOPI is approximately 960 feet amsl and slopes to the southeast. The block-built building sits at the top of the slope and is surrounded by either grass or asphalt. The Building 30 Former Fire Station AOPI is located downgradient from the Building 105 Fire Distribution Testing Area AOPI.

The subsurface geology at the Former Fire Station was characterized during the SI as consisting of silty clay with gravel. Bedrock was encountered between approximately 4 and 12 feet bgs and was explored to 40 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 30 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the south (SERES 2021).

Maintenance and/or testing of firefighting equipment within or around Building 30 may have involved the use of PFAS-containing foams. The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the AOPI. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through leaching and percolation.

The exposure pathways for both surface soil and subsurface soil for onsite workers are potentially complete, as Target PFAS were detected in soil at concentrations below the SLs and in groundwater above the SLs at the Building 30 Former Fire Station AOPI. The restriction on the use of groundwater onsite is not specific to PFAS; therefore, the pathway is potentially complete. Potentially complete groundwater exposure pathways exist for offsite residents because Target PFAS were detected in groundwater above the SLs, and groundwater wells are present within 1 mile of LBAD. Surface water and sediment are not present at the Building 30 Former Fire Station AOPI, which makes the exposure pathways for onsite workers incomplete. However, surface water that leaves LBAD enters an unnamed tributary of Elkhorn Creek, which flows to the Kentucky River several miles downstream and is used as a drinking water source by KAW, making the surface water and sediment exposure pathways for offsite residents and recreators potentially complete. Figure 6-16 presents the CSM for the Building 30 Former Fire Station AOPI.

6.8.4 Recommendation

Detected concentrations of PFAS in groundwater exceed the SLs; therefore, further investigation is recommended at the Building 30 Former Fire Station AOPI.

Table 6-7. Target PFAS Results and Screening for the Building 30 Former Fire Station AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-FFS-01	LBFFS01-SS01	BORE	0.00-1.00	08/23/2022	0.089 U	0.089 U	0.089 U	**0.090 J**	**2.0**	**1.4**
	LBFFS01-SB02	BORE	5.00-7.00	08/23/2022	0.061 U	**0.10 J**	**0.44**	**0.13**	**3.3**	**2.5 J**
	LBFFS01-SB03	BORE	11.00-12.00	08/23/2022	0.084 U	0.084 U	**0.29**	0.084 U	**5.4**	**0.49**
LBAD-FFS-02	LBFFS02-SS01	BORE	0.00-1.00	08/23/2022	0.081 U	0.081 U	0.081 U	0.081 U	**3.8**	**1.4**
	LBFFS02-SB02	BORE	4.00-5.00	08/23/2022	0.081 U	0.081 U	0.081 U	0.081 U	**0.66**	0.081 U
	LBFFS02-SB03	BORE	8.00-9.00	08/23/2022	0.077 U	0.077 U	0.077 U	0.077 U	**0.30**	**0.10 J**
LBAD-FFS-03	LBFFS03-SS01	BORE	0.00-1.00	08/02/2022	0.042 U	**0.045 J**	**0.11**	0.042 U	**1.7**	**0.14**
	LBFFS03-SB02	BORE	3.00-4.00	08/02/2022	0.047 U	0.047 U	**0.12**	0.047 U	**1.4**	**0.30**
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-FFS-01	LBFFS01-MW213	WELL	32.50-32.50	09/14/2022	<0.88 U	**2.3**	**2.1**	<0.88 U	**32**	**1.9**
LBAD-FFS-MW-55	LBFFS-MW55	WELL	36.00-36.00	08/09/2022	<0.84 U	**3.6**	**3**	<0.84 U	**6.2**	**1.1 J**
LBAD-FFS-MW-55D	LBFFS-MW55D	WELL	65.00-65.00	08/09/2022	<0.83 U	**22**	**9.1**	**1.4 J**	**30**	**3.4**

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
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 INDUSTRIAL WASTE LAGOONS AOPI

The following subsections describe the background, sampling results, CSM, and recommendation for the Industrial Waste Lagoons AOPI.

6.9.1 AOPI Background

The Industrial Waste Lagoons were built to receive effluent from the Building 126 IWTP for settling suspended solids prior to discharge into an unnamed tributary to Elkhorn Creek. The lagoons were constructed in 1965 over the surface water drainage channel that leads to the unnamed tributary. Prior to construction of the IWTP, the untreated discharge from the Building 135 Plating Operations was conveyed to the Industrial Waste Lagoons area. When the IWTP became operational in 1965, the metal plating wastes from Building 135 were treated for the removal of cyanide, chromium, and other heavy metals. Effluent discharge from the IWTP to the lagoons ceased in 1977 (Sverdrup 1996). Remediation of the lagoons, including treatment and disposal of lagoon water, sludge, surrounding soil, and regrading activities, were completed in 1996, and the lagoon area has since been regraded.

6.9.2 SI Sampling and Results

Soil, groundwater, surface water, and sediment samples were collected from the Industrial Waste Lagoons AOPI at the following locations (Figure 6-17):

- Four soil samples were collected from two soil borings, one at the suspected release area where the discharge of the Industrial Waste Lagoons historically flowed (LBAD-IWL-02) and one downgradient from the suspected release area (LBAD-IWL-01). One surface soil sample and one subsurface soil sample were collected at leach location. The top of rock was encountered at shallow depths, preventing the collection of a second subsurface soil sample at both locations.
- Groundwater samples were collected from one existing monitoring well (LBAD-IWL-MW-1052) and one newly installed monitoring well (LBAD-IWL-01/MW-214) immediately downgradient from the suspected release area.
- Groundwater samples were collected from four existing wells side-gradient of the AOPI (LBAD-IWL-MW-49, LBAD-IWL-MW-49D, LBAD-IWL-MW-19, LBAD-IWL-WSW-08) and two wells farther downgradient (LBAD-IWL-MW-40, LBAD-IWL-MW-40D) to evaluate PFAS concentrations in groundwater near the western and southern boundaries of the LBAD facility. Results are detailed in the facility-wide groundwater discussion in Section 6.11.
- One co-located surface water and sediment sample was collected at location LBAD-IWL-03 to assess the presence or migration of PFAS at the main discharge point of surface water from LBAD.

The Target PFAS analytical results for soil, groundwater, surface water, and sediment samples collected at the Industrial Waste Lagoons AOPI are summarized below and presented in Table 6-8 and Figure 6-18.

6.9.2.1 Soil

PFOS, PFOA, and PFNA were detected below the SLs in surface soil samples collected at the suspected release area where the discharge of the Industrial Waste Lagoons historically flowed (LBAD-IWL-02) and downgradient from the suspected release area (LBAD-IWL-01). PFOS was also detected below the SL in subsurface soil at location LBAD-IWL-01.

PFBS, PFHxS, and HFPO-DA were not detected in soil samples collected at the Industrial Waste Lagoons AOPI.

6.9.2.2 Groundwater

PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in groundwater samples collected at the Industrial Waste Lagoons AOPI. Wells sampled immediately downgradient from the suspected release area (LBAD-IWL-MW-1052, LBAD-IWL-01/MW214) contained detectable concentrations of Target PFAS; however, no concentration exceeded an SL. HFPO-DA was not detected in groundwater at the AOPI.

Groundwater samples were collected from existing monitoring wells LBAD-IWL-MW-49, LBAD-IWL-MW-49D, LBAD-IWL-MW-19, LBAD-IWL-WSW-08, LBAD-IWL-MW-40, and LBAD-IWL-MW-40D to measure Target PFAS concentrations near the LBAD facility boundary to the west and south of the Industrial Waste Lagoons AOPI. Sample results from these wells are discussed in Section 6.11.2.

6.9.2.3 Surface Water

During the SI, a co-located surface water and sediment sample was collected from location LBAD-IWL-03, which is downstream from surface water and stormwater flow from the Industrial Waste Lagoons AOPI and most of the LBAD property (Section 2.7). The results are discussed further in Section 6.11, which presents a facility-wide discussion of surface water.

6.9.2.4 Sediment

During the SI, a co-located surface water and sediment sample was collected from location LBAD-IWL-03, which is downstream from surface water flow from the Industrial Waste Lagoons AOPI. Because sampling location LBAD-IWL-03 is located at the point of discharge of the majority of the stormwater from LBAD, including upstream areas, currently existing non-BRAC facilities, and potentially areas outside LBAD, these results are discussed further in Section 6.11, which presents a facility-wide discussion of sediment.

6.9.3 CSM

The Industrial Waste Lagoons AOPI is approximately 1.08 acres. The ground surface elevation of the AOPI is approximately 955 feet amsl and slopes to the southwest. The area is covered in grass and includes a rip-rap drainage channel that traverses the AOPI from east to west and leads to a concrete-lined drainage channel to the west. During precipitation events, stormwater runoff is collected in the drainage channel from the areas immediately upslope of the AOPI and discharges to the unnamed tributary of Elkhorn Creek in the southwest. The Industrial Waste Lagoons AOPI is located downgradient from the Building 126 IWTP and Building 135 Plating Operations AOPI.

The subsurface geology at the Industrial Waste Lagoons was characterized during the SI as consisting of silty clay with rock fragments. Bedrock was encountered at approximately 4 feet bgs and was explored to 30 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered at approximately 23 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the south (SERES 2021).

PFAS-containing mist suppressants were likely used during the plating process at Building 135 given the period of operation of the chrome plating activities in the building. Prior to 1965, untreated discharge from Building 135 was made to the area, which later became the Industrial Waste Lagoons. The primary release mechanism is the potential release of PFAS-containing materials to surface soils related to historical operations at the AOPI. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from surface soil to deeper subsurface soil and groundwater through leaching and percolation, and to surface water and sediment via runoff of precipitation.

The surface soil and subsurface soil exposure pathways for onsite workers are potentially complete, as Target PFAS were detected below the SLs in soil.

The onsite groundwater exposure pathways are potentially complete for the duration of the current groundwater use restriction because Target PFAS were detected at concentrations greater than the LOD in groundwater at and immediately downgradient from the suspected release area and the current groundwater restrictions are not specific to PFAS. The groundwater exposure pathways for offsite residents are potentially compete because groundwater wells are within 1 mile of LBAD.

Target PFAS were detected above the SLs in groundwater at LBAD-IWL-WSW-08; however, this well was sampled to evaluate PFAS concentrations near the boundary of LBAD. Several factors support the conclusion that the concentrations of PFOA and PFOS detected at LBAD-IWL-WSW-08 are not a result of a release at the Industrial Waste Lagoons AOPI. No concentrations of Target PFAS exceeded the SLs in soil or groundwater within or immediately adjacent to the AOPI boundary. The maximum concentrations of PFOA and PFOS detected in monitoring wells immediately downgradient from the AOPI are 3.1 and 3.4 ng/L (estimated), respectively. PFAS concentrations at LBAD-IWL-WSW-08 could potentially be impacted by the operations at other existing facilities located between the Industrial Waste Lagoons AOPI and LBAD-IWL-WSW-08.

Concentrations of PFOS and PFOA exceeded SLs at the LBAD boundary downstream from surface water runoff from the Industrial Waste Lagoons AOPI (LBAD-IWL-03). However, several factors support the conclusion that the concentrations of PFOA and PFOS in this surface water sample are not a result of a release at the Industrial Waste Lagoons. No concentrations of Target PFAS exceeded the SLs in soil or groundwater within or immediately adjacent to the Industrial Waste Lagoons AOPI. Sample location LBAD-IWL-03 is located at the point of discharge of most of the surface drainage from LBAD, including upstream areas, currently existing post-BRAC facilities, and potentially areas outside LBAD. Therefore, this location is considered representative of facility-wide surface water and not the Industrial Waste Lagoons AOPI. Further discussion is presented in Section 6.11. Figure 6-19 presents the CSM for the Industrial Waste Lagoons AOPI.

6.9.4 Recommendation

Detected concentrations of Target PFAS in soil and groundwater do not exceed SLs in the suspected release area; therefore, further investigation is not recommended at the Industrial Waste Lagoons AOPI.

Table 6-8. Target PFAS Results and Screening for the Industrial Waste Lagoons AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-IWL-01	LBIWL01-SS01	BORE	0.00-1.00	09/07/2022	0.045 U	0.045 U	0.045 U	**0.051 J**	**0.11**	**0.11**
	LBIWL01-SB02	BORE	1.80-3.80	09/07/2022	0.076 U	0.076 U	0.076 U	0.076 U	0.076 U	**0.21**
LBAD-IWL-02	LBIWL02-SS01	BORE	0.00-1.00	09/07/2022	0.076 U	0.076 U	0.076 U	**0.11 J**	**0.25**	**0.23**
	LBIWL02-SB02	BORE	3.00-5.00	09/07/2022	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-IWL-01	LBIWL01-MW214	WELL	24.30-24.30	09/14/2022	<0.86 U	**1.5 J**	**1.9**	<0.86 U	**1.4 J+**	**1.2 J**
LBAD-IWL-MW-1052	LBIWL-MW1052	WELL	40.00-40.00	08/08/2022	<0.85 U	**2.6**	**10**	<0.85 U	**3.1**	**3.4 J**

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.
J+ = The analyte was positively identified; the result is an estimated concentration and may be biased high.
U = The analyte was analyzed for, but not detected above the reported sample quantitation limit.

6.10 BUILDING H PLATING OPERATIONS AOPI

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

6.10.1 AOPI Background

Building H is one of eight large warehouses located along the southern border of LBAD. Historical activities in the warehouse include painting and wood working, and the building houses storage facilities and offices (Metcalf & Eddy 1994). Seven 275-gallon ASTs were located in Building H and contained chromium liquid (Earth Tech 1994). Historical floor plans from 1951 show that a metal plating shop was located within Bay C of Building H (LBAD 1951b), and the area is presently used for metal plating. Additional details about the periods of operations and activities within Building H are limited; however, the time frame from 1951 to 1994 encompasses the use of PFAS-containing mist suppressants during chrome plating operations.

6.10.2 SI Sampling and Results

Soil and groundwater samples were collected at the Building H Plating Operations AOPI at the following locations (Figure 6-20):

- Four soil samples and one QC duplicate sample were collected from two soil borings (LBAD-HPO-01, LBAD-HPO-03). One surface soil sample and one subsurface soil sample were collected at each boring. The top of rock was encountered at a shallow depth (4.5 feet bgs) at the suspected release area (LBAD-HPO-01), preventing the collection of a second subsurface soil sample. As shallow groundwater was encountered at 4 feet bgs at boring LBAD-HPO-03, subsurface soil sample intervals would have overlapped or were too close to be practical, and a second subsurface soil sample was not collected.
- A groundwater sample was collected from one newly installed monitoring well at the suspected release area (LBAD-HPO-01/MW-215).
- Groundwater samples were collected from three existing wells to evaluate PFAS concentrations in groundwater between AOPIs and near the southeast boundary of LBAD. LBAD-HPO-MW-46 is located upgradient, LBAD-HPO-02/MW-216 is located side-gradient, and LBAD-HPO-B47 is located downgradient of the Building H Plating Operations AOPI. Results from these three monitoring wells are presented in the facility-wide groundwater discussion in Section 6.11.

The Target PFAS analytical results for soil and groundwater samples collected at the Building H plating Operations AOPI are summarized below and presented in Table 6-9 and Figure 6-21. Surface water and sediment are not present at this AOPI.

6.10.2.1 Soil

PFOS, PFOA, and PFNA were detected in soil at the Building H Plating Operations AOPI. PFOS, PFOA, and PFNA were detected below their respective SLs in surface soil samples collected at the suspected release area from locations LBAD-HPO-01 and LBAD-HPO-03. PFOS and PFOA were also detected at estimated concentrations below the SLs in the field duplicate subsurface soil sample collected at location LBAD-HPO-03. PFBS, PFHxS, or HFPO-DA were not detected above the LODs in soil.

6.10.2.2 Groundwater

No Target PFAS were detected above LODs in the groundwater sample collected from well LBAD-HPO-01/MW215 located in the suspected release area.

Groundwater samples were collected from existing monitoring wells LBAD-HPO-MW-46, LBAD-HPO-02/MW-216, and LBAD-HPO-B47 to measure Target PFAS concentrations upgradient (between AOPIs) and near the LBAD facility boundary to the southeast of the Building H Plating Operations AOPI. Sample results from these wells are discussed in Section 6.11.2.

6.10.3 CSM

The Building H Plating Operations AOPI is approximately 0.17 acres. The interior of Building H is concrete, and the exterior is relatively flat grassy or paved areas. The ground surface elevation of the AOPI is approximately 940 feet amsl.

The subsurface geology at the Building H Plating Operations was characterized during the SI as silty clay. Bedrock was encountered at approximately 4.5 feet bgs and was explored to 38 feet bgs. Bedrock is consistent with the limestone and shale beds of the Lexington Limestone. Groundwater was encountered between approximately 4 and 18 feet bgs at the AOPI. Based on previous environmental monitoring, groundwater flows to the south (SERES 2021).

According to historical floor plans, wastewater from plating activities in Building H were discharged to a floor drain along the northern wall of the building that then entered an underground clay pipe, which exited the building toward the north (LBAD 1951b). The primary release mechanism is the potential release of PFAS-containing materials into subsurface soil from this underground piping. The secondary contaminant migration and fate and transport considerations include downward contaminant migration from soil to the bedrock and groundwater through leaching and percolation.

The surface and subsurface soil exposure pathways at the Building H Plating Operations AOPI are potentially complete because Target PFAS were detected at concentrations below the SLs in surface soil and subsurface soil at the AOPI. Groundwater collected in the suspected release area at the Building H Plating Operations AOPI did not contain detectable Target PFAS concentrations. Figure 6-22 presents the CSM for the Building H Plating Operations AOPI.

Concentrations of Target PFAS exceeded SLs at two monitoring wells sampled along the southern boundary of LBAD, downgradient from and side-gradient of the Building H Plating Operations AOPI (LBAD-HPO-B47). Several factors support the conclusion that the concentrations of Target PFAS in these groundwater samples are not a result of a release at the Building H Plating Operations AOPI. No Target PFAS were detected above the SLs in soil or groundwater at the AOPI. LBAD-HPO-MW-B47 and LBAD-HPO-02/MW-216 are downgradient from the industrial area at LBAD, and the potential exists for post-BRAC impacts on these wells. This supports the determination of a potentially complete groundwater pathway at the Building H Plating Operations AOPI. Further discussion regarding groundwater at the southern boundary of LBAD is presented in Section 6.11.

6.10.4 Recommendation

Detected concentrations of Target PFAS in soil and groundwater do not exceed SLs in the suspected release area; therefore, further investigation is not recommended at the Building H Plating Operations AOPI.

Table 6-9. Target PFAS Results and Screening for the Building H Plating Operations AOPI

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
Soil				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-HPO-01	LBHPO01-SS01	BORE	0.00-1.00	08/02/2022	0.099 U	0.099 U	0.099 U	**0.27**	**1.2**	**2.5**
	LBHPO01-SB02	BORE	3.50-4.50	08/02/2022	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U
LBAD-HPO-03	LBHPO03-SS01	BORE	0.00-1.00	08/02/2022	0.092 U	0.092 U	0.092 U	**0.20**	**0.43**	**0.83**
	LBHPO03-SB02	BORE	3.00-4.00	08/02/2022	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U	0.070 U
	LBHPO03-SB02FD	BORE	3.00-4.00 (D)	08/02/2022	0.059 U	0.059 U	0.059 U	0.059 U	**0.065 J**	**0.064 J**
Groundwater				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-HPO-01	LBHPO01-MW215	WELL	35.00-35.00	08/23/2022	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ

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.
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.

6.11 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 LBAD and provide recommendations based on results.

6.11.1 Background and Purpose

One of the goals of this SI was to determine the presence of migration of PFAS at the LBAD facility boundary. To accomplish this goal, groundwater, surface water, and sediment samples were collected from monitoring wells and drainage locations at or near the LBAD boundary. In addition, wells upgradient of and between AOPIs were sampled to evaluate the potential for PFAS migration from post-BRAC transfer activities or to the facility boundary. Potential areas of post-BRAC transfer PFAS use or release are shown in Figures 6-23 and 6-24.

