FINAL
Site Inspection Report
MTA Camp Rilea
Warrenton, Oregon

Site Inspection for Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorohexanesulfonic acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene oxide dimer acid (HFPO-DA), and Perfluorobutanesulfonic acid (PFBS) at ARNG Installations, Nationwide

August 2023

Prepared for:

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film-forming foam
amsl	above mean sea level
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DOT	Department of Transportation
DPT	direct push technology
DQO	data quality objective
DUA	data usability assessment
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GRPS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LW	Lake and Wetland
MDL	Method Detection Limit
MIL-SPEC	military specification
MR	Military Reserve
ND	non-detect
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
NOAA	National Oceanic and Atmospheric Administration
NS	Natural Shorelands
ORDEQ	Oregon Department of Environmental Quality
OPR	Open Space Parks and Recreation
ORARNG	Oregon Army National Guard
OSD	Office of the Secretary of Defense

OWRD	Oregon Water Resources Department
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RA-5	Residential Agriculture
RV	Recreational Vehicle
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UCMR3	Third Unregulated Contaminant Monitoring Rule
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTES	Unit Training Equipment Site

Executive Summary

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS). These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable screening levels (SLs) are provided in **Table ES-1**.

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at Military Training Area (MTA) Camp Rilea in Warrenton, Oregon and determined further investigation is warranted for AOI 1: Former Fire Station – Building 7241 and AOI 2: Unit Training Equipment Site (UTES): Former Firetruck Parking – Building 7156. MTA Camp Rilea will also be referred to as Camp Rilea or the "facility" throughout this document.

Camp Rilea is on the Pacific Coast in northwest Oregon in Clatsop County, approximately 1.4 miles to the southwest of the City of Warrenton and 5.7 miles to the southwest of the City of Astoria. Camp Rilea has operated at the Warrenton location since 1927, under the jurisdiction of the State of Oregon, as a training facility for ARNG. The facility was formerly known as Camp Clatsop until the name was changed to Camp Rilea in 1959. Numerous improvements were made to the original facility during the 1930s. Prior to World War II, the facility was used as a mobilization site for the 249th Coast Artillery. After the war, the facility was used as an annual training site by many military and non-military groups: air defense units; ARNG infantry, field artillery, and engineering units; infantry divisions; Special Forces Groups; various ANG communications units; Marine Corps; Coast Guard and Navy Reserve Units; Search and Rescue Organizations; Oregon State Defense Force; Oregon State Police and other police organizations; Housing Authority of Portland for Camp Rosenbaum; and various local and civic organizations (AECOM Technical Services, Inc., 2020).

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the two AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for AOI 1 and AOI 2.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table ES-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table ES-2: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Former Fire Station – Building 7241	◐	●	Proceed to RI
2	UTES: Former Firetruck Parking – Building 7156	◐	●	Proceed to RI

Legend:
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at Military Training Area (MTA) Camp Rilea in Warrenton, Oregon. MTA Camp Rilea is also referred to as Camp Rilea or the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; United States [US] Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations.

1.2 SI Purpose

A PA was performed at Camp Rilea (AECOM, 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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2. Facility Background

2.1 Facility Location and Description

Camp Rilea is located in Warrenton, Clatsop County, Oregon, approximately 1.4 miles to the southwest of the City of Warrenton and 5.7 miles to the southwest of the City of Astoria. The facility is located west of Highway 101 and includes approximately 3 miles of ocean frontage along the Pacific Ocean (**Figure 2-1**).

The facility is occupied and operated by the Oregon ARNG (ORARNG) as a military training center for military personnel and encompasses 1,870 acres (Mitchell, 2001). Civilians also use certain areas throughout Camp Rilea for recreational purposes throughout the year. Camp Rilea's mission for the federal government is to provide facilities and resources as a training center contributing readiness and military capability for the armed forces of the US and Oregon. Camp Rilea's mission for the State of Oregon is to provide community service support and serve as the regional base for Oregon's North Coast emergency response and recovery operations (Oregon, 2018).

The facility consists of the cantonment area and armory (450 acres), training and range areas (1,400 acres), and a wastewater treatment facility with two sewage lagoons adjacent to a spray irrigation area (20 acres) (DA, 2001). Camp Rilea's cantonment area encompasses dining and support facilities and temporary living facilities; numerous buildings are scattered across the facility for administration, maintenance, medical, petroleum oil and fuel storage, equipment and vehicles storage (including at the Unit Training Equipment Site [UTES] facility), and a fire station building (DA, 2001). The Air National Guard (ANG) facility operates on approximately 6.25 acres along the central/eastern Camp Rilea boundary and consists primarily of a building within a fenced area (DA, 2001). Access to Camp Rilea is controlled. Camp Rilea also uses up to 352,000 acres of private and public land for military training under landowner agreements and permits (DA, 2001).

The property that Camp Rilea currently occupies is owned by the State of Oregon, with operations beginning in 1927 (DA, 2001). The facility was formerly known as Camp Clatsop until the name was changed to Camp Rilea in 1959. Numerous improvements were made to the original facility during the 1930s. Prior to World War II, the facility was used as a mobilization site for the 249th Coast Artillery. After the war, the facility was used as an annual training site by the 237th Air Defense Group (later named the 249th Air Defense Group) and by air defense units from Washington, Nevada, Delaware, and Pennsylvania (Shaw Environmental Inc. [Shaw], 2010; DA, 2001). Camp Rilea has been used by various military units to conduct annual or inactive duty training, including: ARNG infantry, field artillery, and engineering units; Infantry Divisions (2nd, 25th, and 75th); Special Forces Groups (1st, 19th, and 20th); various ANG communications units; Marine Corps; Coast Guard and Navy Reserve Units; Search and Rescue Organizations; Oregon State Defense Force; Oregon State Police and other police organizations; Housing Authority of Portland for Camp Rosenbaum; and by various local and civic organizations.