6.11.2 Supplementary Sampling and Results

Figure 6-23 presents the locations of all interior and perimeter groundwater and surface water samples collected during this SI at LBAD. In addition to the AOPI-specific locations described previously, the rationale for supplementary sampling locations is as follows:

- Fourteen perimeter wells at or near the LBAD boundary were sampled to further evaluate facility boundary conditions and potential for offsite migration of PFAS from the facility:
  - LBAD-IWL-MW-19, LBAD-IWL-MW-49, and LBAD-IWL-MW-49D along the western boundary. Monitoring well LBAD-IWL-MW-49D was sampled at 55 feet bgs to evaluate the potential vertical gradient of Target PFAS concentrations in groundwater.
  - LBAD-IWL-WSW-08, LBAD-IWL-MW-40, LBAD-IWL-MW-40D, LBAD-FFS-MW-41, LBAD-HOPO-B47, and LBAD-HPO-2/MW-216 along the southern boundary. Monitoring well LBAD-IWL-MW-40D was sampled at 50 feet bgs to evaluate the potential vertical gradient of Target PFAS concentrations in groundwater.
  - LBAD-NLF-MW-1135, LBAD-NLF-MW-43i, LBAD-NLF-MW-23, and LBAD-NLF-MW-58 along the eastern boundary.
  - LBAD-NLF-1009 along the northern boundary.
- Nine interior wells (MW-46, MW-48, MW-48D, LBAD-NLF-02/MW-201, LBAD-NLF-03/MW-202, LBAD-ISL-02/MW-204, LBAD-ISL-03/MW-205, LBAD-ISL-04/MW-206, LBAD-ISL-05/ MW-207) were sampled to evaluate between AOPIs and potential post-BRAC sources of AFFF identified during the PA.
- One co-located surface water and sediment sample was collected in the southwestern corner of the facility at LBAD-IWL-03 to assess the presence or migration of PFAS in surface water and sediment at the primary discharge point from LBAD.

The Target PFAS analytical results for the supplementary groundwater, surface water, and sediment samples are summarized below and presented with all of the SI groundwater sample results in Table 6-10 and Figure 6-24.

6.11.2.1 Groundwater

Groundwater samples were collected from nine wells along the southern and western LBAD facility boundaries. Eight of the nine wells contained detections of Target PFAS: LBAD-IWL-MW-49, LBAD-IWL-MW-49D, LBAD-ISL-WSW-08, LBAD-IWL-MW-40, LBAD-ISL-MW-40D, LBAD-FFS-

MW-41, LBAD-HPO-B47, and LBAD-HPO-02/MW-216. HFPO-DA was not detected above the LOD in groundwater.

The analytical results for Target PFAS exceeding SLs along the southern and western facility boundary are as follows:

- The concentration of PFOS exceeded the SL of 4 ng/L in wells LBAD-IWL-WSW-08, LBAD-FFS-MW-41, and LBAD-HPO-02/MW-216, ranging from 9.1 ng/L (LBAD-HPO-02/MW-216) to 21 ng/L (LBAD-FFS-MW-41).
- The concentration of PFOA exceeded the SL of 6 ng/L in wells LBAD-IWL-WSW-08, LBAD-FFS-MW-41, LBAD-HPO-B47, and LBAD-HPO-02/MW-216, ranging from 9.2 ng/L (LBAD-HPO-B47) to 73 ng/L (LBAD-HPO-02/MW-216).
- The concentration of PFNA exceeded the SL of 6 ng/L at well HPO-02/MW-216 (9.8 ng/L).

Groundwater along the north and eastern facility boundaries (LBAD-NLF-MW-1009, LBAD-NLF-MW-1135, LBAD-NLF-MW-43i, LBAD-NLF-MW-23, LBAD-NLF-MW-58) did not contain any detectable Target PFAS.

The analytical results for interior of the facility wells, which were sampled to further delineate between AOPIs and post-BRAC sources of AFFF, are as follows:

- PFAS were not detected in wells MW-46, LBAD-NLF-02/MW-201, LBAD-NLF-03/MW-202, LBAD-ISL-02/MW-204, LBAD-ISL-03/MW-205, LBAD-ISL-04/MW-206, and LBAD-ISL-05/MW-207. These wells are generally located upgradient of the industrial parcel in the southern portion of LBAD, which includes all of the AOPIs except the New Landfill.
- PFOS, PFOA, PFBS, and PFHxS were detected in wells MW-48 and MW-48D. PFOA exceeded the SL of 6 ng/L in well MW-48 (23 ng/L). Wells MW-48 and MW-48D are located within the industrial parcel, side-gradient of the Building 105 Fire Distribution System Testing Area AOPI and the Building 30 Former Fire Station AOPI.

6.11.2.2 Surface Water

PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in the surface water sample collected at location LBAD-IWL-03. PFOS exceeded the SL of 4 ng/L at 11 ng/L, and PFOA exceeded the SL of 6 ng/L at 33 ng/L. PFBS, PFNA, and PFHxS were detected below their respective SLs. HFPO-DA was not detected above the LOD.

6.11.2.3 Sediment

Location LBAD-IWL-03 is representative of sediment prior to leaving the south-southwest facility boundary. PFOS, PFOA, PFBS, PFNA, and PFHxS were detected but did not exceed their respective SLs in the sample from LBAD-IWL-03. HFPO-DA was not detected above the LOD.

6.11.3 CSM

Surface drainage from the north-central and northwestern portions of the facility flows into an unnamed drainage channel that runs along the inside of the western boundary adjacent to Ware Road and ultimately discharges to Elkhorn Creek, approximately 1,000 feet south of the facility border. Drainage from the central and eastern portions of the facility flows through a stormwater drainage system that exits the facility at an outfall located along the southern facility edge. The discharged stormwater flows parallel to the southern property boundary and railroad tracks and combines with flow from the north-central and northwestern facility discharge to Elkhorn Creek. The remaining portions of the facility drain northeastwardly into Hutchinson Creek (Jacobs 2003).

Elkhorn Creek is the nearest surface water body and is approximately 1,000 feet to the south of LBAD. Surface water from LBAD flows to an unnamed drainageway along the western boundary of LBAD, which then discharges to Elkhorn Creek. Tributaries feeding Hutchinson Creek are approximately a quarter mile to the northeast of LBAD. A number of small wetland areas are located within or near the facility boundary.

LBAD is underlain by flat-lying rocks of Ordovician age, consisting primarily of alternating limestone and shale beds of the Lexington Limestone. During the SI, bedrock was typically encountered between 4 and 12 feet bgs at the facility.

The subsurface geology at LBAD was typically characterized during the SI as silty clay with sand and gravel. Bedrock was consistent with the limestone and shale beds of the Lexington Limestone and was encountered at approximately 4 to 12 feet bgs. Groundwater was encountered between 5 and 45 feet bgs, and most of the flow at LBAD is to the south.

KAW supplies all water to LBAD and most of the surrounding area via intakes located along the Kentucky River and Jacobsen Reservoir (KAW 2020). Offsite, the Kentucky River and Jacobsen Reservoir are known to be used as a drinking water sources. The majority of surface water from the facility discharges to the tributary of Elkhorn Creek, which joins the Kentucky River several miles downstream.

6.11.4 Recommendation

Detected concentrations of Target PFAS in groundwater, surface water, and sediment at the LBAD facility boundary exceed the SLs. Further investigation into the potential sources and offsite migration of PFAS from the facility is recommended.

Table 6-10. Target PFAS Results and Screening Facility-Wide Groundwater, Surface Water, and Sediment

Location ID	Sample ID	Sample Type	Depth (ft)	Sample Date	HFPO-DA	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**
LBAD-FDT-01	LBFDT01-MW211	WELL	33.90-33.90	09/12/2022	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ
	LBFDT01-MW211FD	WELL	33.90-33.90	09/12/2022 (D)	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ	<0.89 UJ
LBAD-FDT-02	LBFDT02-MW212	WELL	23.00-23.00	09/14/2022	<0.88 U	**2.1**	**1.6 J**	<0.88 U	**6.1 J+**	**9.1**
LBAD-FFS-01	LBFFS01-MW213	WELL	32.50-32.50	09/14/2022	<0.88 U	**2.3**	**2.1**	<0.88 U	**32**	**1.9**
LBAD-FFS-MW-41	LBFFS-MW41	WELL	20.00-20.00	08/04/2022	<0.84 U	**11**	**21**	**1.9**	**27**	**21**
LBAD-FFS-MW-48	LBFFS-MW48	WELL	35.00-35.00	08/09/2022	<0.89 U	**6.3**	<0.89 U	<0.89 U	**23**	**1.2 J**
LBAD-FFS-MW-48D	LBFFS-MW48D	WELL	55.00-55.00	08/09/2022	<0.86 U	<0.86 U	**1.1 J**	<0.86 U	**5.1**	<0.86 U
LBAD-FFS-MW-55	LBFFS-MW55	WELL	36.00-36.00	08/09/2022	<0.84 U	**3.6**	**3**	<0.84 U	**6.2**	**1.1 J**
LBAD-FFS-MW-55D	LBFFS-MW55D	WELL	65.00-65.00	08/09/2022	<0.83 U	**22**	**9.1**	**1.4 J**	**30**	**3.4**
LBAD-FTA-01	LBFTA01-MW208	WELL	41.50-41.50	09/12/2022	<0.88 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-HPO-01	LBHPO01-MW215	WELL	35.00-35.00	08/23/2022	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ	<0.87 UJ
LBAD-HPO-02	LBHPO02-MW216	WELL	24.30-24.30	09/14/2022	<0.88 U	**2.6**	**4.4**	**9.8**	**73**	**9.1**
LBAD-HPO-B47	LBHPO-MWB47	WELL	35.00-35.00	08/05/2022	<0.89 U	**2**	**5.4**	<0.89 U	**9.2**	**1.5 J**
LBAD-HPO-MW-46	LBHPO-MW46	WELL	45.00-45.00	08/06/2022	<0.9 U	<0.9 U	<0.9 U	<0.9 U	<0.9 U	<0.9 U
LBAD-IDB-01	LBIDB01-MW209	WELL	65.00-65.00	09/15/2022	<0.83 U	<0.83 U	<0.83 U	<0.83 U	<0.83 U	<0.83 U
LBAD-IPO-01	LBIPO01-MW210	WELL	5.00-5.00	09/15/2022	<0.88 U	**2.3**	**2.3**	<0.88 U	**1.4 J**	**1.9**
LBAD-ISL-01	LBISL01-MW203	WELL	40.00-40.00	08/24/2022	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-ISL-02	LBISL02-MW204	WELL	44.10-44.10	08/15/2022	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U
LBAD-ISL-03	LBISL03-MW205	WELL	62.80-62.80	09/13/2022	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ	<0.88 UJ
LBAD-ISL-04	LBISL04-MW206	WELL	65.00-65.00	09/13/2022	<0.86 U	<0.87 U	<0.87 U	<0.87 U	<0.87 U	<0.87 U
LBAD-ISL-05	LBISL05-MW207	WELL	55.00-55.00	08/24/2022	<0.93 UJ	<0.93 UJ	<0.93 UJ	<0.93 UJ	<0.93 UJ	<0.93 UJ
	LBISL05-MW207FD	WELL	55.00-55.00	08/24/2022 (D)	<0.92 UJ	<0.92 UJ	<0.92 UJ	<0.92 UJ	<0.92 UJ	<0.92 UJ
LBAD-ISL-MW-18	LBISL-MW18	WELL	60.00-60.00	08/08/2022	<0.85 U	**0.85 J**	<0.85 U	<0.85 U	**32**	<0.85 U
LBAD-IWL-01	LBIWL01-MW214	WELL	24.30-24.30	09/14/2022	<0.86 U	**1.5 J**	**1.9**	<0.86 U	**1.4 J+**	**1.2 J**
LBAD-IWL-MW-1052	LBIWL-MW1052	WELL	40.00-40.00	08/08/2022	<0.85 U	**2.6**	**10**	<0.85 U	**3.1**	**3.4 J**
LBAD-IWL-MW-19	LBIWL-MW19	WELL	30.00-30.00	08/06/2022	<0.84 U	<0.84 U	<0.84 U	<0.84 U	<0.84 U	<0.84 U
LBAD-IWL-MW-40	LBIWL-MW40	WELL	25.00-25.00	08/04/2022	<0.84 U	<0.84 U	<0.84 U	<0.84 U	**2.8**	**1 J**
LBAD-IWL-MW-40D	LBIWL-MW40D	WELL	50.00-50.00	08/05/2022	<0.93 U	**1.3 J**	<0.93 U	<0.93 U	<0.93 U	<0.93 U
LBAD-IWL-MW-49	LBIWL-MW49	WELL	30.00-30.00	08/08/2022	<0.85 U	**40**	**11**	<0.85 U	**0.9 J**	<0.85 U
LBAD-IWL-MW-49D	LBIWL-MW49D	WELL	55.00-55.00	08/07/2022	<0.88 U	**12**	**1.2 J**	<0.88 U	<1.8 U	**0.95 J**
LBAD-IWL-WSW-08	LBIWL-WSW08	WELL	65.00-65.00	08/04/2022	<0.86 U	**1.3 J**	**2.8**	**2.9**	**29**	**17**
	LBIWL-WSW08FD	WELL	65.00-65.00	08/04/2022 (D)	<0.84 U	**1.4 J**	**3.9**	**3.1**	**32**	**20**
LBAD-NLF-02	LBNLF02-MW201	WELL	99.00-99.00	08/16/2022	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U

Table 6-10. Target PFAS Results and Screening Facility-Wide Groundwater, Surface Water, and Sediment (Continued)

Location ID	Sample ID	Sample Type	Depth (ft.)	Sample Date	HFPO-DA	PFBS	PFHxS	PFNA	PFOA	PFOS
LBAD-NLF-03	LBNLF03-MW202	WELL	47.00-47.00	09/14/2022	<0.93 U	<0.93 U	<0.93 U	<0.93 U	<0.93 U	<0.93 U
LBAD-NLF-MW-1009	LBNLF-MW1009	WELL	40.00-40.00	08/05/2022	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U	<0.88 U
LBAD-NLF-MW-1135	LBNLF-MW1135	WELL	30.00-30.00	08/05/2022	<0.84 U	<0.84 U	<0.84 U	R	<0.84 U	<0.84 UJ
LBAD-NLF-MW-23	LBNLF-MW23	WELL	50.00-50.00	08/06/2022	<0.87 U	<0.87 U	<0.87 U	<0.87 U	<0.87 U	<0.87 U
LBAD-NLF-MW-43i	LBNLF-MW43i	WELL	13.00-13.00	08/05/2022	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-NLF-MW-58	LBNLF-MW58	WELL	70.00-70.00	08/06/2022	<0.84 U	<0.84 U	<0.84 U	<0.84 U	<0.84 U	<0.84 U
	LBNLF-MW58FD	WELL	70.00-70.00	08/06/2022 (D)	<0.82 U	<0.82 U	<0.82 U	<0.82 U	<0.82 U	<0.82 U
LBAD-NLF-MW-67	LBNLF-MW67	WELL	18.00-18.00	08/08/2022	<0.88 U	<0.88 U	<0.88 U	<0.88 U	**1.4 J**	**1.5 J**
LBAD-NLF-MW-68	LBNLF-MW68	WELL	15.00-15.00	08/09/2022	<0.86 U	<0.86 U	<0.86 U	<0.86 U	**1.4 J**	**1.2 J**
LBAD-NLF-MW-72	LBNLF-MW72	WELL	15.00-15.00	08/06/2022	<0.86 U	<0.86 U	<0.86 U	<0.86 U	<0.86 U	<0.86 U
Surface Water				**Units**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
				Screening Levels	**6**	**601**	**39**	**6**	**6**	**4**
LBAD-ISL-06	LBISL06-SW01	SWTR	0.00-0.00	08/06/2022	<0.86 U	**180**	**7.9**	**2.4**	**34**	**4.4**
LBAD-IWL-03	LBIWL03-SW01	SWTR	0.00-0.00	08/06/2022	<0.86 U	**140**	**15**	**3**	**33**	**11**
LBAD-NLF-04	LBNLF04-SW01	SWTR	0.00-0.00	08/03/2022	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U	<0.89 U
LBAD-NLF-05	LBNLF05-SW01	SWTR	0.00-0.00	08/05/2022	<0.86 U	**16**	<0.86 U	<0.86 U	**1.2 J**	<0.86 U
	LBNLF05-SW01FD	SWTR	0.00-0.00	08/05/2022 (D)	<0.86 U	**17**	<0.86 U	<0.86 U	**1.1 J**	<0.86 U
Sediment				**Units**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
				Screening Levels	**23**	**1900**	**130**	**19**	**19**	**13**
LBAD-ISL-06	LBISL06-SD01	SEDI	0.00-0.50	08/06/2022	0.094 U	0.094 U	0.094 U	**0.24**	**0.84**	**0.26**
LBAD-IWL-03	LBIWL03-SD01	SEDI	0.00-0.50	08/06/2022	0.051 U	**0.12**	**0.053 J**	**0.23**	**0.76**	**0.94**
LBAD-NLF-04	LBNLF04-SD01	SEDI	0.00-0.50	08/03/2022	0.053 U	0.053 U	0.053 U	0.053 U	0.053 U	0.053 U
LBAD-NLF-05	LBNLF05-SD01	SEDI	0.00-0.50	08/05/2022	0.062 U	0.062 U	0.062 U	**0.068 J**	0.062 U	0.062 U
	LBNLF05-SD01FD	SEDI	0.00-0.50 (D)	08/05/2022	0.049 U	0.049 U	0.049 U	**0.082 J**	**0.061 J**	**0.062 J**
LBAD-NLF-06	LBNLF06-SD01	SEDI	0.00-0.50	08/03/2022	0.081 U	0.081 U	0.081 U	**0.11 J**	**0.13 J**	**0.18**

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.
J+ = The analyte was positively identified; the result is an estimated concentration and may be biased high.
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.
R = After consultation with the Project Decision Team, the analyte result was rejected due to serious deficiencies in the ability to analyze the sample and/or meet QC criteria. The presence or absence of the analyte cannot be verified.

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 multi-media 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 soil, groundwater, surface water, and sediment sampling data for each AOPI and from other LBAD facility locations 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 and surface water that is known to be used, or could realistically be used in the future, as a source of drinking water and identified potential soil and sediment exposure pathways. All AOPIs were sampled during the SI at LBAD to further evaluate PFAS-related releases and identify the presence or absence of Target PFAS.

Target PFAS were detected in eight of the nine AOPIs in soil, groundwater, surface water, and/or sediment; however, Target PFAS exceeded the SLs at only three of the AOPIs: the Industrial and Sanitary Waste Landfill, Building 105 Fire Distribution Testing Area, and Building 30 Former Fire Station. HFPO-DA was not detected in any samples.

Target PFAS were detected in samples collected from 20 of 39 total locations sampled for groundwater, including detections at 8 of the 9 AOPIs and in supplemental groundwater samples collected from interior wells between AOPIs and along the LBAD facility boundary. PFOS, PFOA, and/or PFNA concentrations exceeded the SLs at 10 monitoring wells, including wells located at 3 AOPIs, 1 interior well between AOPIs, and 4 wells along the southern boundary of LBAD.

Target PFAS were detected in surface and subsurface soil samples collected at four of the nine AOPIs, although no concentrations were greater than the SLs.

Target PFAS were detected in samples from three of four surface water locations and four of five sediment locations. PFOS and PFOA concentrations exceeded the SLs in two surface water samples collected from the primary surface water drainage conveyance along the western boundary of LBAD. Concentrations detected in sediment did not exceed the SLs.

The CSMs were updated for each AOPI where Target PFAS were detected. 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. The soil exposure pathway for onsite workers is potentially complete at five AOPIs where Target PFAS were detected in soil or exceeded the SLs in groundwater, as the SL exceedances in groundwater could indicate a source in soil that has not been identified.

There is currently a groundwater use restriction that applies to the entire LBAD. However, because the restriction is not specific to PFAS, the onsite groundwater exposure pathway is considered potentially complete for the duration of the groundwater use restriction at the six AOPIs where Target PFAS concentrations exceeded the SL or were detected at concentrations greater than the LOD. The groundwater exposure pathway for offsite residents is potentially complete for AOPIs in which Target PFAS were detected in groundwater due to the potential for migration to offsite groundwater wells within 1 mile of LBAD.

The exposure pathway for onsite surface water and sediment is complete at one AOPI where Target PFAS in surface water exceeded SLs and potentially complete at one additional AOPI where Target PFAS were detected in surface water and sediment. Potentially complete pathways from surface water and sediment to offsite receptors exist where Target PFAS were detected in onsite surface water or sediment. Exposure pathways for offsite receptors for surface water and sediment are also potentially complete where Target PFAS concentrations exceeded SLs in groundwater, as evidence supports potential connectivity and migration from groundwater to surface water through seeps and springs.

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. The following three AOPIs are recommended for further investigation or evaluation:

- Industrial and Sanitary Waste Landfill
- Building 105 Fire Distribution Testing Area
- Building 30 Former Fire Station.

In addition, as Target PFAS were detected at concentrations above the SLs in groundwater, surface water, and sediment samples collected at or near the LBAD facility boundary, and exposure pathways for offsite groundwater and surface water are potentially complete, further investigation of the potential for offsite migration of PFAS from LBAD is recommended.

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	Soil	Surface Water	Sediment	
New Landfill	Detected	–	Detected	Detected	SLs not exceeded; further investigation not recommended at this time
Industrial and Sanitary Waste Landfill	Exceeds SL	–	Exceeds SL	Detected	SLs exceeded in groundwater and surface water; further investigation recommended
Fire Training Area	ND	Detected	–	–	SLs not exceeded; further investigation not recommended at this time
IWTP Drying Beds	ND	ND	–	–	Target PFAS not detected above LODs; further investigation not recommended at this time
Building 126 IWTP and Building 135 Plating Operations	Detected	ND	–	–	SLs not exceeded; further investigation not recommended at this time
Building 105 Fire Distribution Testing Area	Exceeds SL	ND	–	–	SLs exceeded in groundwater; further investigation recommended

Table 7-1. Summary of PFAS Detected and Recommendations (Continued)

AOPI	Detection of HFPO-DA, PFBS, PFHxS, PFNA, PFOS, and/or PFOA				Recommendation and Rationale
	Groundwater	Soil	Surface Water	Sediment	
Building 30 Former Fire Station	Exceeds SL	Detected	–	–	SLs exceeded in groundwater; further investigation recommended
Industrial Waste Lagoons	Detected	Detected	–	–	SLs not exceeded; further investigation not recommended at this time
Building H Plating Operations	ND	Detected	–	–	SLs not exceeded; further investigation not recommended at this time
Further investigation is also recommended to evaluate the potential for offsite PFAS migration based on SL exceedances in groundwater and surface water along the western and southern boundaries of LBAD.					

– Not Collected
ND = Not Detected

8. REFERENCES

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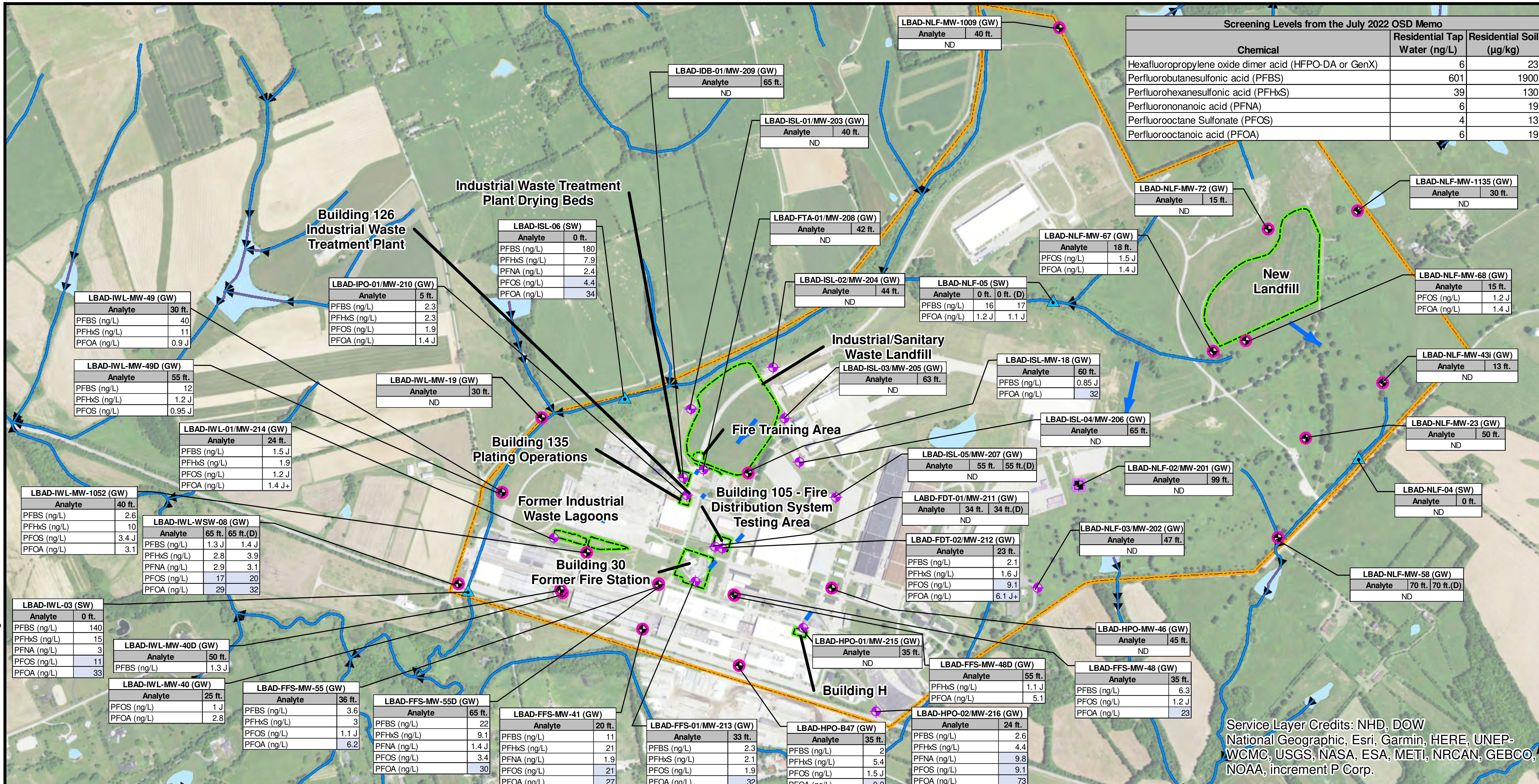
FIGURES



Screening Levels from the July 2022 OSD Memo

Chemical	Residential Tap Water (ng/L)	Residential Soil (µg/kg)
Hexafluoropropylene oxide dimer acid (HFPO-DA or GenX)	6	23
Perfluorobutanesulfonic acid (PFBS)	601	1900
Perfluorohexanesulfonic acid (PFHxS)	39	130
Perfluorononanoic acid (PFNA)	6	19
Perfluorooctane Sulfonate (PFOS)	4	13
Perfluorooctanoic acid (PFOA)	6	19

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure ES-1 GW and SW Results.mxd

Legend

- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Monitoring Well (15)
- Surface Water/Sediment (4)
- Sample Existing Well (23)
- Temporary Well (1)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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

0 200 400 800 1,200 1,600 Feet
SCALE: 1 " = 1,000 '

KY STATE PLANE NORTH (NAD83)

US Army Corps of Engineers

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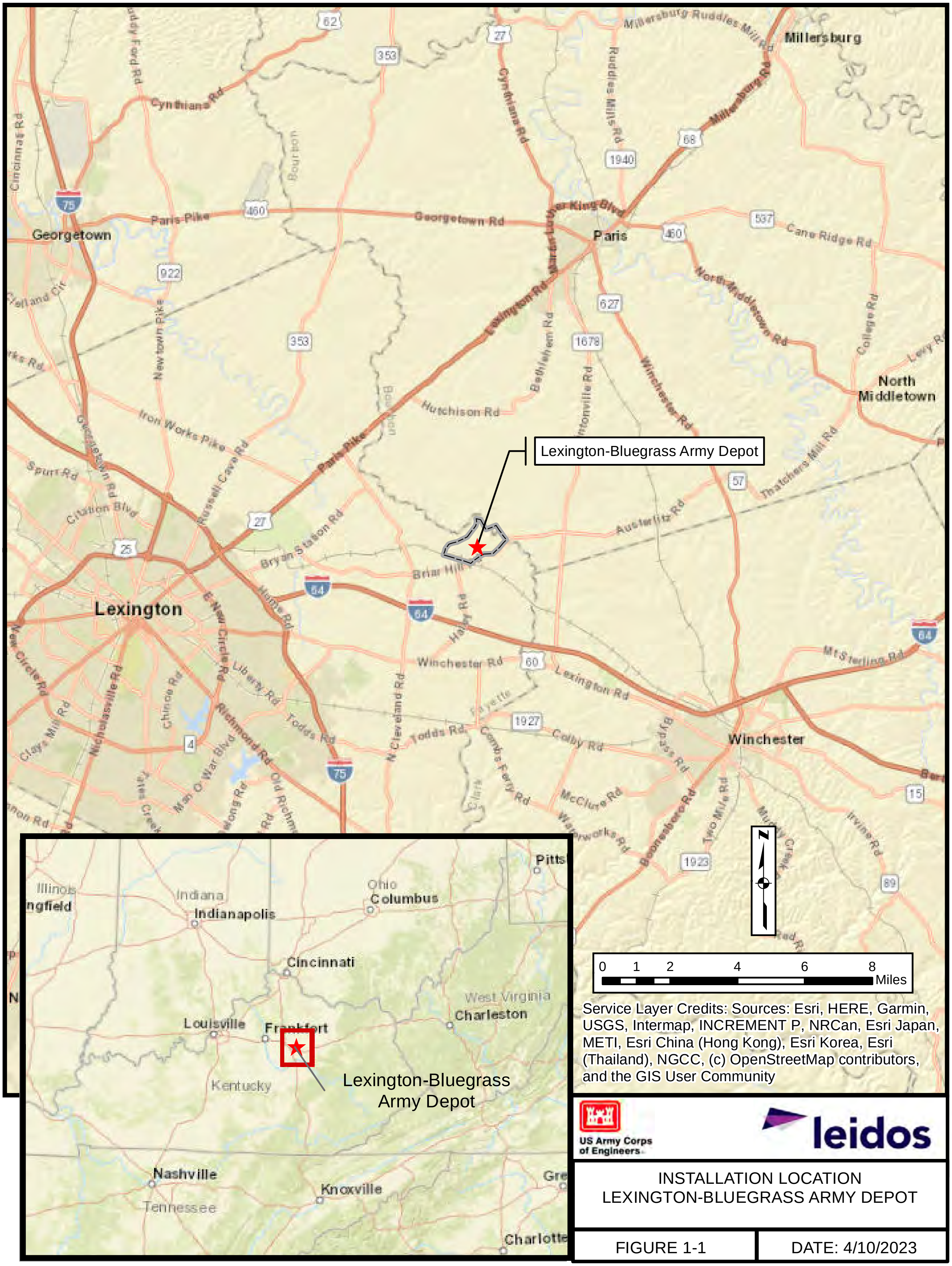
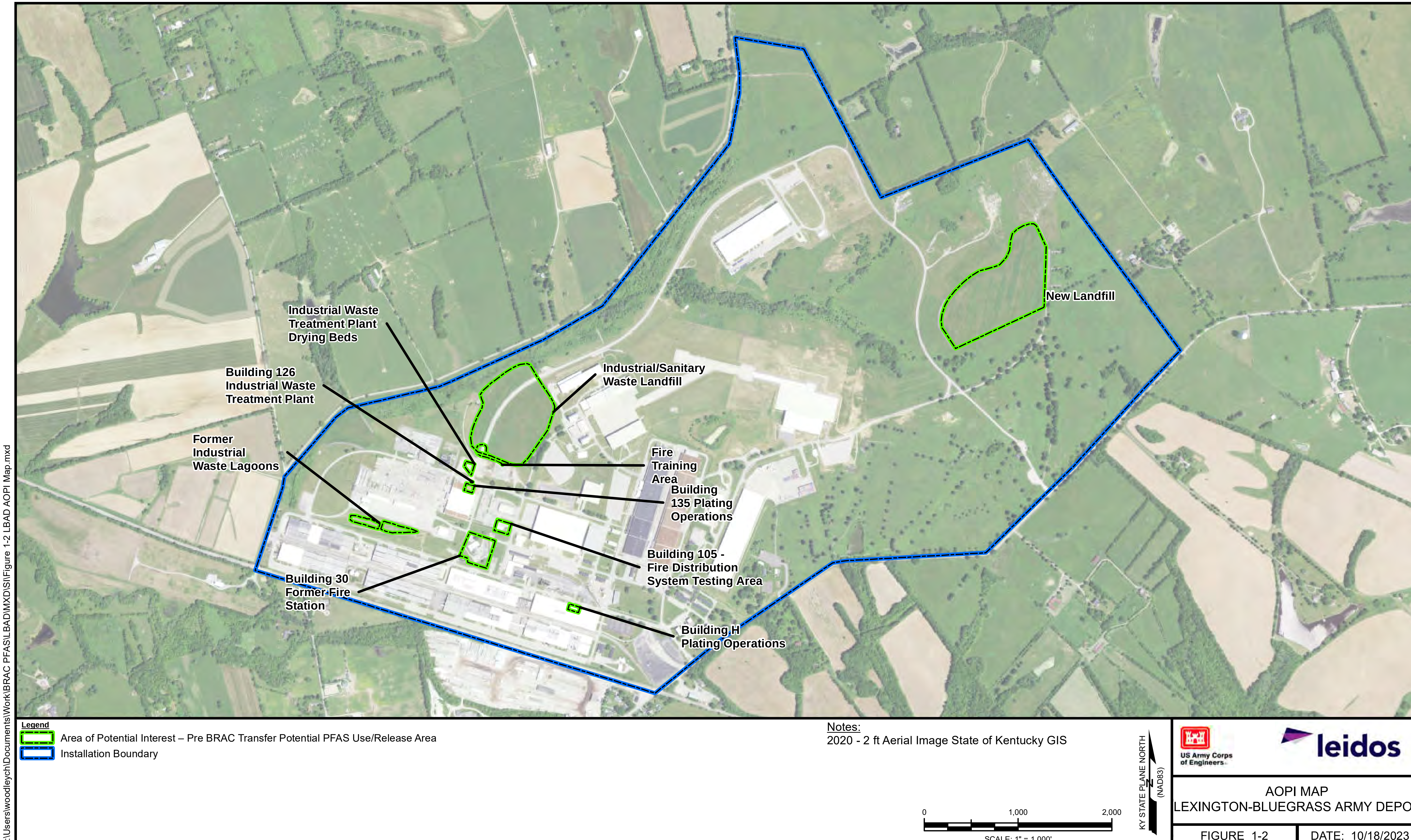
LBAD FACILITY-WIDE GROUNDWATER AND SURFACE WATER RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE ES-1 DATE: 4/11/2023



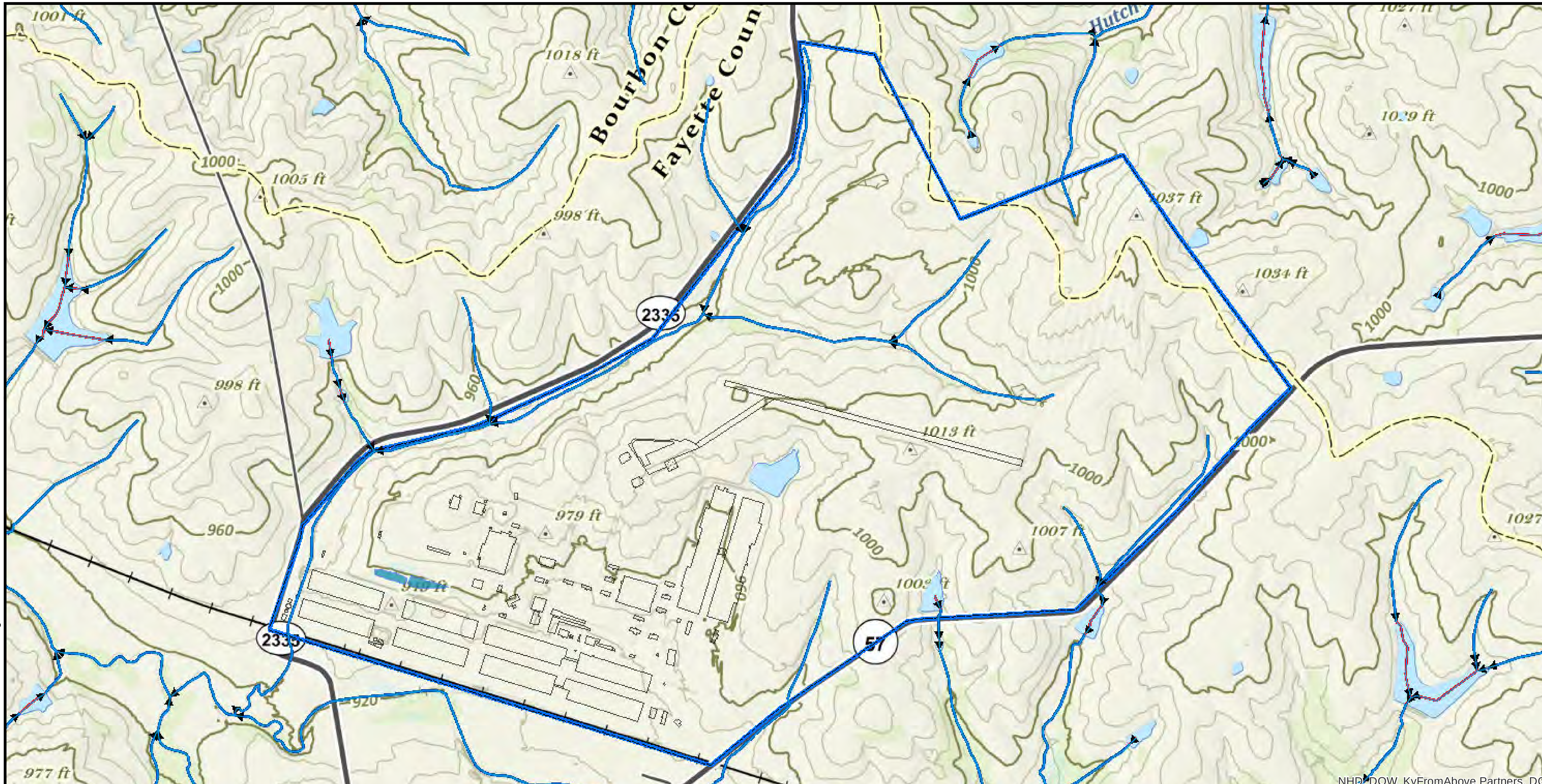
INSTALLATION LOCATION
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 1-1 | DATE: 4/10/2023



AOPI MAP
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 1-2 DATE: 10/18/2023



Legend

Historic Site Features

- Lagoons
- Lake
- Building
- Former Helipad
- Former Runway
- Installation Boundary

Notes:
Historic site features circa 1993
Kentucky Topographic Map Series 7/25/2021

0 1,000 2,000
SCALE: 1" = 1,000'

KY STATE PLANE NORTH (NAD83)

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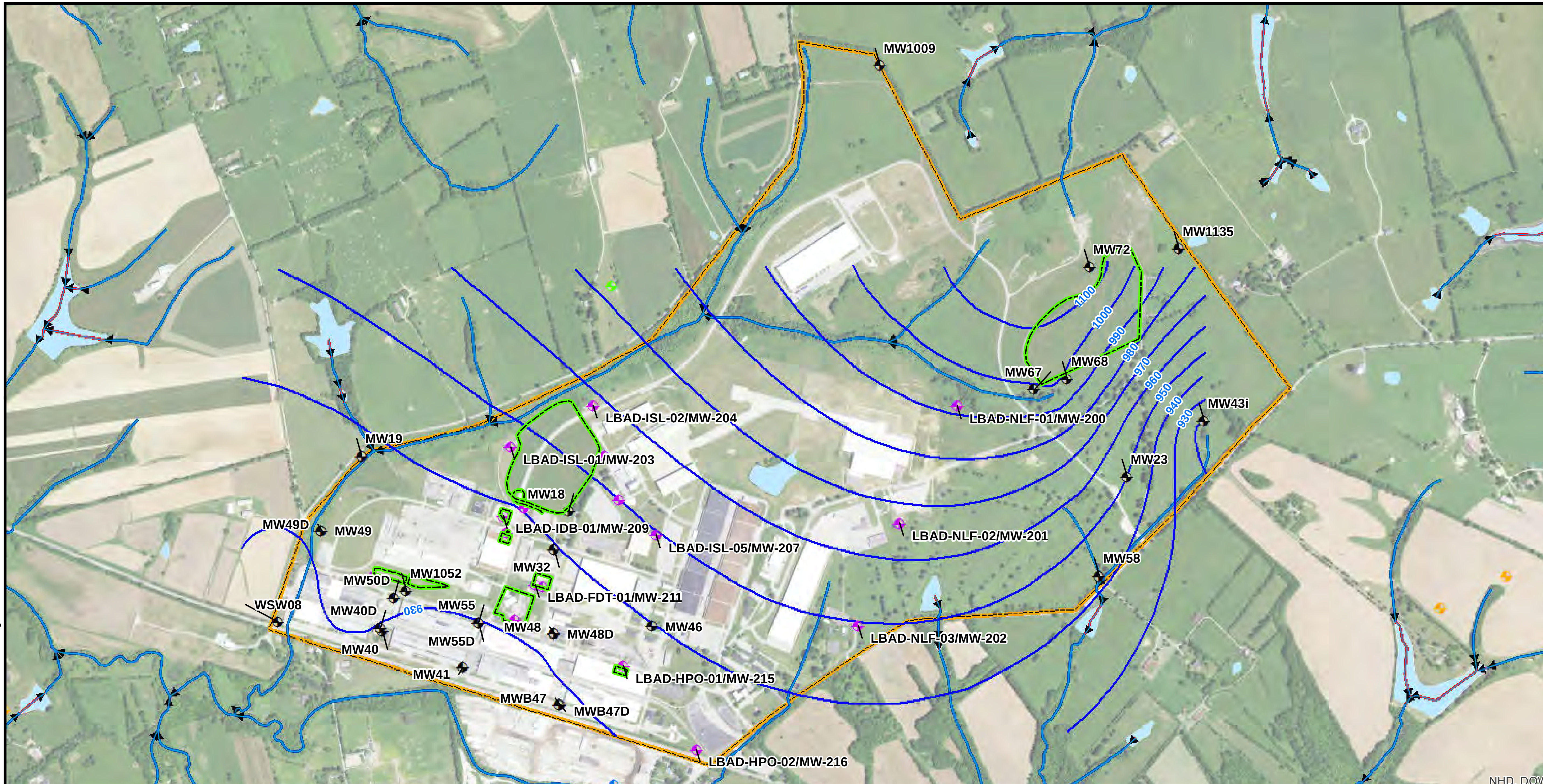
SITE FEATURES
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 2-1 | DATE: 4/11/2023