2.2 Facility Environmental Setting

Camp Rilea is situated in the Coast Range of the Pacific Border geologic province of Oregon (Oregon Department of Environmental Quality [ORDEQ], 2013; US Department of the Interior [USDOI], 2018). The facility is bordered by the Pacific Ocean to the west, low lying sand dunes to the north and south, and low-lying wetlands and agricultural land to the east (**Figure 2-2**). The Coast Mountain Range is located further to the east. The western facility boundary is comprised of sand dunes that parallel the beach from north to south. A series of five sand dune ridges and

five interdune areas, oriented north to south, are located throughout the facility; the dunes are separated by lakes and creeks (DA, 2001; URS and Arcadis, 2013).

The facility is moderately hilly throughout, with steeper slopes found in the western portion characterized by sand dunes; slopes of the sand dunes are less than 10 percent (%). Elevation throughout the facility ranges from sea level at the beach up to 75 feet above mean sea level (amsl) at the sand dunes. Many of the dunes are covered by vegetation (i.e., brush and trees). Elevation along the eastern facility boundary averages 45 feet amsl, with a low of 25 feet amsl in the northeastern portion (DA, 2001; Google Earth, 2018).

2.2.1 Geology

Camp Rilea is located in a geologic area characterized as Dune sand of the Holocene age (**Figure 2-3**). Dune sand consists of large areas of windblown sand composed of rock-forming minerals, mostly feldspar and small amounts of quartz. Constituents are characterized as unconsolidated, coarse-detrital sand (US Geological Survey [USGS], 2018a). This geological feature is found along the northern Oregon Coastline, extending south to Tillamook Head (approximately 5 miles north and 11 miles south of Camp Rilea, respectively) (Frank, 1970).

Dune sand of the Pleistocene and Holocene ages overlies eroded surfaces of the Astoria Formation of the Tertiary age. This rock formation underlies the eastern edge of the dunes and constitutes bedrock of the sand-dune area, characterized as fine grained and tightly compacted, primarily carbonaceous sandstone. The Astoria Formation is a layer up to 1,400 feet thick; dune sand layers may be greater than 100 feet thick, and these deposits contain the principal aquifers. The geology of the northern Oregon Coast area is characterized by a small extent of alluvium of the Quaternary age, characterized by clay, silt, and sand. Dune sand ranges in size from coarse to very fine, consisting mostly of quartz with lesser amounts of feldspar, magnetite, mica, and rock fragment. Sand is loosely compacted and unconsolidated (Frank, 1970; DA, 2001).

During the SI, fine- to medium-grained, poorly graded sand was observed as the dominant lithology of the unconsolidated sediments below Camp Rilea. The borings were completed at depths between 7 and 30 feet below ground surface (bgs). These results and facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

Soils beneath Camp Rilea consist of six different series. From west to east across the facility, the soil series are beaches, dune lands, Gearheart fine sandy loam, Heceta-Waldport fine sand, Waldport fine sand, and Warrenton loamy fine sand (URS and Arcadis, 2013; US Department of Agriculture [USDA], 2018). Beaches are present along the entire western border of the facility, at the edge of the Pacific Ocean. Dune lands are present along the entire western boundary of the facility, east of the beaches. The beaches and dune lands are characterized with high infiltration rates. Warrenton soils are present only in the northeastern portion of the facility. With exception for beaches and dune lands, all the soil series beneath the facility consist of very deep and poorly drained to excessively drained soils formed in sand, dune sands, or eolian sands, located in interdunal depressions or on stabilized sand dunes (DA, 2001).

The Dune sands are the primary water-bearing unit in the area (DA, 2001; Frank, 1970). Camp Rilea is situated above the Pacific Northwest basin-fill aquifer, characterized as unconsolidated sand and gravel aquifers at or near the land surface. This type of aquifer is prevalent along stream valleys and in lowlands associated with erosional basins and yields a sufficient supply of fresh water (and saltwater along the Coast) for public drinking via wells and springs. These deposits are mostly alluvial but also consist of eolian, glacial, or volcanic deposits in other areas. The thickness of the deposits in stream valleys is typically less than 250 feet. Permeability of the

aquifer is variable, depending on the soil series. The dune sands have saturated thicknesses ranging from 95 to greater than 150 feet, with most of the discharge flowing west towards the ocean (Frank, 1970). Sand and gravel commonly yield groundwater to wells in the range of 20 to 20,000 gallons per minute (USGS, 1994, 2018b, 2018c).

Because precipitation infiltrates Dune sands fairly rapidly, precipitation recharges groundwater and is distributed fairly evenly throughout the dune area. Approximately 5 inches of precipitation raises groundwater levels from their low stages on a monthly basis. Hydraulic gradients near the sides of the Dune sand aquifer steepen, causing groundwater to flow towards discharge areas. Neacoxie Creek receives groundwater recharge throughout the year, and flow increases in a downstream direction (Frank, 1970). Regionally, the water table in the Dune sand fluctuates in association with recharge from precipitation, which is quickly absorbed and stored in the Dune sand. During warm weather months with little to no precipitation (spring and summer), groundwater levels in wells decline. Water level fluctuations in the area are also a result of tidal movements. Perched groundwater in the area is noted seasonally, primarily during the wet months of fall and winter. (Frank, 1970). The aquifer of the Astoria Formation is recharged in the Coast Range to the east of Camp Rilea and discharges at the range margins both to the east and west. Groundwater flow beneath Camp Rilea in the bedrock aquifer is toward submarine recharge zones to the west. With relatively low hydraulic conductivity, there is likely little interaction between the Dune sand and bedrock aquifers (DA, 2001).

The estimated depth to groundwater at the facility (measured historically at several onsite groundwater wells in 2001) ranges from 22.6 to 32.8 feet bgs (DA, 2001) Groundwater flow beneath Camp Rilea is generally from east to west, towards the Pacific Ocean. However, groundwater flow may vary in localized areas of groundwater recharging to surface water, such as Neacoxie Creek in the eastern portion of the facility (DA, 2001; URS and Arcadis, 2013). Neacoxie Creek flows off-Post to the east, eventually discharging into the Columbia River approximately three miles to the northeast of the facility, and ultimately discharging into the Pacific Ocean (AMEC, 2009). A USGS monitoring well located on the facility at a depth of 135 feet bgs (Site No. CLAT0050230) has groundwater measurements ranging from 10 to 17 feet bgs (USGS, 2018c) (**Figure 2-3**).