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 2-1 LBAD Site Features.mxd



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Legend

- Monitoring Well
- Existing Monitoring Well
- AGRICULTURE - IRRIGATION OR LIVESTOCK
- COMMERCIAL OR INDUSTRIAL
- DOMESTIC
- Potentiometric Surface
- Installation Boundary
- Area of Potential Interest

Notes:

Potentiometric data from the Long-Term Monitoring and Landfill Inspection Report Round 14 – August 2020, SERES Engineering Services, LLC, February 2021

KY STATE PLANE NORTH (NAD83)

0 1,000 2,000

SCALE: 1" = 1,000'

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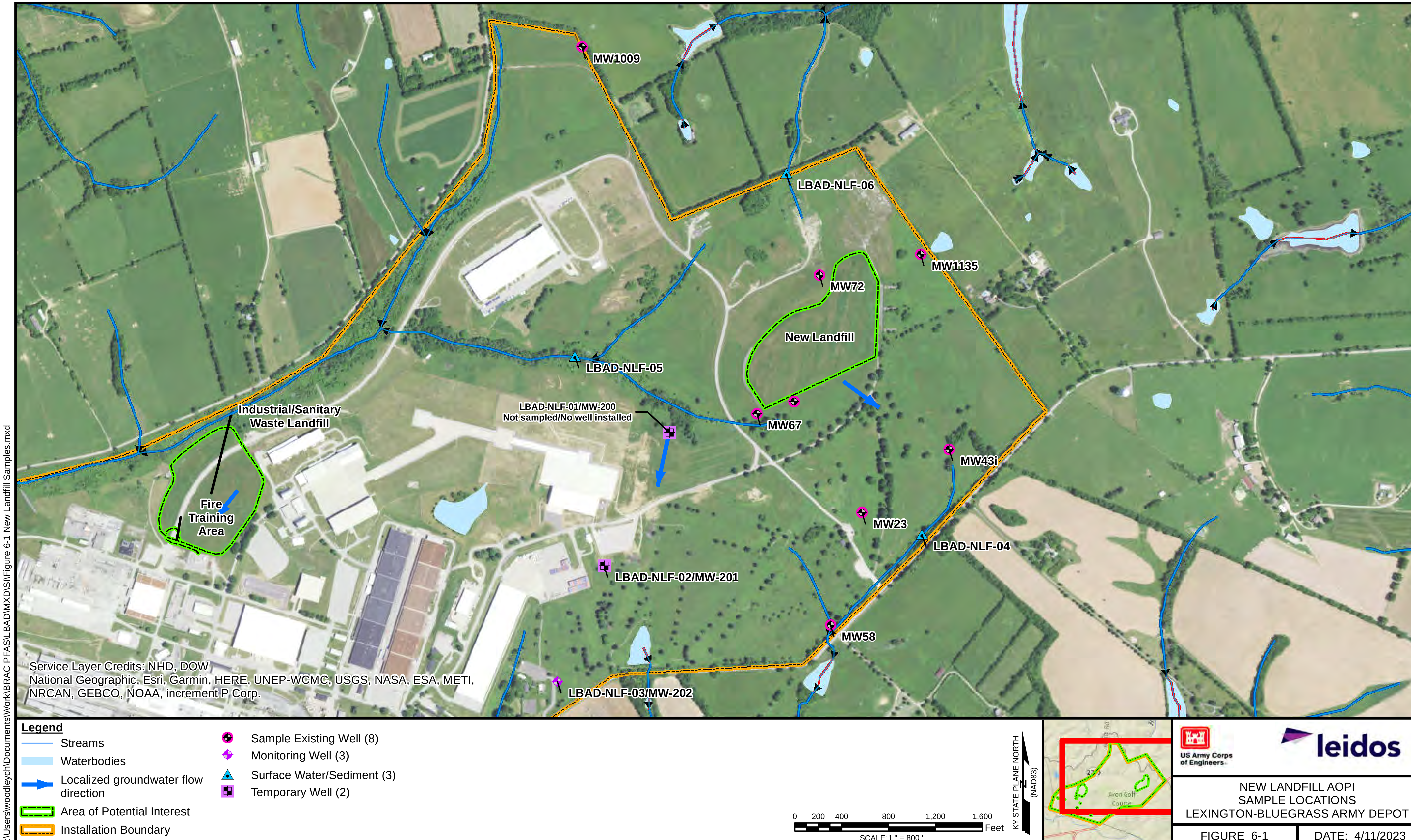
GROUNDWATER FLOW
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 2-2 | DATE: 4/11/2023



MW1009
LBAD-NLF-06
MW1135
MW72
New Landfill
LBAD-NLF-05
Industrial/Sanitary Waste Landfill
LBAD-NLF-01/MW-200
Not sampled/No well installed
MW67
MW43i
Fire Training Area
MW23
LBAD-NLF-04
LBAD-NLF-02/MW-201
MW58
LBAD-NLF-03/MW-202
Service Layer Credits: NHD, DOW
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-1 New Landfill Samples.mxd
Legend
Streams
Waterbodies
Localized groundwater flow direction
Area of Potential Interest
Installation Boundary
Sample Existing Well (8)
Monitoring Well (3)
Surface Water/Sediment (3)
Temporary Well (2)
0 200 400 800 1,200 1,600 Feet
SCALE: 1 " = 800 '
KY STATE PLANE NORTH (NAD83)
N
US Army Corps of Engineers
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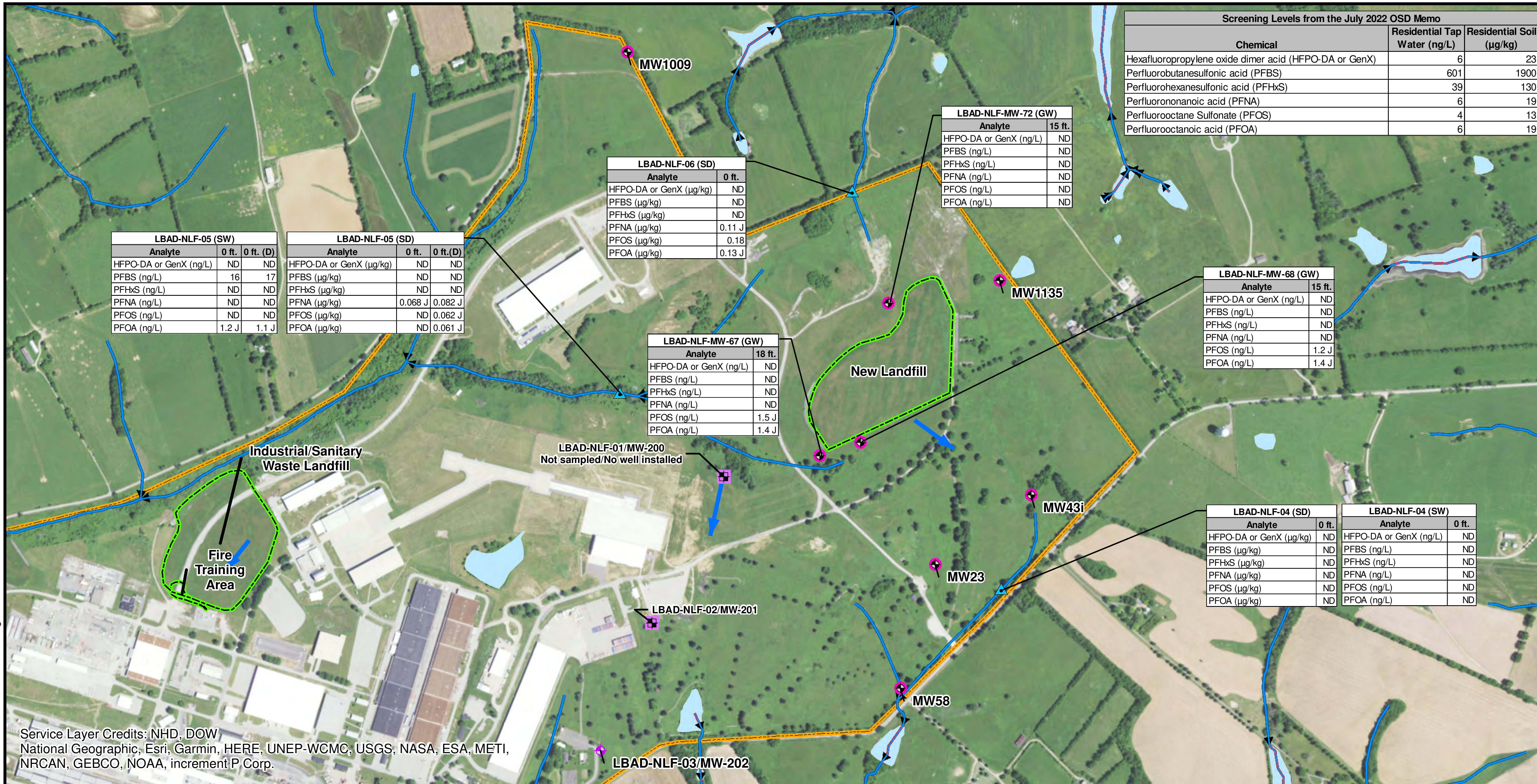
NEW LANDFILL AOPI
SAMPLE LOCATIONS
LEXINGTON-BLUEGRASS ARMY DEPOT
FIGURE 6-1
DATE: 4/11/2023



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

LBAD-NLF-05 (SW)		
Analyte	0 ft.	0 ft. (D)
HFPO-DA or GenX (ng/L)	ND	ND
PFBS (ng/L)	16	17
PFHxS (ng/L)	ND	ND
PFNA (ng/L)	ND	ND
PFOS (ng/L)	ND	ND
PFOA (ng/L)	1.2 J	1.1 J

LBAD-NLF-05 (SD)		
Analyte	0 ft.	0 ft.(D)
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	0.068 J	0.082 J
PFOS (µg/kg)	ND	0.062 J
PFOA (µg/kg)	ND	0.061 J

LBAD-NLF-06 (SD)	
Analyte	0 ft.
HFPO-DA or GenX (µg/kg)	ND
PFBS (µg/kg)	ND
PFHxS (µg/kg)	ND
PFNA (µg/kg)	0.11 J
PFOS (µg/kg)	0.18
PFOA (µg/kg)	0.13 J

LBAD-NLF-MW-72 (GW)	
Analyte	15 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

LBAD-NLF-MW-67 (GW)	
Analyte	18 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	1.5 J
PFOA (ng/L)	1.4 J

LBAD-NLF-MW-68 (GW)	
Analyte	15 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	1.2 J
PFOA (ng/L)	1.4 J

LBAD-NLF-04 (SD)	
Analyte	0 ft.
HFPO-DA or GenX (µg/kg)	ND
PFBS (µg/kg)	ND
PFHxS (µg/kg)	ND
PFNA (µg/kg)	ND
PFOS (µg/kg)	ND
PFOA (µg/kg)	ND

LBAD-NLF-04 (SW)	
Analyte	0 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

Legend

- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (8)
- Monitoring Well (3)
- Surface Water/Sediment (3)
- Temporary Well (2)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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

0 200 400 800 1,200 1,600 Feet
SCALE: 1 " = 800 '

KY STATE PLANE NORTH (NAD83)

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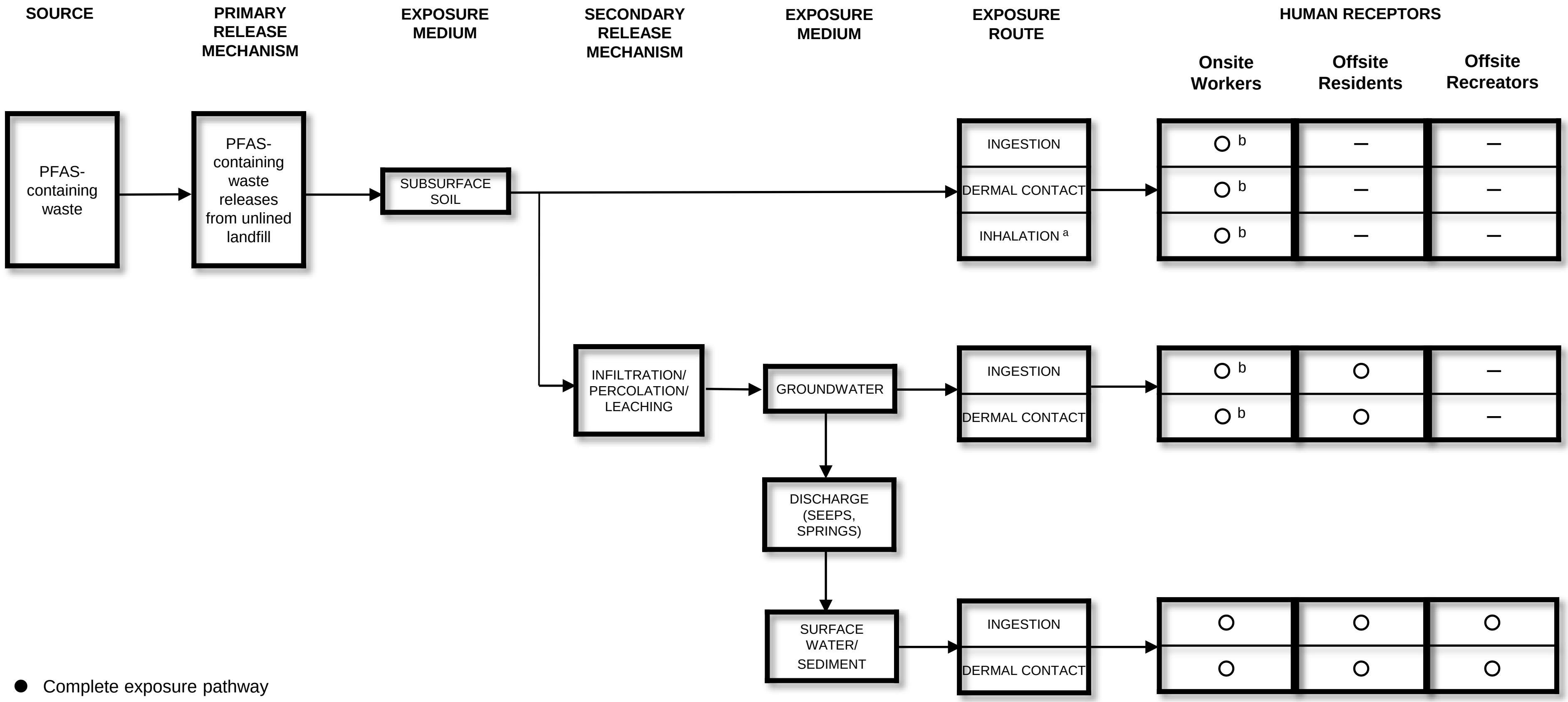
NEW LANDFILL AOPI
SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-2 DATE: 4/11/2023



● Complete exposure pathway

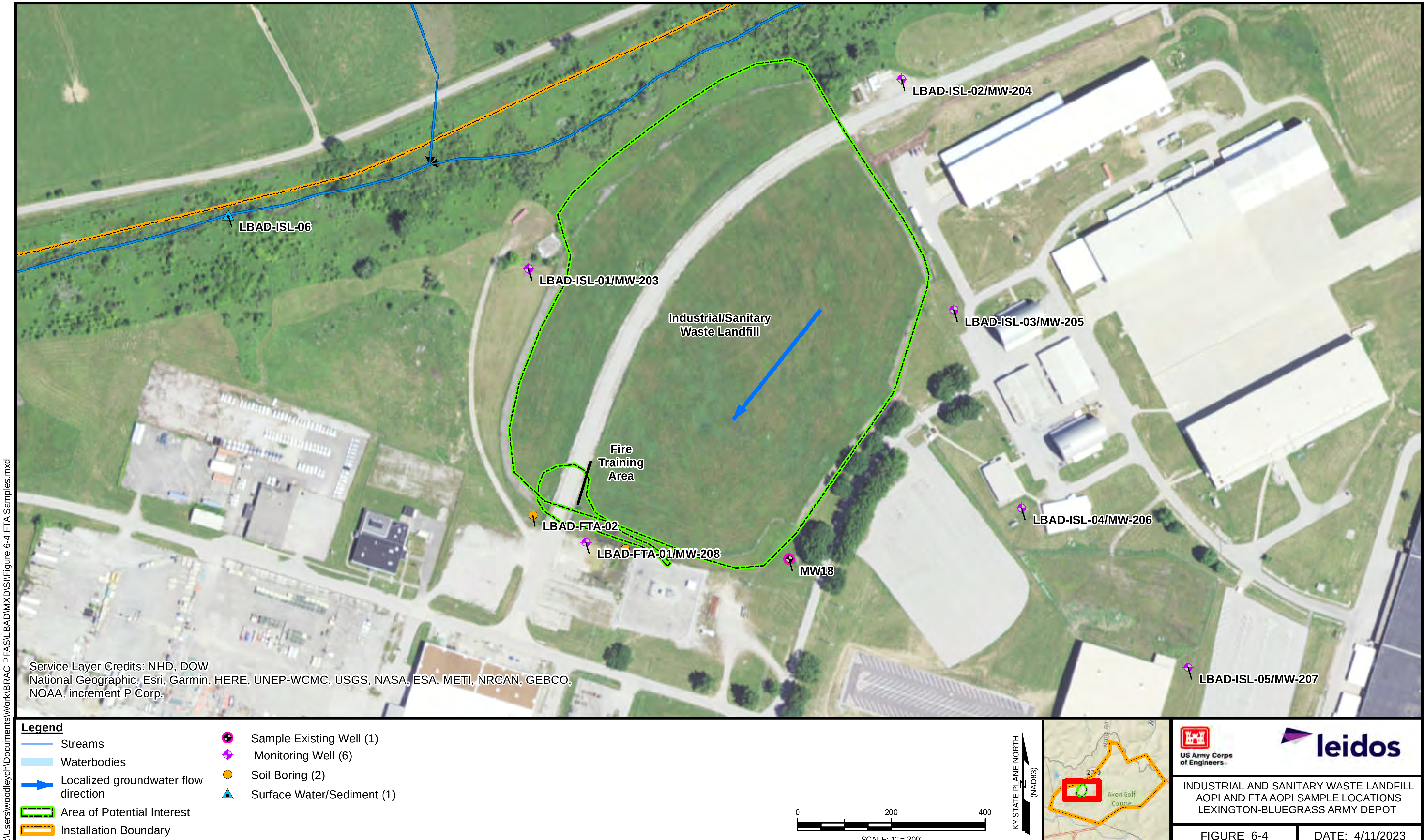
○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

[b] Land use controls, including restrictions on cap and soil disturbance and groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-3. Human Health CSM for New Landfill AOPI