Camp Rilea obtains drinking water from two onsite water supply wells located in the central/western portion of the facility, east of the beach (Wells #53837 and #53838) (ORDEQ, 2018; Oregon Water Resources Department [OWRD], 2018). Both wells were installed in 2011 and completed with 10-inch diameter casing. Well #53837 was drilled to a depth of 172 feet bgs and completed with 20 feet of stainless steel 0.02 slotted screen from 142 to 162 feet bgs. Well #53838 was drilled to a depth of 157 feet bgs and completed with 15 feet of stainless steel 0.02 slotted screen from 132 to 147 feet bgs. Depth to groundwater measurements at wells #53837 and #53838 were 58 feet bgs and 50 feet bgs, respectively (OWRD, 2018). The two wells are located approximately 0.5 miles west of AOI 2 and 0.75 miles northwest of AOI 1.

PFAS sampling has been performed at Camp Rilea under the direction of the ARNG. The drinking water wells at Camp Rilea were sampled in April 2017 and laboratory analysis included the relevant compounds. PFOA was detected at a concentration of 0.719 nanograms per liter (ng/L). PFOS, PFBS, PFHxS, and PFNA concentrations were reported below laboratory method detection limits (MDLs) (ORDEQ, 2018). The reported laboratory MDLs were below the ORDEQ Pollutant Initiation Levels (PILs) (Oregon Administrative Rule [OAR 340-045-0100]).

Public groundwater systems used as drinking water sources are located at off-Post facilities, including the Sunset Lake recreational vehicle (RV) Park (located approximately 0.5 miles to the south of the facility) and the City of Warrenton (located less than 1 mile to the north of the facility) (ORDEQ, 2018) (**Figure 2-3**). Within a 4-mile radius of Camp Rilea, the Clatsop Plains Aquifer is used for private water supplies, and as of 2001, approximately 300 private well users were estimated to be within a 1- to 4-mile radius of the facility (DA, 2001).

Depths to water measured in January 2022 during the SI ranged from 1.90 to 23.05 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the groundwater flow direction at AOI 1 at Camp Rilea is primarily to the east-southeast, while groundwater flow direction at AOI 2 is primarily to the west-southwest.

2.2.3 Hydrology

Camp Rilea is located within the Necanicum River subbasin of the North Coast/Lower Columbia basin. Within this feature, the eastern portion of the facility is located within the Skipanon/River-Frontal Columbia River Watershed, the western portion of the facility is located within the Arch Cape Creek-Frontal Pacific Ocean Watershed, and the southeastern portion of the facility is located in the Lower Necanicum River Watershed (**Figure 2-3**). Rivers in the North Coast subbasin generally begin in the steep terrain of the Coast Mountain Range, located east of Camp Rilea. Rivers to the west of the Coast Mountain Range, near the Pacific Coast, are surrounded by wetlands and agriculture (ORDEQ, 2003).

Surface waterbodies at the facility include Neacoxie Creek (including a slough), Sunset Lake, and Slusher Lake. Neacoxie Creek originates south of the facility flowing north paralleling the eastern property boundary (east fork), entering the central/eastern properly and turning 180 degrees to flow south along the eastern property boundary (west fork), before flowing offsite to the east into the Skipanon River, which ultimately discharges to the north into the Columbia River. Sunset Lake is located in the southeastern corner of the property, where drainage flows south to the Necanicum River, ultimately discharging into the Pacific Ocean to the west (DA, 2001). Slusher Lake is located in the south/central portion of the facility and is connected to a smaller lake on the adjacent property to the south, ultimately discharging to Neacoxie Creek (Frank, 1970; DA, 2001; Shaw, 2010).

Surface stormwater runoff from paved areas of the facility enters a storm drainage conveyance system located throughout the majority of the cantonment area, discharging to an outfall in Neacoxie Creek (west fork), located to the west of the facility. Stormwater throughout unpaved areas of the property infiltrates the sandy soil (DA, 2001; Shaw, 2010). Because precipitation infiltrates Dune sands rapidly, surface water runoff throughout the facility is negligible. Surface water runoff at Camp Rilea would occur during heavy precipitation events where precipitation exceeds the infiltration rate of the sandy soil (Frank, 1970). Surface water features are presented on **Figure 2-5**.

2.2.4 Climate

Climate at Camp Rilea is marine temperate. Climate of the North Coast Basin is cool and moist, characterized by mild summers and wet winters, with moderately low temperatures. The area receives heavy rainfall from easterly storms originating in the Pacific Ocean that traverse the Cascade Mountain Range to the east. The majority of precipitation occurs as rain during the fall and winter, with heavy rainfall experienced between November and March; at least one or two heavy storm events occur annually. Snowfall is rare, and the area experiences a frost-free period for 200 to 240 days, annually. Winds prevail from the northwest during summer months and from the southwest (off the Pacific Coast) during winter months (Frank, 1970; ORDEQ, 2003; URS and Arcadis, 2013).

Temperatures recorded for a period of three decades (1961 to 1990) at the Astoria Regional Airport weather station (located approximately 2.8 miles northeast of the facility) ranged from a low of 36 degrees Fahrenheit (°F) in January to a high of 69 °F in August, averaging 51 °F annually. Precipitation recorded for this same time period ranged from an average low of 1.2 inches in July to an average high of 10.6 inches in December, averaging 6.6 inches annually (ORDEQ, 2003).

Temperatures recorded for the most recent time period (2020) at Astoria Regional Airport weather station ranged from a low of 37.4°F in February to a high of 68.7°F in August, averaging 51.4°F for the year. Precipitation for this same year ranged from a low of 0.83 inches in July to a high of 11.05 inches in November, averaging 5.9 inches for the year (snow was not reported) (National Oceanic and Atmospheric Administration [NOAA], 2022).

2.2.5 Current and Future Land Use

Camp Rilea's mission for the federal government is to provide facilities and resources as a training center contributing readiness and military capability for the armed forces of the US and Oregon. Camp Rilea's mission for the State of Oregon is to provide community service support and serve as the regional base for Oregon's North Coast emergency response and recovery operations (Oregon, 2018).

Access to the facility is controlled. Land use to the north, east, and south is a mixture of residential and agriculture with interspersed sand dunes and wetlands. The Astoria Golf and Country Club is located east of the southeast corner of the facility. The Pacific Ocean is located adjacent to the west. The nearest urban area is Warrenton, 1.4 miles to the northeast.

The facility is zoned by Clatsop County primarily as Military Reserve (MR), with smaller footprints zoned as Residential Agriculture 5 (RA-5), Lake and Wetland (LW), Natural Shorelands (NS), and Open Space Parks and Recreation (OPR) (Clatsop County, 2018). These additional zoning codes are associated with the surface waterbodies on the facility, in addition to the residential/agricultural land that OMD also uses for training (Clatsop County, 2018).

Land to the north of the facility is zoned by the City of Warrenton as Open Space Institutional, Lake and Freshwater Wetland, and R40 - Low Density Residential (City of Warrenton, 2020). Land to the south of the facility is zoned by Clatsop County as LW, OPR, Residential Agriculture 1 (RA-1), and RA-5. Land to the east of the facility is zoned Single Family Residential, RA-5, Agriculture Forest, and LW (Clatsop County, 2018).

Clatsop County's Comprehensive Plan does not specify restrictions for Camp Rilea or future land use changes at Camp Rilea (Clatsop County, 2013). The MR-zoned areas of Camp Rilea are defined by Clatsop County as "intended to accommodate the immediate foreseeable demand for military activities in areas where a commitment to such activities has already occurred through existing uses by the military." (Mitchell, 2001). It is anticipated that Camp Rilea will remain used for military-related uses, including training, in the future. In addition, it is anticipated that the OPR-, RA-5-, LW-, and NS-zoned footprints of Camp Rilea will remain used for their intended purpose, as zoned (Mitchell, 2001).

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

A wildlife survey has not occurred at the facility, and the facility does not have any significant areas of habitat. The following species have not been identified at the facility but may be present in the surrounding area.

The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Clatsop, Oregon (US Fish and Wildlife Service [USFWS], 2022).

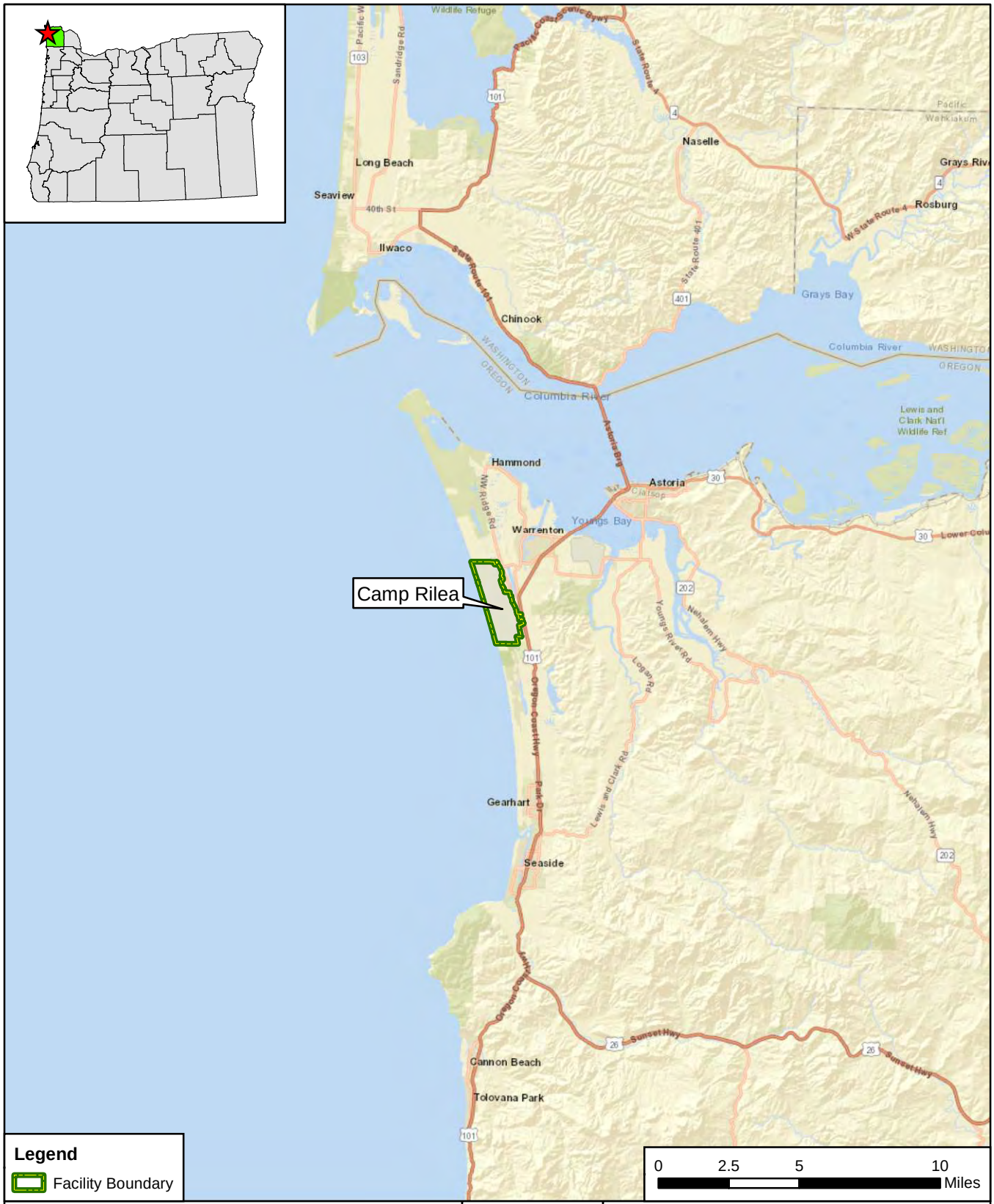
- **Birds:** Hawaiian petrel, *Pterodroma sandwichensis* (Endangered); Western snowy plover, *Charadrius nivosus* (Threatened); Marbled murrelet, *Brachyramphus marmoratus* (Threatened); Yellow-billed Cuckoo, *Coccyzus americanus* (Threatened); Short-tailed albatross, *Phoebastria (=Diomedea) albatrus* (Endangered); Northern spotted owl, *Strix*

occidentalis caurina (Threatened); Streaked Horned lark, *Eremophila alpestris strigata* (Threatened)