LBAD-ISL-02/MW-204
LBAD-ISL-06
LBAD-ISL-01/MW-203
Industrial/Sanitary Waste Landfill
LBAD-ISL-03/MW-205
Fire Training Area
LBAD-FTA-02
LBAD-FTA-01/MW-208
MW18
LBAD-ISL-04/MW-206
LBAD-ISL-05/MW-207
Service Layer Credits: NHD, DOW
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-4 FTA Samples.mxd
Legend
Streams
Waterbodies
Localized groundwater flow direction
Area of Potential Interest
Installation Boundary
Sample Existing Well (1)
Monitoring Well (6)
Soil Boring (2)
Surface Water/Sediment (1)
0
200
400
SCALE: 1" = 200'
KY STATE PLANE NORTH (NAD83)
N
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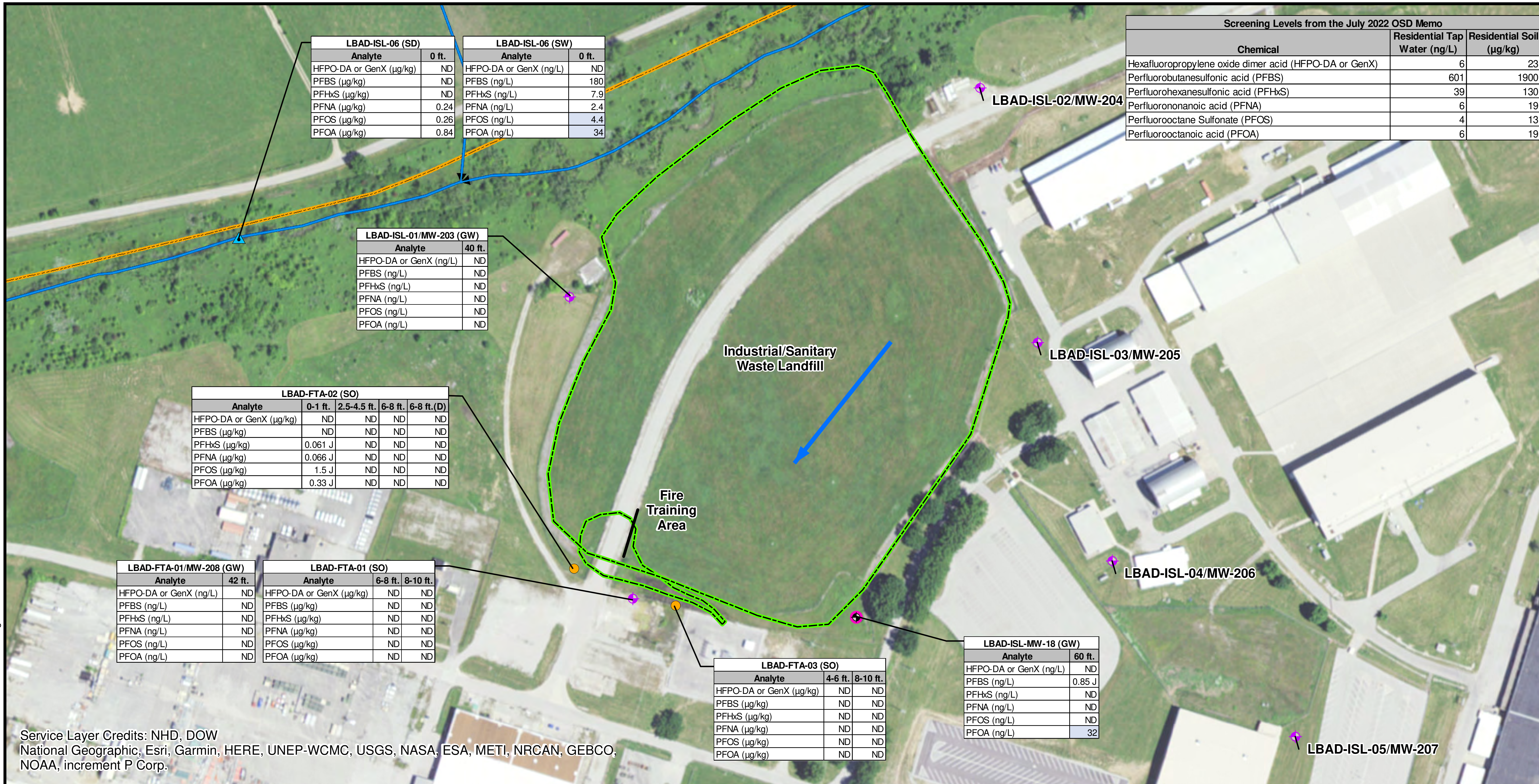
INDUSTRIAL AND SANITARY WASTE LANDFILL AOPI AND FTA AOPI SAMPLE LOCATIONS LEXINGTON-BLUEGRASS ARMY DEPOT
FIGURE 6-4
DATE: 4/11/2023



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

LBAD-ISL-06 (SD)	
Analyte	0 ft.
HFPO-DA or GenX (µg/kg)	ND
PFBS (µg/kg)	ND
PFHxS (µg/kg)	ND
PFNA (µg/kg)	0.24
PFOS (µg/kg)	0.26
PFOA (µg/kg)	0.84

LBAD-ISL-06 (SW)	
Analyte	0 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	180
PFHxS (ng/L)	7.9
PFNA (ng/L)	2.4
PFOS (ng/L)	4.4
PFOA (ng/L)	34

LBAD-ISL-01/MW-203 (GW)	
Analyte	40 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

LBAD-FTA-02 (SO)				
Analyte	0-1 ft.	2.5-4.5 ft.	6-8 ft.	6-8 ft.(D)
HFPO-DA or GenX (µg/kg)	ND	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND	ND
PFHxS (µg/kg)	0.061 J	ND	ND	ND
PFNA (µg/kg)	0.066 J	ND	ND	ND
PFOS (µg/kg)	1.5 J	ND	ND	ND
PFOA (µg/kg)	0.33 J	ND	ND	ND

LBAD-FTA-01/MW-208 (GW)	
Analyte	42 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

LBAD-FTA-01 (SO)		
Analyte	6-8 ft.	8-10 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	ND	ND
PFOS (µg/kg)	ND	ND
PFOA (µg/kg)	ND	ND

LBAD-FTA-03 (SO)		
Analyte	4-6 ft.	8-10 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	ND	ND
PFOS (µg/kg)	ND	ND
PFOA (µg/kg)	ND	ND

LBAD-ISL-MW-18 (GW)	
Analyte	60 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	0.85 J
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	32

Legend

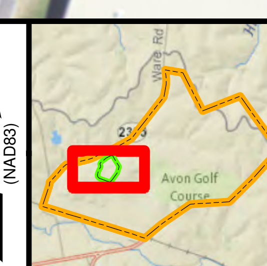
- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (1)
- Monitoring Well (6)
- Soil Boring (2)
- Surface Water/Sediment (1)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Values are the Residential Scenario Screening Levels calculated using 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 Value

0 200 400
SCALE: 1" = 200'

KY STATE PLANE NORTH (NAD83)



US Army Corps of Engineers

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INDUSTRIAL AND SANITARY WASTE LANDFILL AOPI AND FTA AOPI SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-5 | DATE: 4/11/2023

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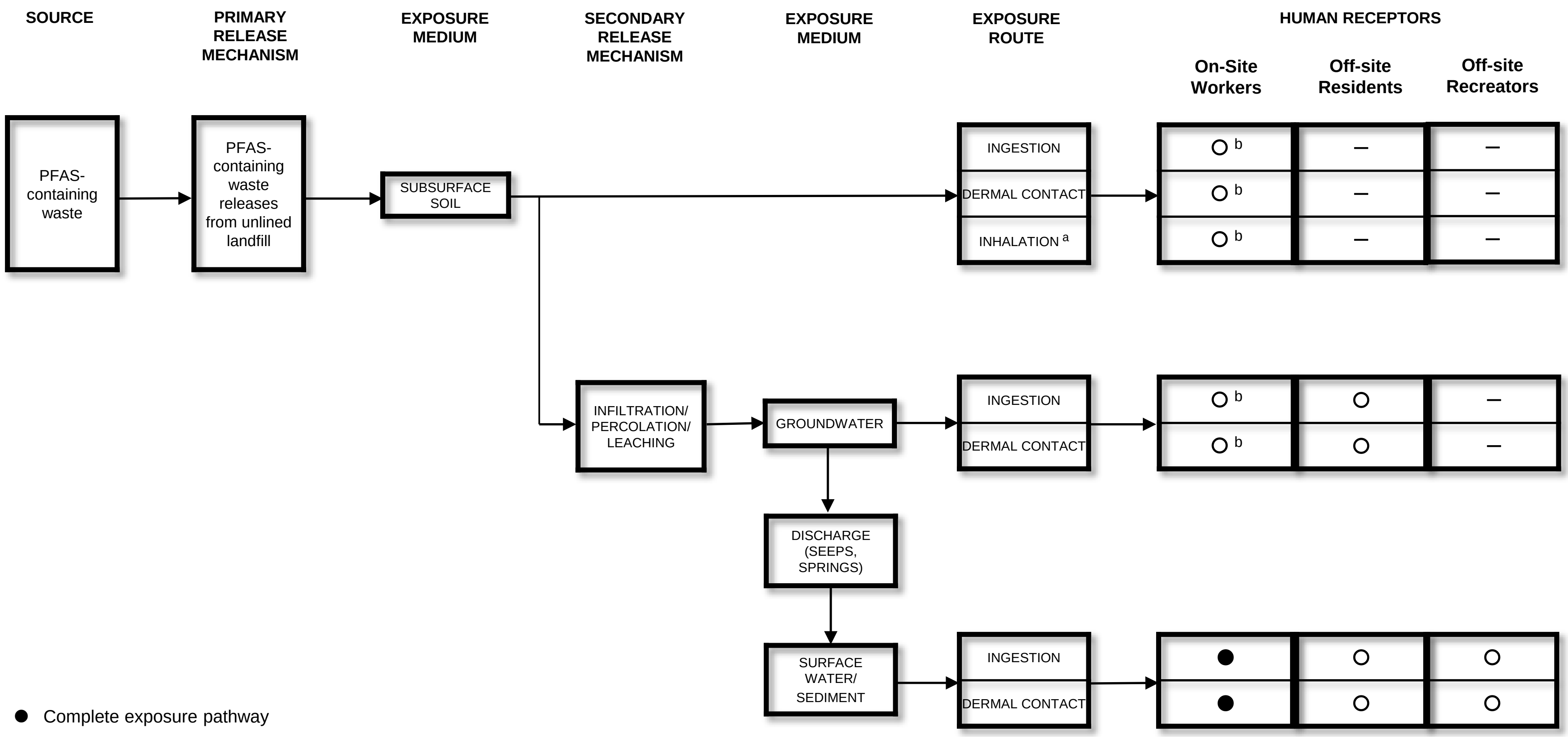


● Complete exposure pathway

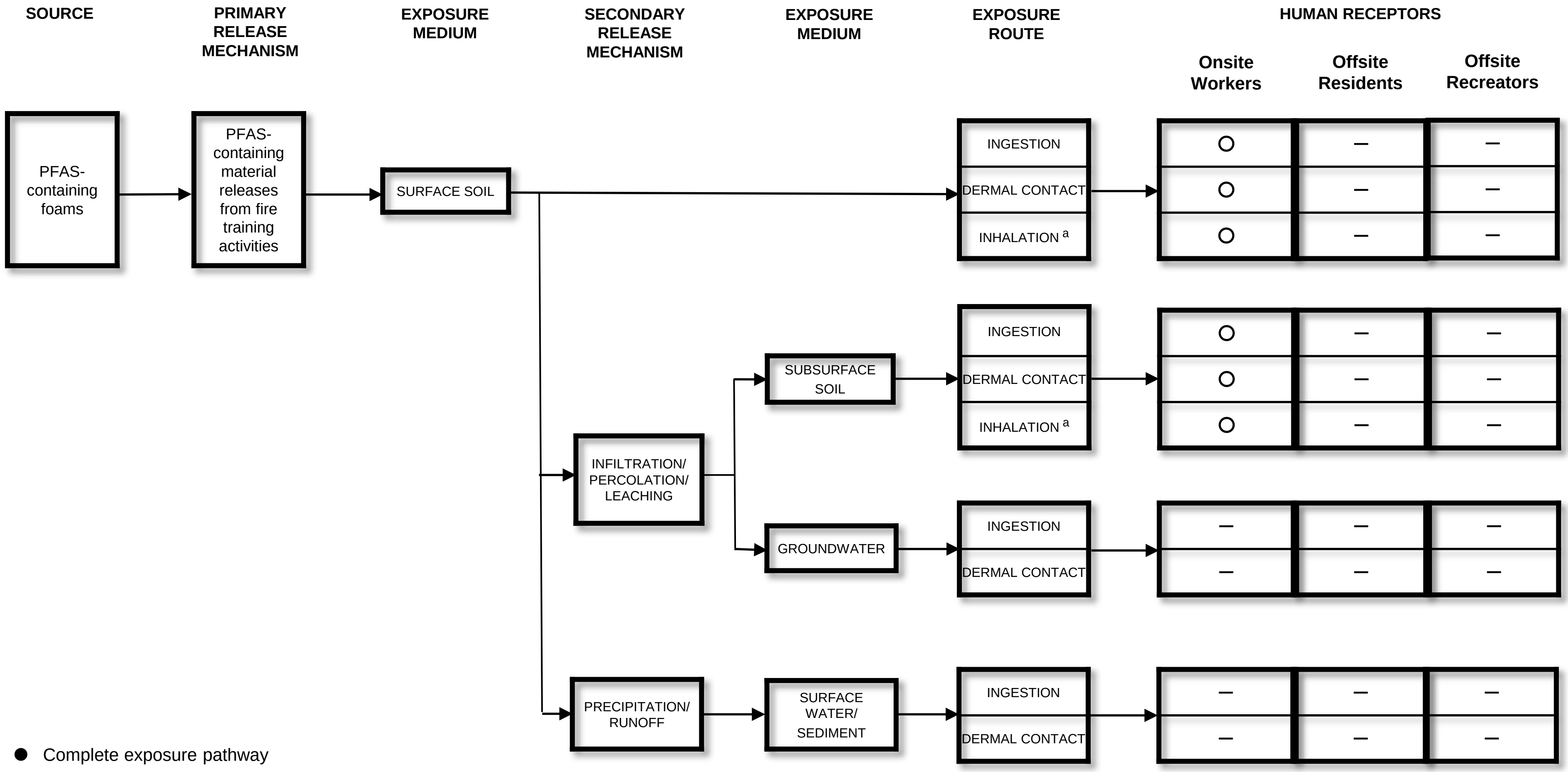
○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

[b] Land use controls, including restrictions on cap and soil disturbance and groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-6. Human Health CSM for Industrial and Sanitary Waste Landfill AOPI



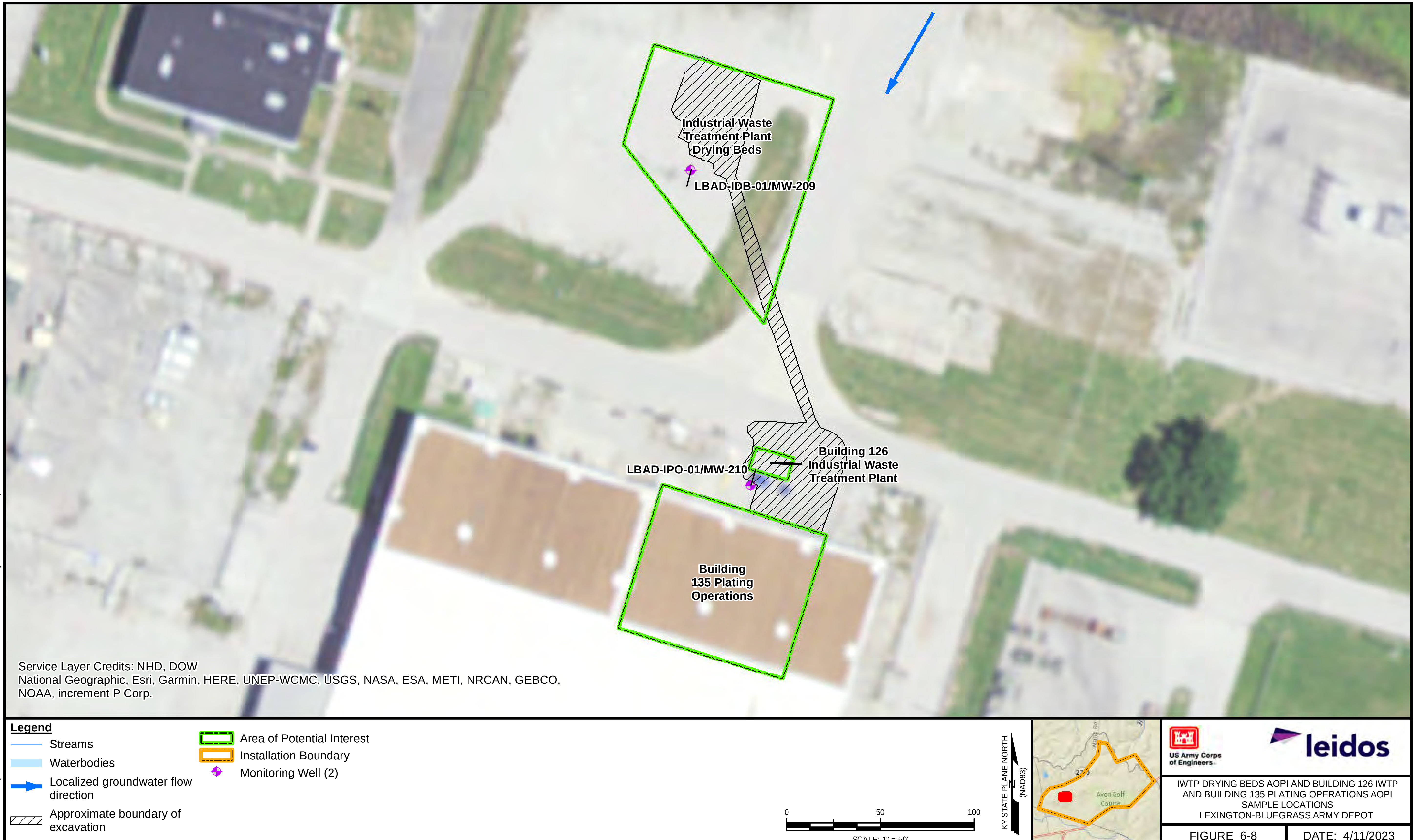
● Complete exposure pathway

○ Potentially complete exposure pathway

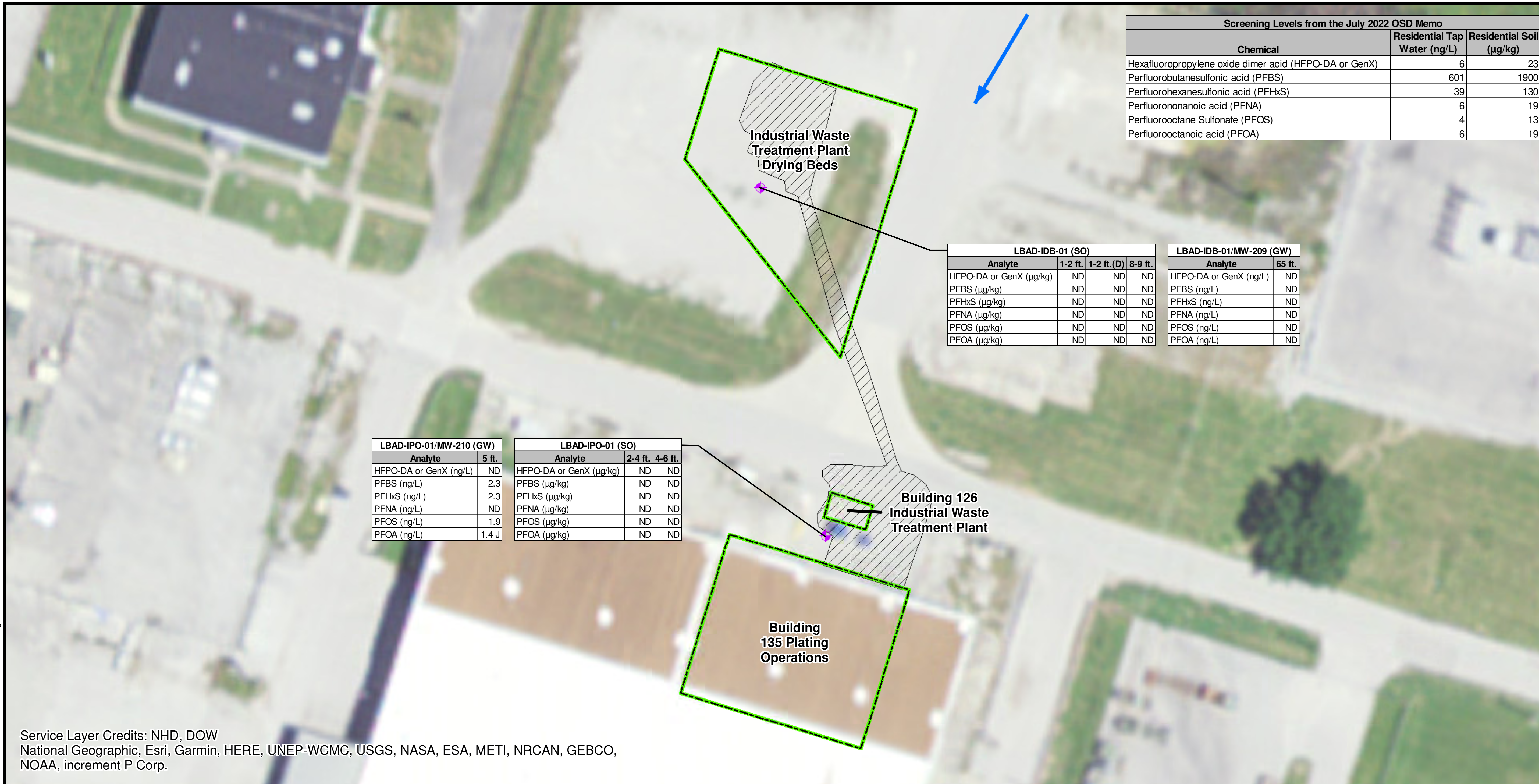
— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

Figure 6-7. Human Health CSM for FTA AOPI



C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-8 IPO Samples.mxd



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

LBAD-IDB-01 (SO)			
Analyte	1-2 ft.	1-2 ft.(D)	8-9 ft.
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND
PFHxS (µg/kg)	ND	ND	ND
PFNA (µg/kg)	ND	ND	ND
PFOS (µg/kg)	ND	ND	ND
PFOA (µg/kg)	ND	ND	ND