- **Fishes:** Bull Trout, *Salvelinus confluentus* (threatened)
- **Flowering Plants:** Nelson's checker-mallow, *Sidalcea nelsoniana* (Threatened)
- **Insects:** Monarch butterfly, *Danaus plexippus* (Candidate); Oregon silverspot butterfly, *Speyeria zerene hippolyta* (Threatened)
- **Mammals**: Little brown bat, *Myotis lucifugus* (Under Review); Pacific Marten, *Martes caurina* (Threatened); Red tree vole, *Arborimus longicaudus* (Candidate); Columbian white-tailed deer, *Odocoileus virginianus leucurus* (Threatened)
- **Reptiles**: Loggerhead sea turtle, *Caretta* (Endangered); Olive ridley sea turtle, *Lepidochelys olivacea* (Threatened); Leatherback sea turtle, *Dermochelys coriacea* (Endangered)
- **Snails**: Burrington jumping-slug, *Hemphillia burringtoni* (Resolved Taxon)

2.3 History of PFAS Use

Two AOIs were identified in the PA where AFFF may have been used, stored, disposed, or released historically at Camp Rilea (AECOM, 2020). AFFF may have historically been released at the facility during washing of firetrucks carrying AFFF, flushing out lines used for AFFF discharge at other locations, and storage of AFFF as early as the 1970s. The potential release areas were grouped into two AOIs based on preliminary data and presumed groundwater flow directions. A description of each AOI is presented in **Section 3**.

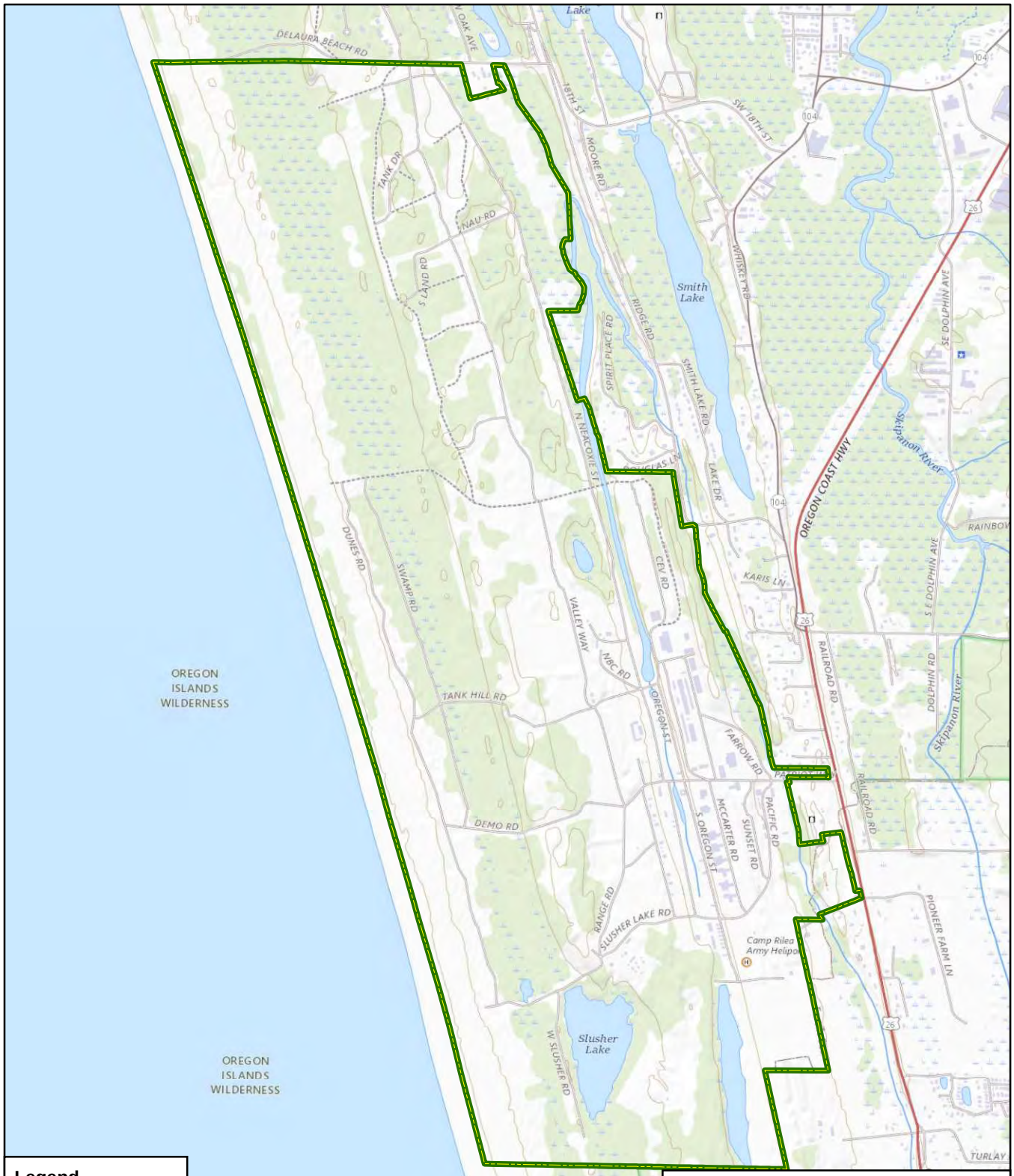


CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	8/5/2022	GIS BY	MS	8/5/2022
SCALE	1:316,800	CHK BY	MB	8/5/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	8/5/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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PROJECT	Site Inspection at Camp Rilea, OR			
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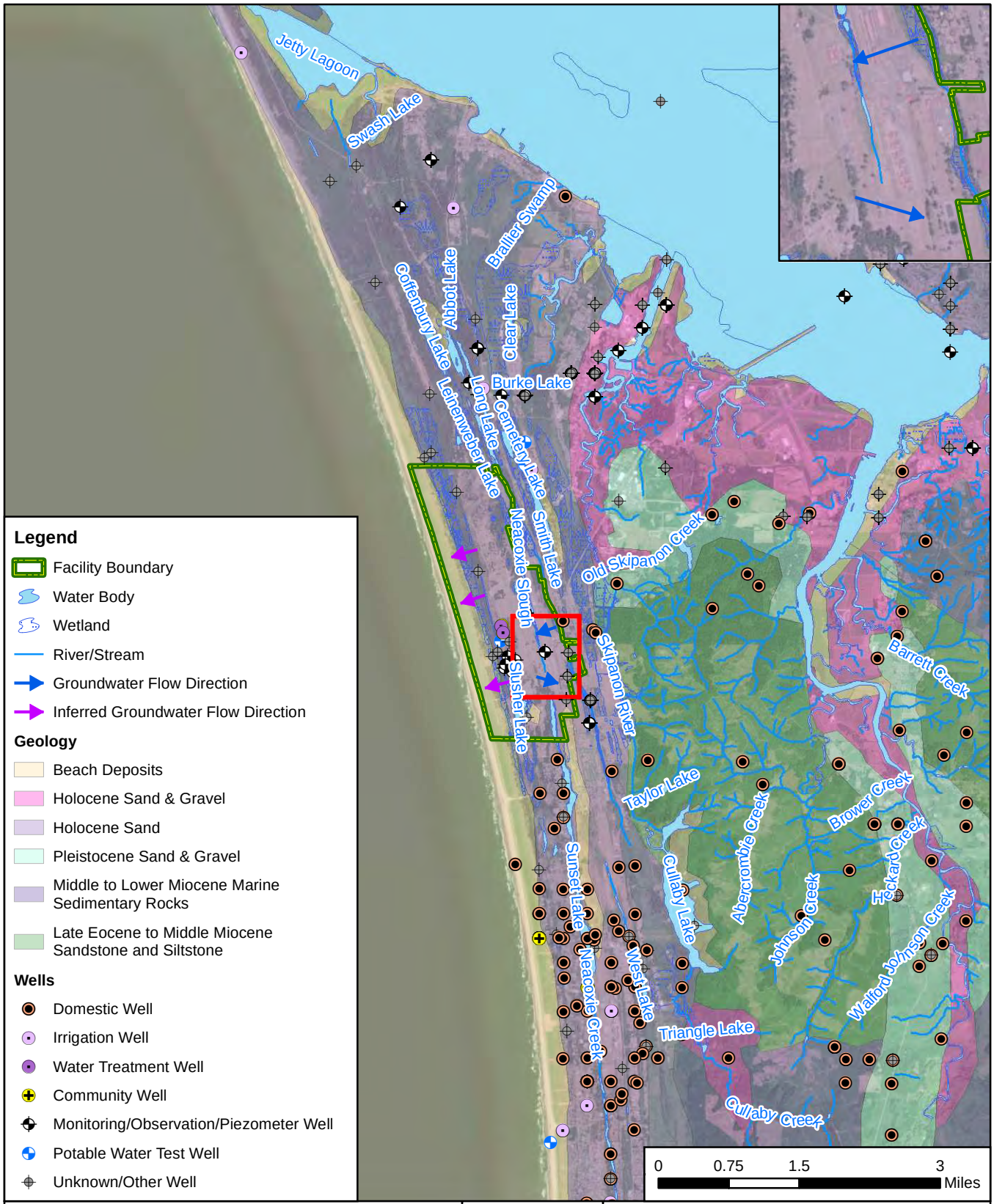
SCALE	1:24,000	CHK BY	MB	8/5/2022
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	8/5/2022

Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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SCALE	1:95,040	CHK BY	MB	9/19/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/19/2022