LBAD-IDB-01/MW-209 (GW)	
Analyte	65 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

LBAD-IPO-01/MW-210 (GW)	
Analyte	5 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	2.3
PFHxS (ng/L)	2.3
PFNA (ng/L)	ND
PFOS (ng/L)	1.9
PFOA (ng/L)	1.4 J

LBAD-IPO-01 (SO)		
Analyte	2-4 ft.	4-6 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	ND	ND
PFOS (µg/kg)	ND	ND
PFOA (µg/kg)	ND	ND

Legend

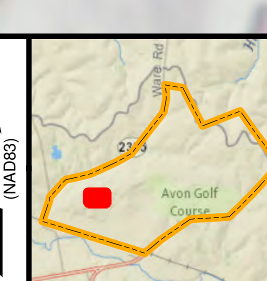
- Streams
- Waterbodies
- Localized groundwater flow direction
- Approximate boundary of excavation
- Area of Potential Interest
- Installation Boundary
- Monitoring Well (2)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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 Value

0 50 100
SCALE: 1" = 50'

KY STATE PLANE NORTH (NAD83)
N



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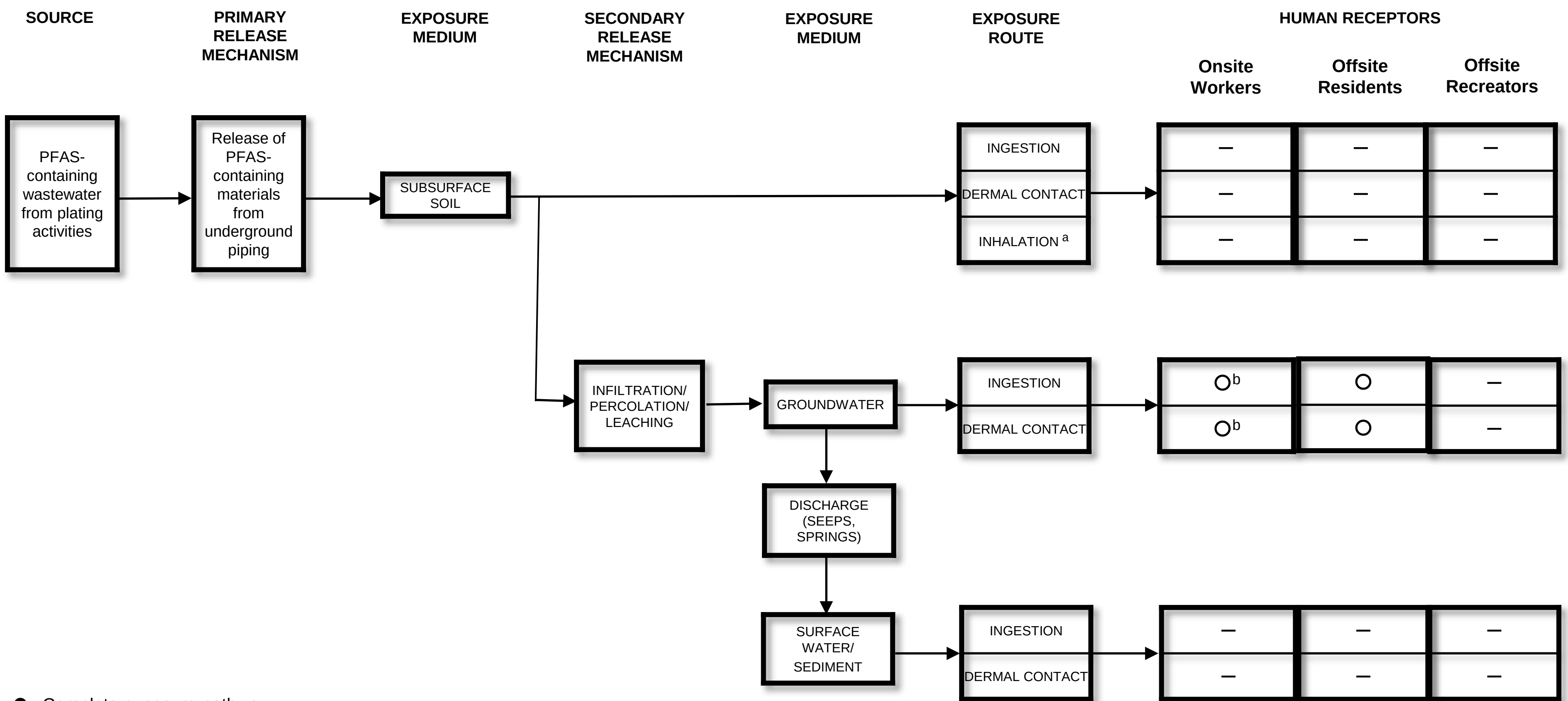
IWTP DRYING BEDS AOPI AND BUILDING 126 IWTP AND BUILDING 135 PLATING OPERATIONS AOPI SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-9 | DATE: 4/11/2023

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-9 IPO Results.mxd



● Complete exposure pathway

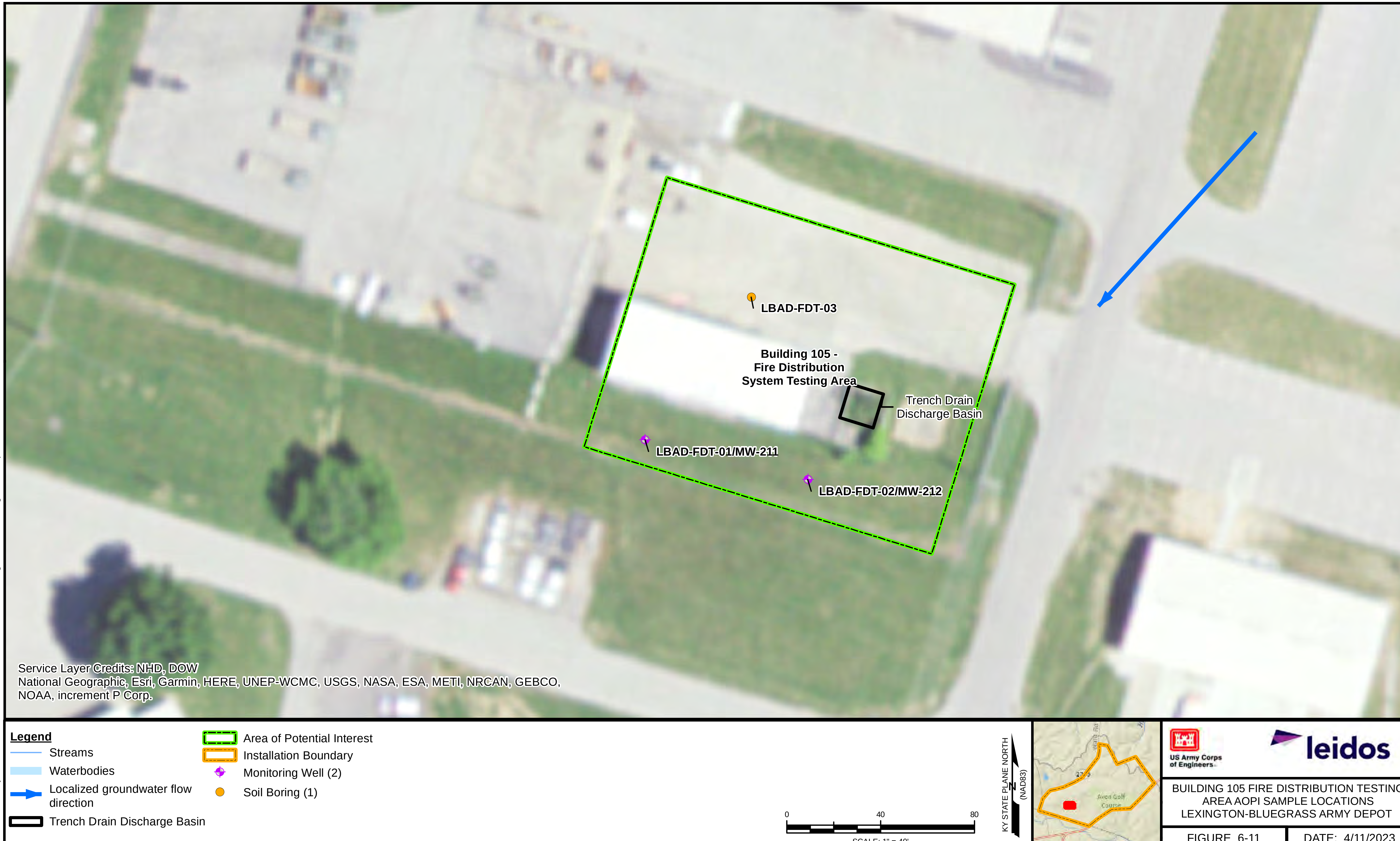
○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

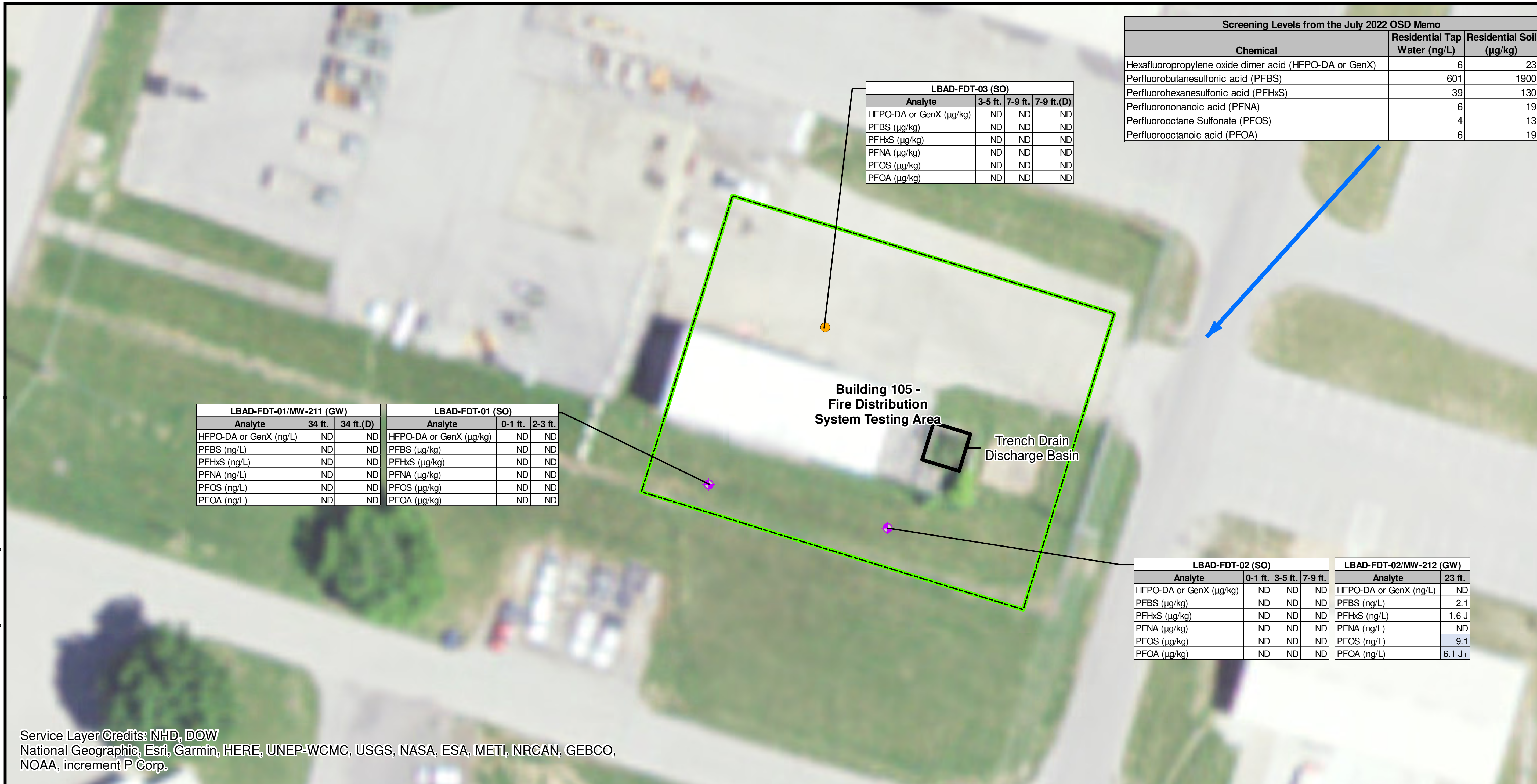
[b] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-10. Human Health CSM for Building 126 IWTP and Building 135 Plating Operations AOPI



BUILDING 105 FIRE DISTRIBUTION TESTING AREA AOPI SAMPLE LOCATIONS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-11 | DATE: 4/11/2023



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

LBAD-FDT-03 (SO)			
Analyte	3-5 ft.	7-9 ft.	7-9 ft.(D)
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND
PFHxS (µg/kg)	ND	ND	ND
PFNA (µg/kg)	ND	ND	ND
PFOS (µg/kg)	ND	ND	ND
PFOA (µg/kg)	ND	ND	ND

LBAD-FDT-01/MW-211 (GW)		
Analyte	34 ft.	34 ft.(D)
HFPO-DA or GenX (ng/L)	ND	ND
PFBS (ng/L)	ND	ND
PFHxS (ng/L)	ND	ND
PFNA (ng/L)	ND	ND
PFOS (ng/L)	ND	ND
PFOA (ng/L)	ND	ND

LBAD-FDT-01 (SO)		
Analyte	0-1 ft.	2-3 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	ND	ND
PFOS (µg/kg)	ND	ND
PFOA (µg/kg)	ND	ND

LBAD-FDT-02 (SO)			
Analyte	0-1 ft.	3-5 ft.	7-9 ft.
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND
PFHxS (µg/kg)	ND	ND	ND
PFNA (µg/kg)	ND	ND	ND
PFOS (µg/kg)	ND	ND	ND
PFOA (µg/kg)	ND	ND	ND

LBAD-FDT-02/MW-212 (GW)	
Analyte	23 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	2.1
PFHxS (ng/L)	1.6 J
PFNA (ng/L)	ND
PFOS (ng/L)	9.1
PFOA (ng/L)	6.1 J+

Legend

- Streams
- Waterbodies
- Localized groundwater flow direction
- Trench Drain Discharge Basin
- Area of Potential Interest (1)
- Installation Boundary (1)
- Monitoring Well (2)
- Soil Boring (1)

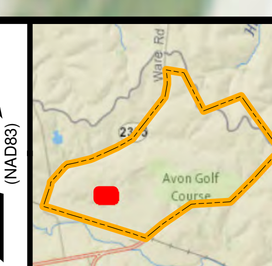
Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Limits are the Residential Scenario Screening Levels calculated using 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

0 40 80
SCALE: 1" = 40'

KY STATE PLANE NORTH (NAD83)

N



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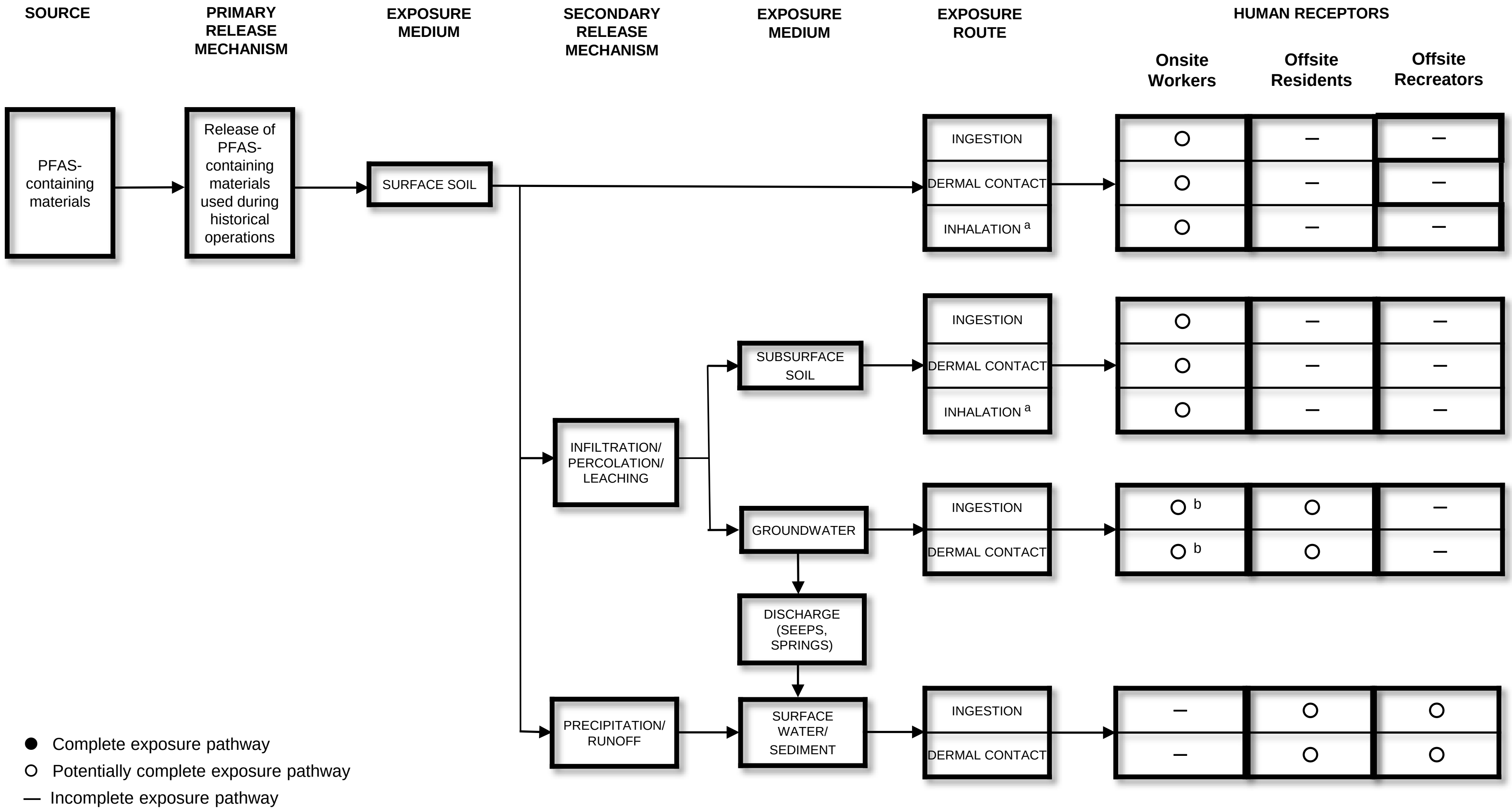
BUILDING 105 FIRE DISTRIBUTION TESTING AREA AOPI SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-12 | DATE: 4/11/2023

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-12 Building 105 Results.mxd



[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

[b] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-13. Human Health CSM for Building 105 Fire Distribution Testing Area AOPI

Legend

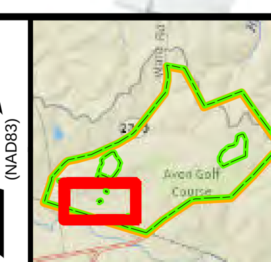
- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (5)
- Monitoring Well (1)
- Soil Boring (2)

0 50 100 200 300 400 Feet

SCALE: 1 " = 200 '

KY STATE PLANE NORTH (NAD83)