N

Groundwater Features

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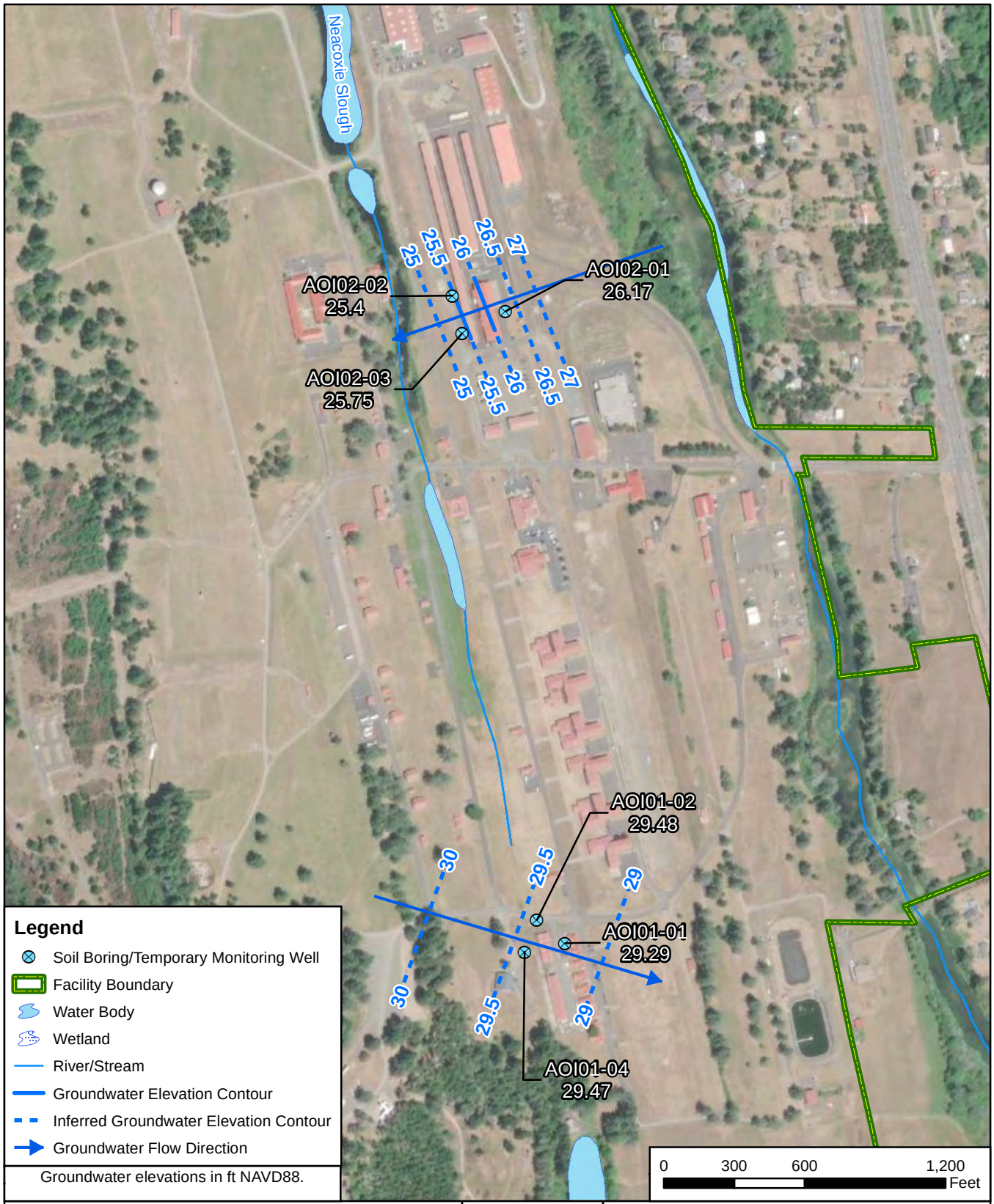
Germantown, MD 20876

Figure 2-3



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	10/20/2022	GIS BY	MS	10/20/2022
SCALE	1:7,200	CHK BY	VG	10/20/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/20/2022

N

Groundwater Elevations, January 2022

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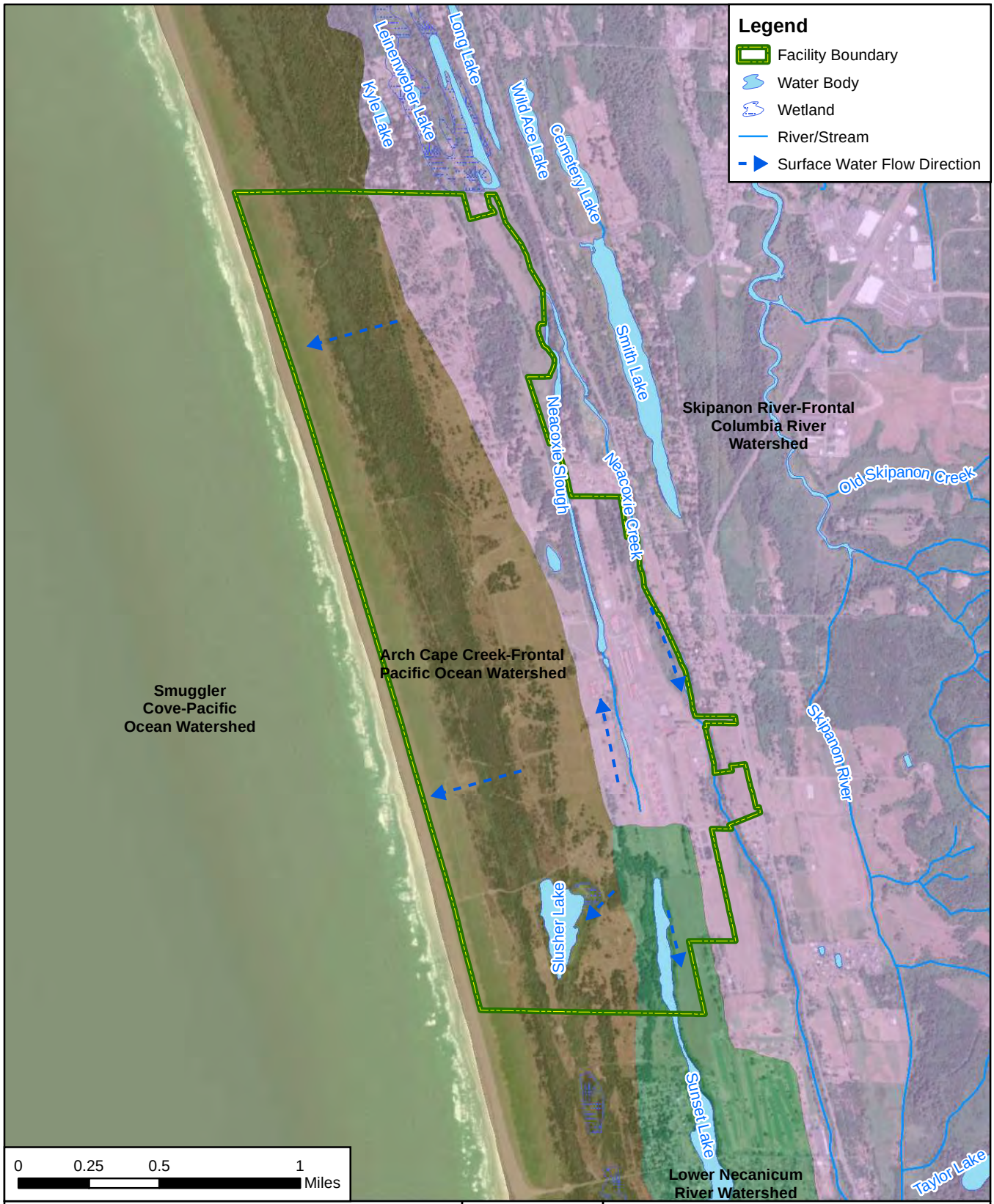
Germantown, MD 20876