N



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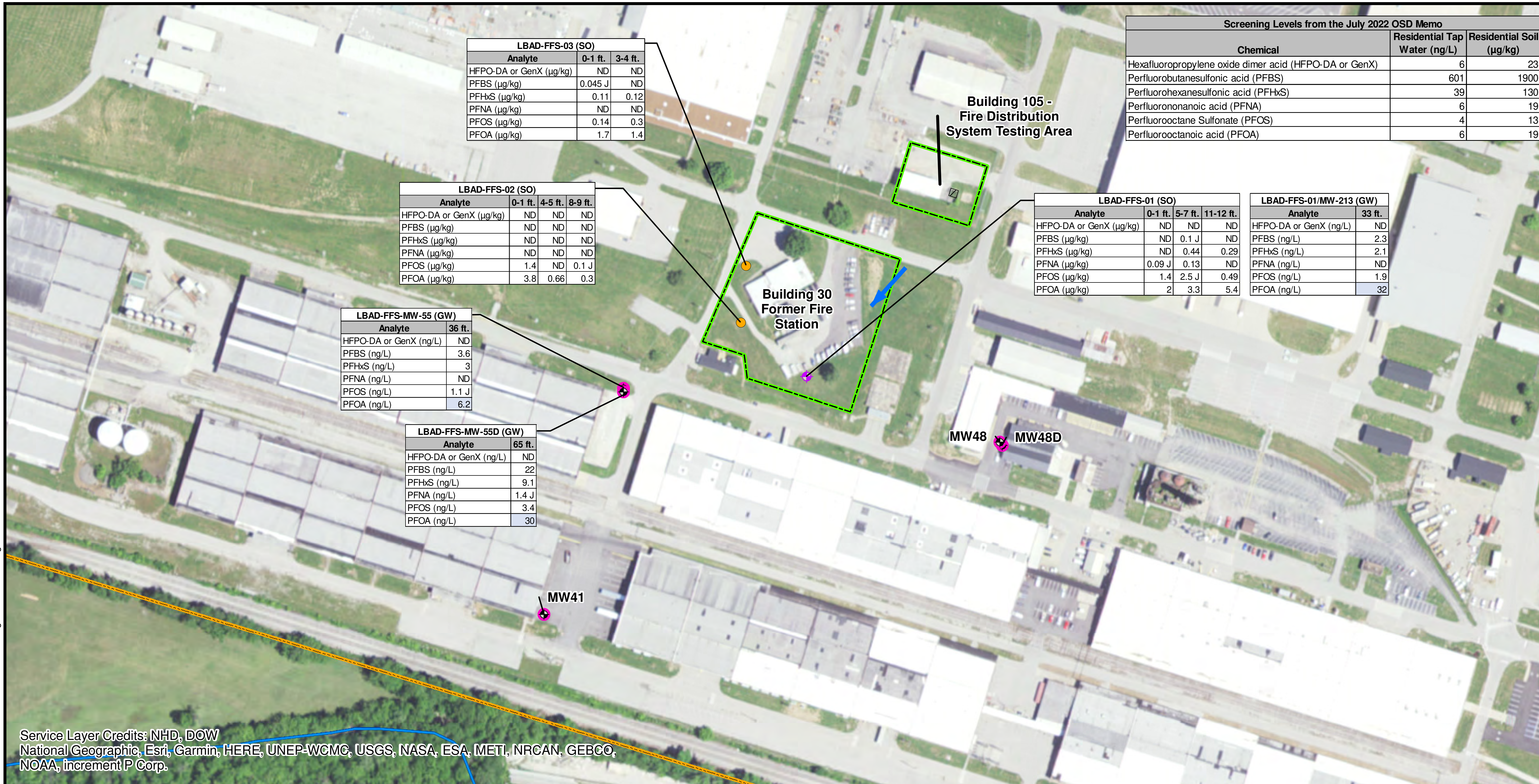
BUILDING 30 FORMER FIRE STATION AOPI SAMPLE LOCATIONS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-14

DATE: 4/11/2023

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-14 Building 30 Samples.mxd



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

LBAD-FFS-03 (SO)

Analyte	0-1 ft.	3-4 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	0.045 J	ND
PFHxS (µg/kg)	0.11	0.12
PFNA (µg/kg)	ND	ND
PFOS (µg/kg)	0.14	0.3
PFOA (µg/kg)	1.7	1.4

LBAD-FFS-02 (SO)

Analyte	0-1 ft.	4-5 ft.	8-9 ft.
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND
PFHxS (µg/kg)	ND	ND	ND
PFNA (µg/kg)	ND	ND	ND
PFOS (µg/kg)	1.4	ND	0.1 J
PFOA (µg/kg)	3.8	0.66	0.3

LBAD-FFS-01 (SO)

Analyte	0-1 ft.	5-7 ft.	11-12 ft.
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	0.1 J	ND
PFHxS (µg/kg)	ND	0.44	0.29
PFNA (µg/kg)	0.09 J	0.13	ND
PFOS (µg/kg)	1.4	2.5 J	0.49
PFOA (µg/kg)	2	3.3	5.4

LBAD-FFS-01/MW-213 (GW)

Analyte	33 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	2.3
PFHxS (ng/L)	2.1
PFNA (ng/L)	ND
PFOS (ng/L)	1.9
PFOA (ng/L)	32

LBAD-FFS-MW-55 (GW)

Analyte	36 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	3.6
PFHxS (ng/L)	3
PFNA (ng/L)	ND
PFOS (ng/L)	1.1 J
PFOA (ng/L)	6.2

LBAD-FFS-MW-55D (GW)

Analyte	65 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	22
PFHxS (ng/L)	9.1
PFNA (ng/L)	1.4 J
PFOS (ng/L)	3.4
PFOA (ng/L)	30

Legend

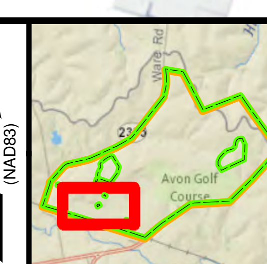
- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (5)
- Monitoring Well (1)
- Soil Boring (2)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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

0 50 100 200 300 400 Feet
SCALE: 1 " = 200 '

KY STATE PLANE NORTH (NAD83)



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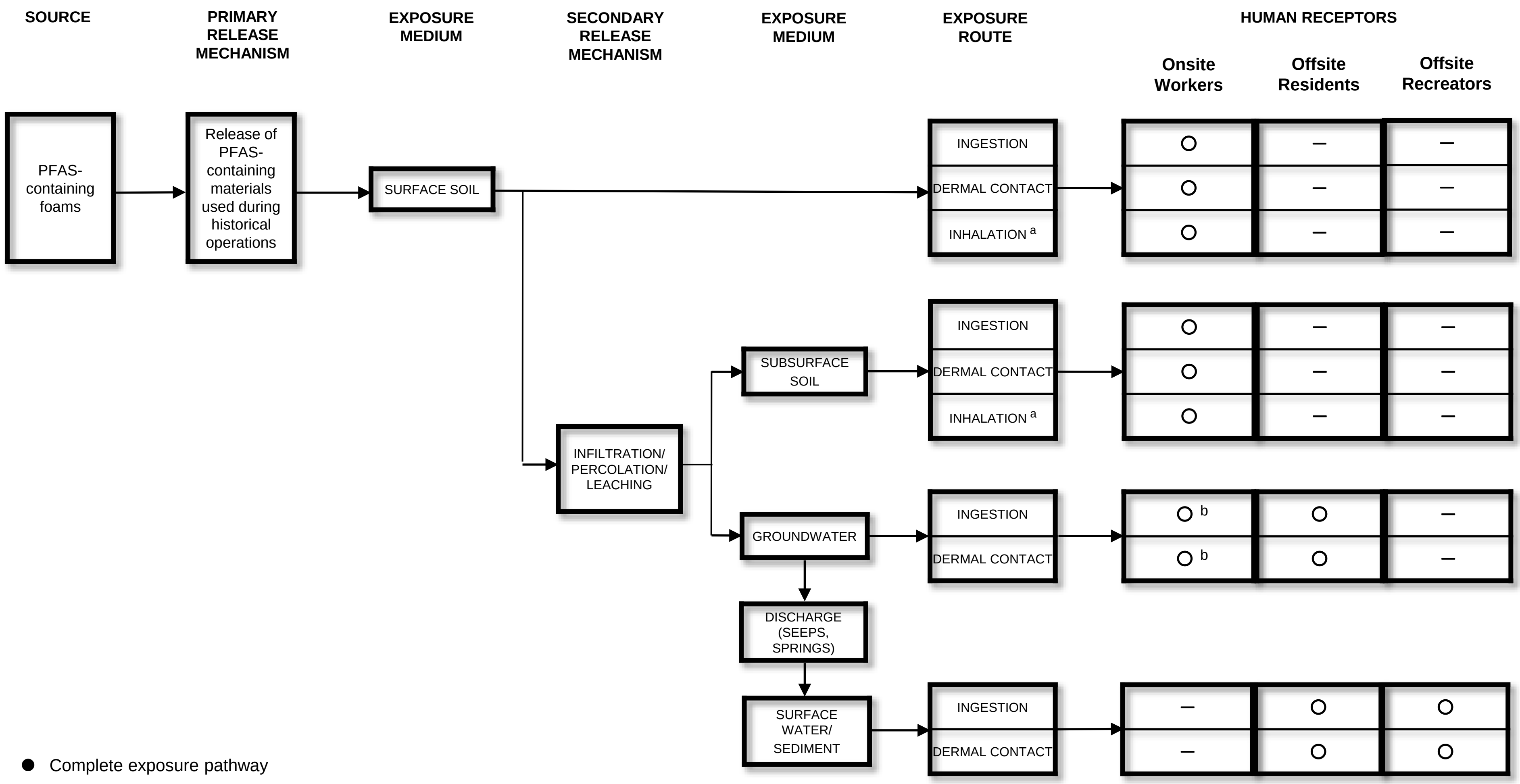
BUILDING 30 FORMER FIRE STATION AOPI
SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-15 | DATE: 4/11/2023

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-15 Building 30 Results.mxd



● Complete exposure pathway

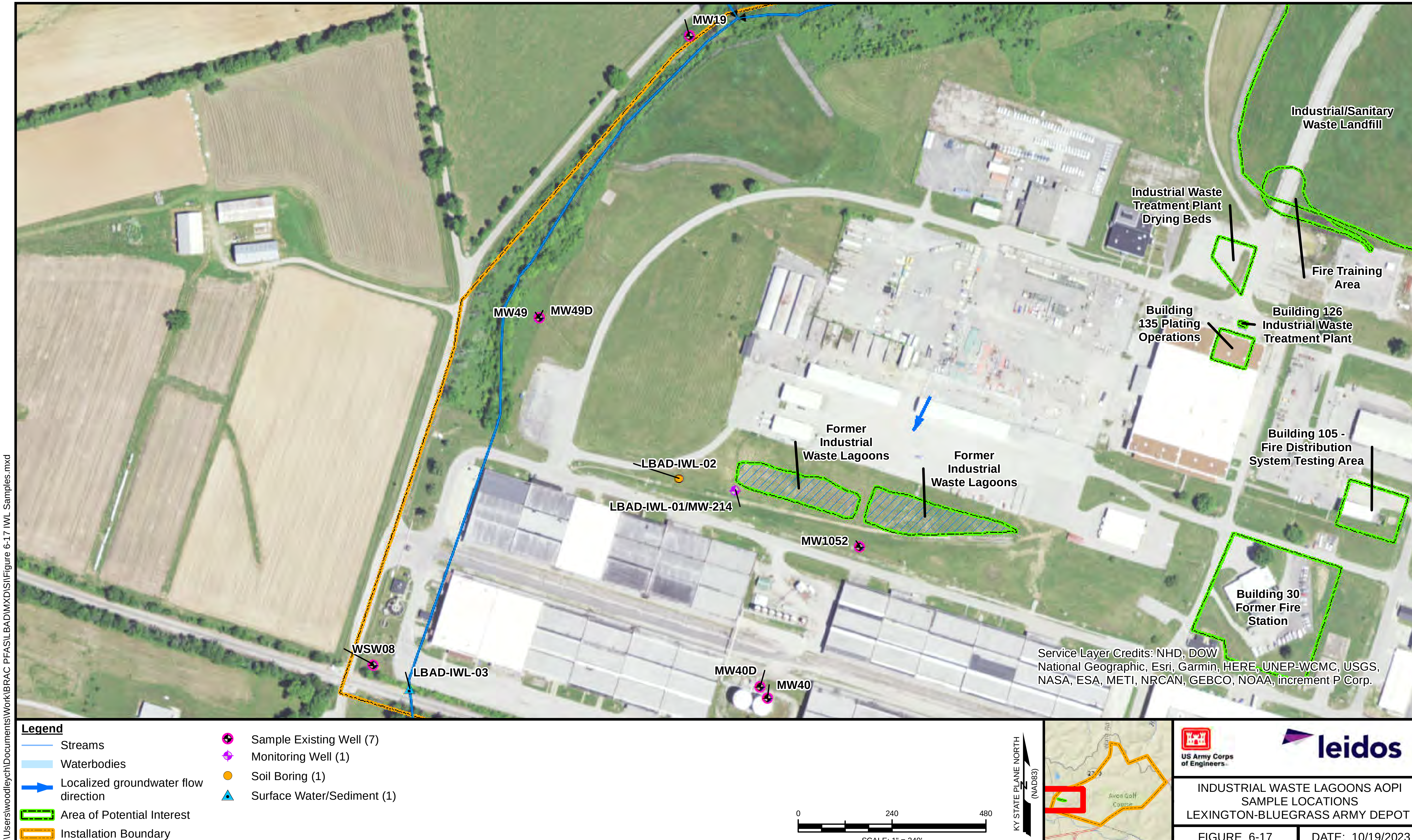
○ Potentially complete exposure pathway

— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

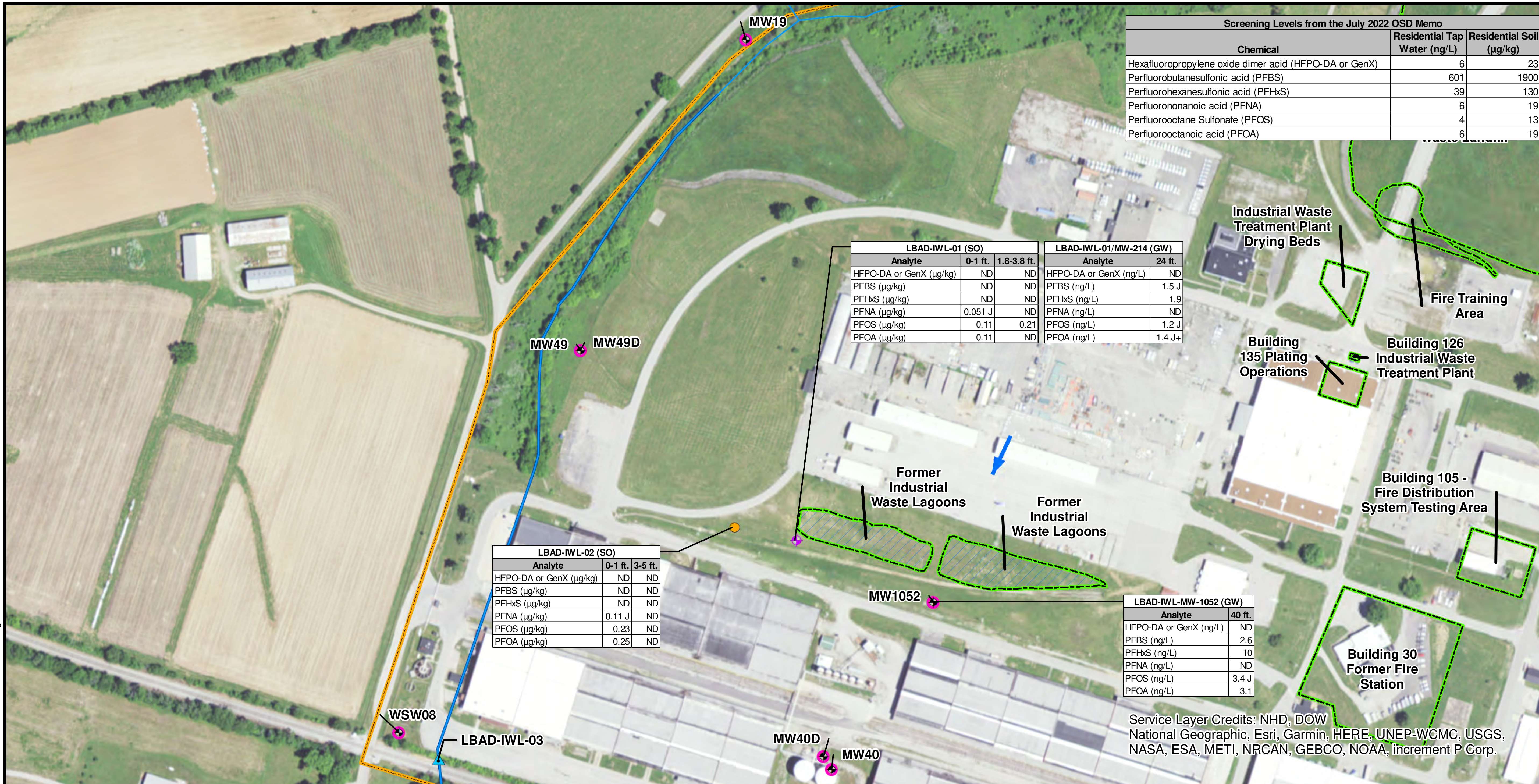
[b] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-16. Human Health CSM for Building 30 Former Fire Station AOPI



INDUSTRIAL WASTE LAGOONS AOPI
SAMPLE LOCATIONS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-17 | DATE: 10/19/2023



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

LBAD-IWL-01 (SO)		
Analyte	0-1 ft.	1.8-3.8 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	0.051 J	ND
PFOS (µg/kg)	0.11	0.21
PFOA (µg/kg)	0.11	ND

LBAD-IWL-01/MW-214 (GW)	
Analyte	24 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	1.5 J
PFHxS (ng/L)	1.9
PFNA (ng/L)	ND
PFOS (ng/L)	1.2 J
PFOA (ng/L)	1.4 J+

LBAD-IWL-02 (SO)		
Analyte	0-1 ft.	3-5 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	0.11 J	ND
PFOS (µg/kg)	0.23	ND
PFOA (µg/kg)	0.25	ND

LBAD-IWL-MW-1052 (GW)	
Analyte	40 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	2.6
PFHxS (ng/L)	10
PFNA (ng/L)	ND
PFOS (ng/L)	3.4 J
PFOA (ng/L)	3.1

Legend

- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (7)
- Monitoring Well (1)
- Soil Boring (1)
- Surface Water/Sediment (1)

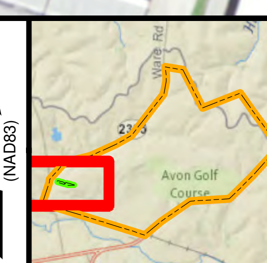
Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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

0 240 480
SCALE: 1" = 240'

KY STATE PLANE NORTH (NAD83)

N



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INDUSTRIAL WASTE LAGOONS AOPI
SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-18 | DATE: 10/19/2023

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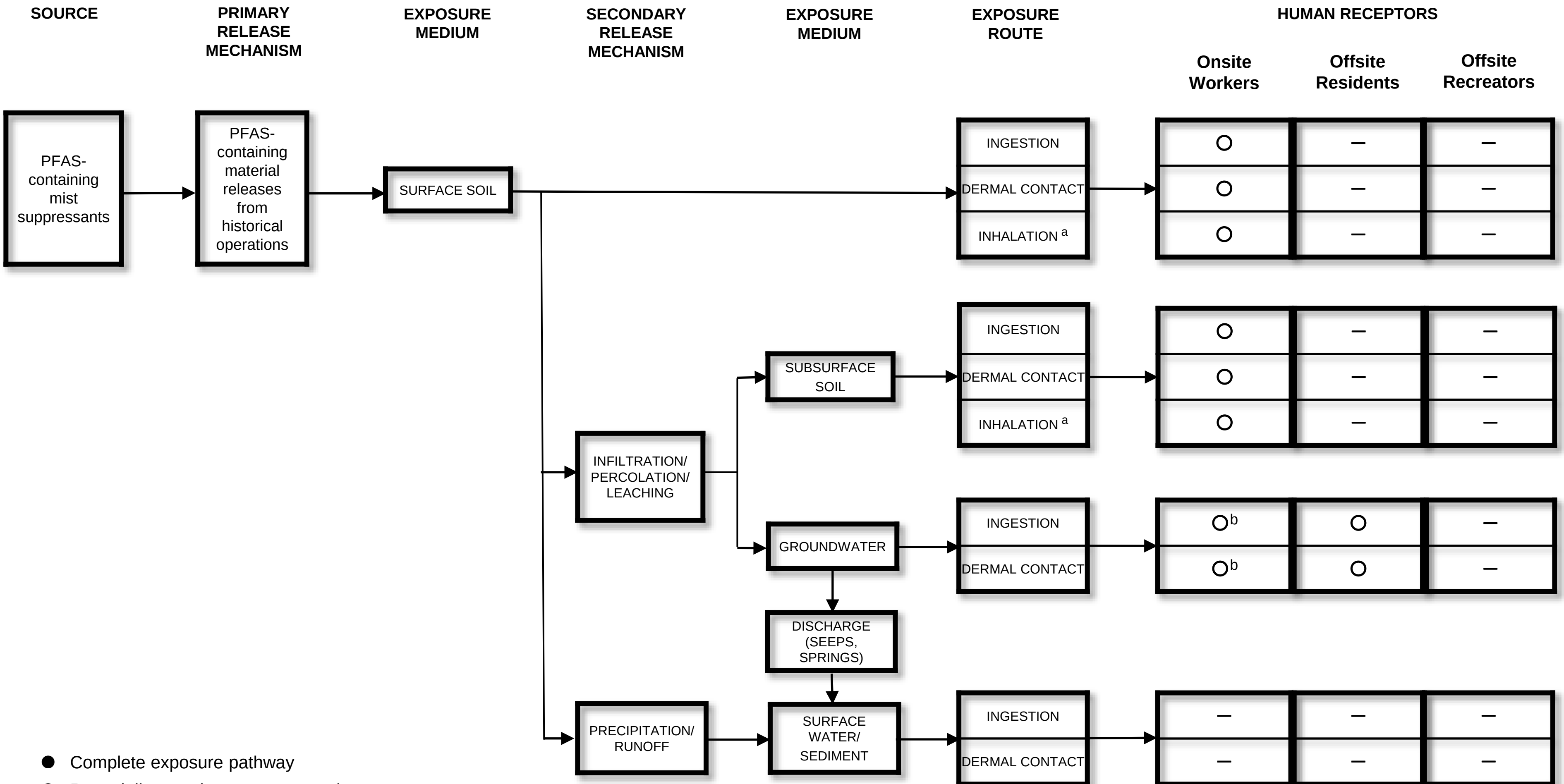


● Complete exposure pathway

○ Potentially complete exposure pathway

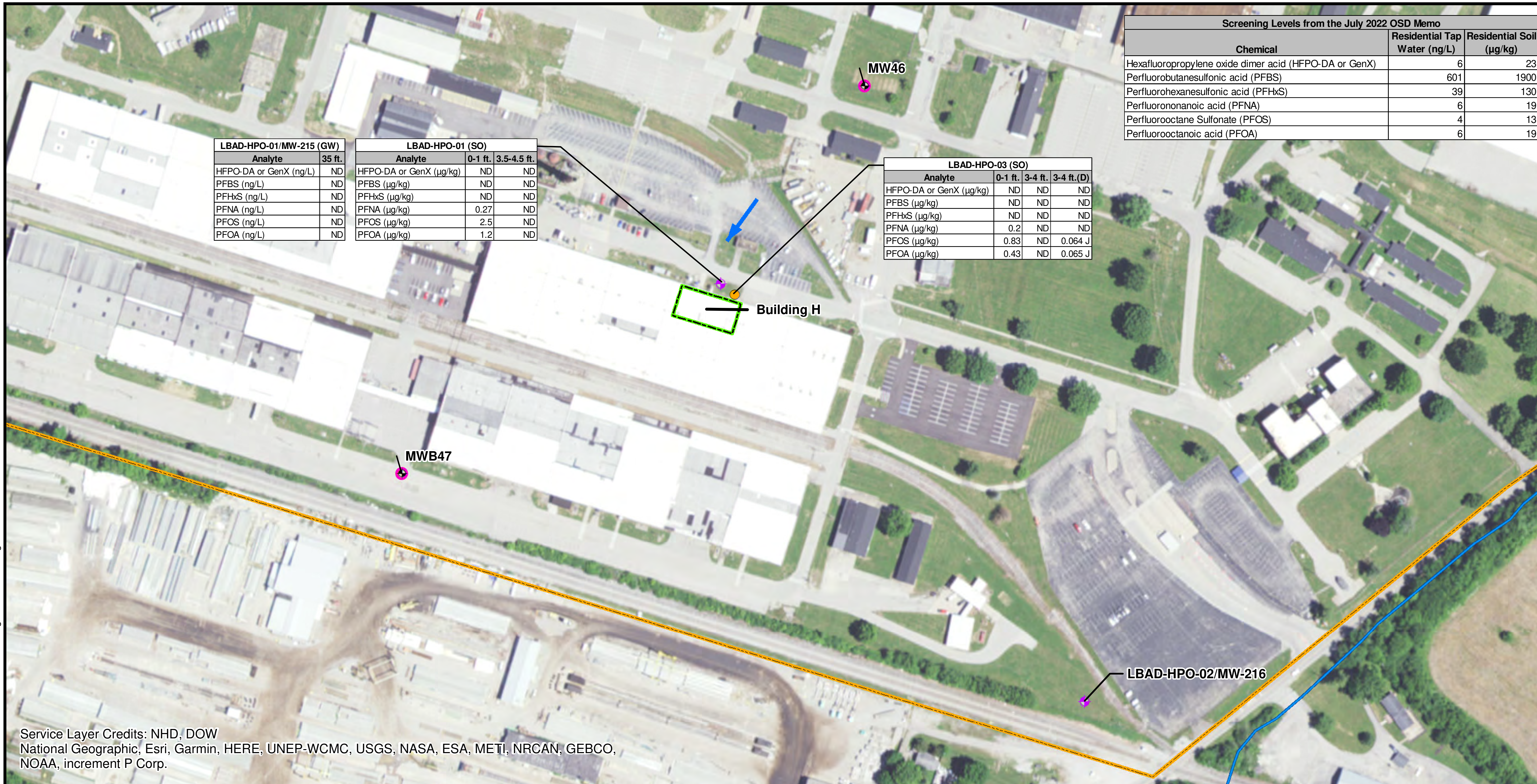
— Incomplete exposure pathway

[a] Inhalation of PFAS is considered potentially complete because no toxicity information is available for the inhalation route.

[b] Land use controls, including restrictions on groundwater use, are in place at this AOPI; however, since the restrictions are not PFAS specific, the pathway is potentially complete.

Figure 6-19. Human Health CSM for Industrial Waste Lagoons AOPI

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-20 Building H Samples.mxd



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

LBAD-HPO-01/MW-215 (GW)

Analyte	35 ft.
HFPO-DA or GenX (ng/L)	ND
PFBS (ng/L)	ND
PFHxS (ng/L)	ND
PFNA (ng/L)	ND
PFOS (ng/L)	ND
PFOA (ng/L)	ND

LBAD-HPO-01 (SO)

Analyte	0-1 ft.	3.5-4.5 ft.
HFPO-DA or GenX (µg/kg)	ND	ND
PFBS (µg/kg)	ND	ND
PFHxS (µg/kg)	ND	ND
PFNA (µg/kg)	0.27	ND
PFOS (µg/kg)	2.5	ND
PFOA (µg/kg)	1.2	ND

LBAD-HPO-03 (SO)

Analyte	0-1 ft.	3-4 ft.	3-4 ft.(D)
HFPO-DA or GenX (µg/kg)	ND	ND	ND
PFBS (µg/kg)	ND	ND	ND
PFHxS (µg/kg)	ND	ND	ND
PFNA (µg/kg)	0.2	ND	ND
PFOS (µg/kg)	0.83	ND	0.064 J
PFOA (µg/kg)	0.43	ND	0.065 J

C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-21 Building H Results.mxd

Legend

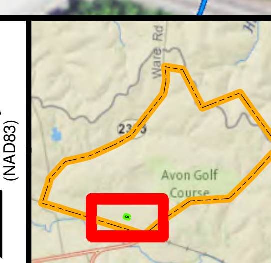
- Streams
- Waterbodies
- Localized groundwater flow direction
- Area of Potential Interest
- Installation Boundary
- Sample Existing Well (4)
- Monitoring Well (2)
- Soil Boring (1)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Level are the Residential Scenario Screening Levels calculated using 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

0 200 400
SCALE: 1" = 200'

KY STATE PLANE NORTH (NAD83)



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BUILDING H PLATING OPERATIONS AOPI
SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-21 | DATE: 4/11/2023

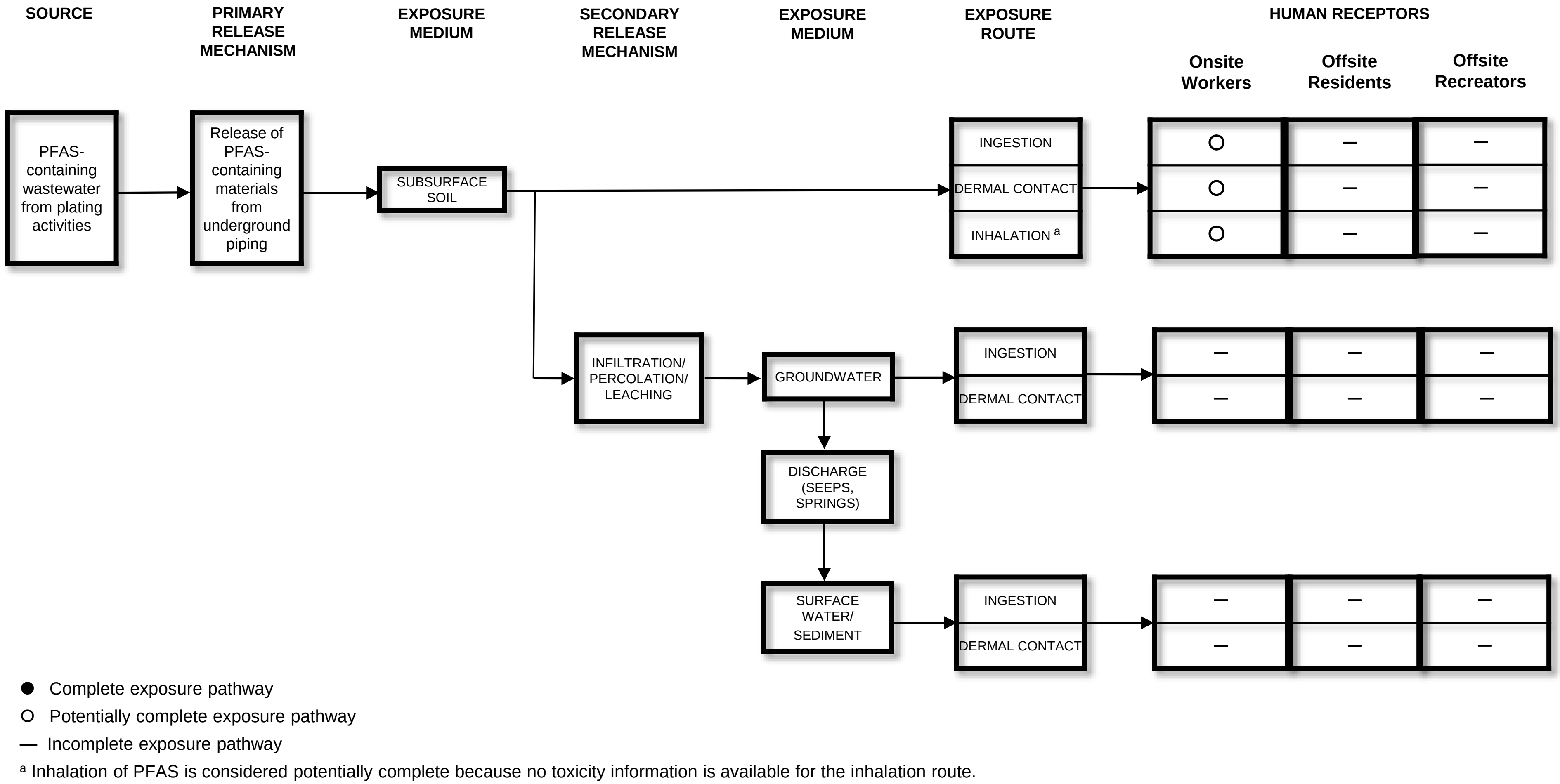
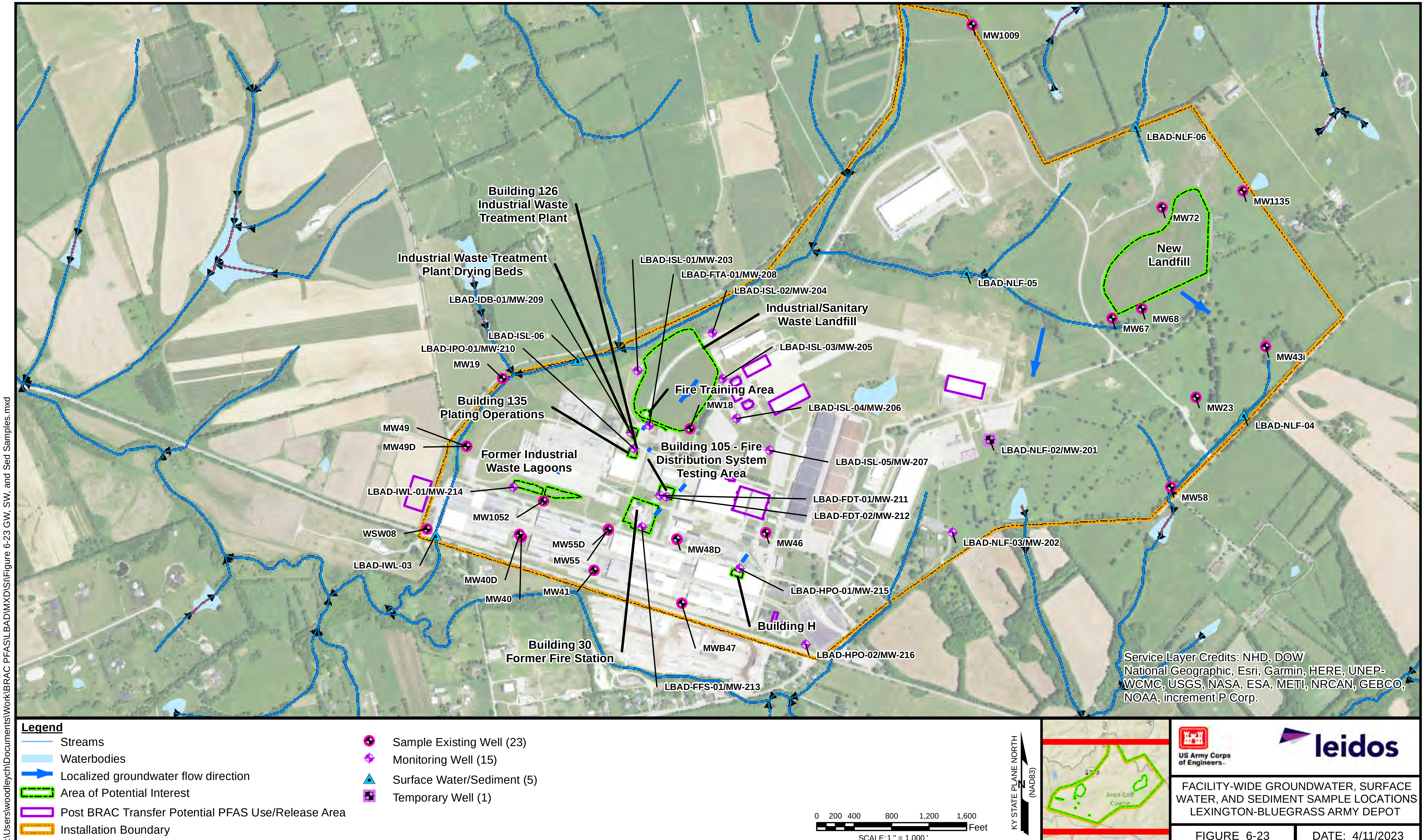


Figure 6-22. Human Health CSM for Building H Plating Operations AOPI



MW1009
LBAD-NLF-06
MW1135
MW72
New Landfill
LBAD-NLF-05
MW68
MW67
MW43i
MW23
LBAD-NLF-04
LBAD-NLF-02/MW-201
MW58
LBAD-NLF-03/MW-202
Building 126 Industrial Waste Treatment Plant
Industrial Waste Treatment Plant Drying Beds
LBAD-ISL-01/MW-203
LBAD-FTA-01/MW-208
LBAD-ISL-02/MW-204
Industrial/Sanitary Waste Landfill
LBAD-IDB-01/MW-209
LBAD-ISL-06
LBAD-IPO-01/MW-210
LBAD-ISL-03/MW-205
MW19
Fire Training Area
Building 135 Plating Operations
MW18
LBAD-ISL-04/MW-206
MW49
MW49D
Building 105 - Fire Distribution System Testing Area
Former Industrial Waste Lagoons
LBAD-ISL-05/MW-207
LBAD-IWL-01/MW-214
LBAD-FDT-01/MW-211
LBAD-FDT-02/MW-212
MW1052
WSW08
MW55D
MW46
MW48D
LBAD-IWL-03
MW55
MW40D
MW41
MW40
LBAD-HPO-01/MW-215
Building H
MWB47
Building 30 Former Fire Station
LBAD-HPO-02/MW-216
LBAD-FFS-01/MW-213
Service Layer Credits: NHD, DOW National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Legend
Streams
Waterbodies
Localized groundwater flow direction
Area of Potential Interest
Post BRAC Transfer Potential PFAS Use/Release Area
Installation Boundary
Sample Existing Well (23)
Monitoring Well (15)
Surface Water/Sediment (5)
Temporary Well (1)
0 200 400 800 1,200 1,600 Feet
SCALE: 1 " = 1,000 '
KY STATE PLANE NORTH (NAD83)
N
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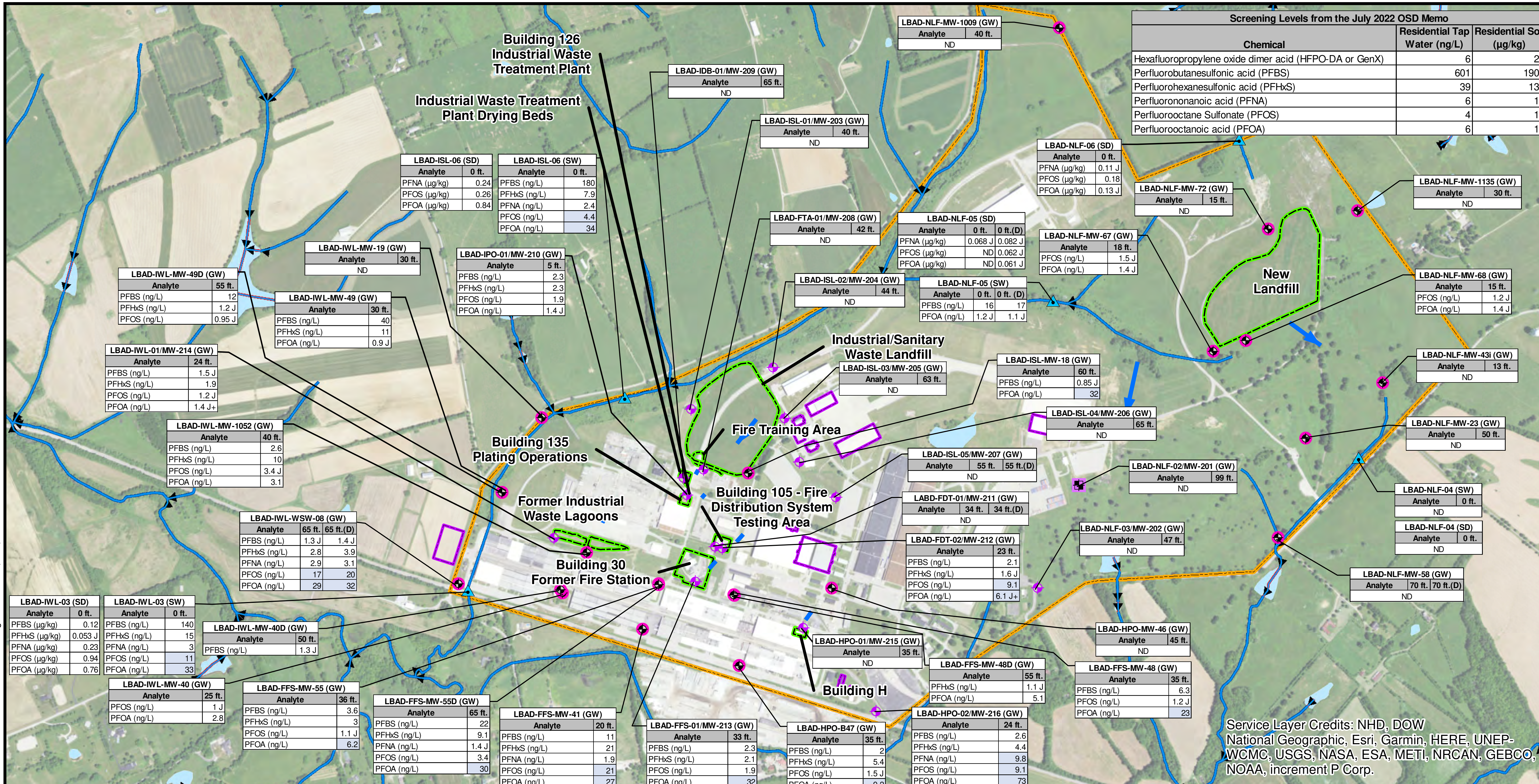
FACILITY-WIDE GROUNDWATER, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS LEXINGTON-BLUEGRASS ARMY DEPOT
FIGURE 6-23
DATE: 4/11/2023
C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-23 GW, SW, and Sed Samples.mxd



C:\Users\woodleych\Documents\Work\BRAC PFAS\LBAD\MXD\SI\Figure 6-24 GW, SW, and Sed Results.mxd

Legend

- Streams
- Waterbodies
- Localized groundwater flow direction
- Installation Boundary
- Area of Potential Interest
- Post BRAC Transfer Potential PFAS Use/Release Area
- Monitoring Well (15)
- Surface Water/Sediment (5)
- Sample Existing Well (23)
- Temporary Well (1)

Notes:
µg/kg = microgram per kilogram
ng/L = nanogram per liter
ND = Nondetect
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

The Screening Levels are the Residential Scenario Screening Levels calculated using 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

0 200 400 800 1,200 1,600 Feet
SCALE: 1 " = 1,000 '

KY STATE PLANE NORTH (NAD83)

US Army Corps of Engineers

leidos

FACILITY-WIDE GROUNDWATER, SURFACE WATER, AND SEDIMENT SAMPLE RESULTS
LEXINGTON-BLUEGRASS ARMY DEPOT

FIGURE 6-24 | DATE: 4/13/2023