Figure 2-4



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
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SCALE	1:31,680	CHK BY	MB	8/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/5/2022

Surface Water Features

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Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, two potential release areas were identified at Camp Rilea and were designated AOIs (AECOM, 2020). The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Former Fire Station – Building 7241

AOI 1 is Building 7241, a former fire station currently occupied by Public Works offices. The former fire station dates back to the early 1970s and was operational until at least 1980. Facility personnel interviewed could not confirm if a firetruck was operated or parked at the former station. Given the history of AFFF reportedly contained in the firetrucks parked at the UTES between 1989 and 1995 (refer to AOI 2 below), it is assumed if any firetrucks were parked at the former fire station, it would have also contained AFFF. Activities at the former fire station may have included washing the firetruck carrying AFFF, flushing out lines used for AFFF discharge at other locations, and storage of AFFF.

3.2 AOI 2 UTES: Former Firetruck Parking – Building 7156

AOI 2 is the UTES Former Firetruck Parking area surrounding Building 7156 in the central/eastern portion of the facility. One firetruck (model 530C) was present on-Post between 1989 and 1995. Another firetruck (model 2500L) was present on-Post from 1995 until an unknown time period. Both firetrucks, which had tank capacities of approximately 50 gallons each, reportedly contained AFFF. AFFF from the former firetrucks was reportedly never deployed on-Post. OMD maintenance personnel performed minor repairs and maintenance of the former firetrucks at the UTES.

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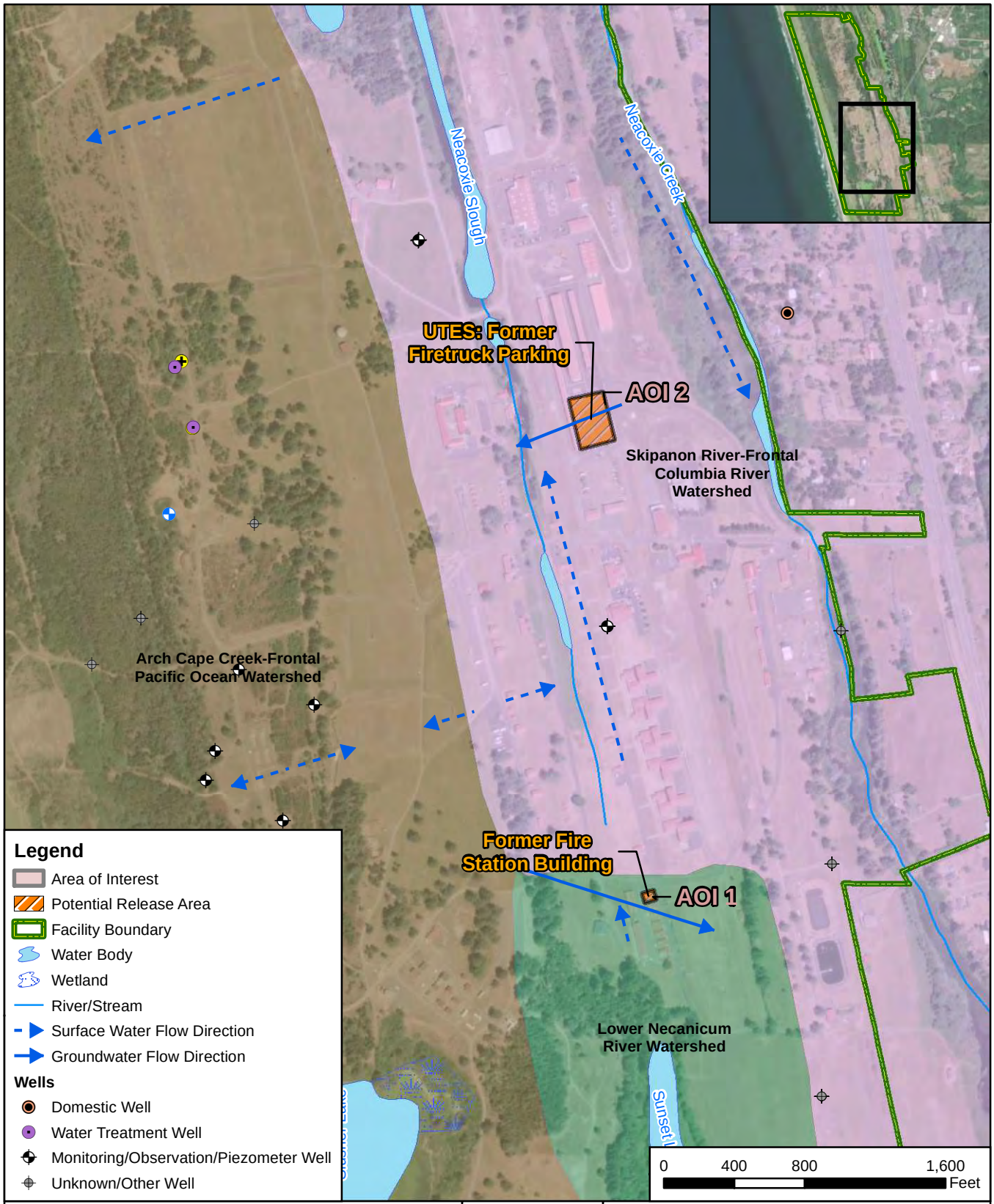

CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	8/5/2022	GIS BY	MS	8/5/2022
SCALE	1:9,600	CHK BY	MB	8/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/5/2022

Area of Interest

AECOM
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Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 Problem Statement

ARNG will recommend an AOI for Remedial Investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based SLs. The SLs are presented in **Section 6.1** of this report.

4.2 Information Inputs

Primary information inputs included:

- The PA for Camp Rilea (AECOM, 2020);
- Analytical data collected as part of ARNG drinking water well sampling efforts around the facility (ORDEQ, 2018):
    - PFOA was detected at a concentration of 0.719 ng/L. PFOS, PFBS, PFHxS, and PFNA concentrations were reported below laboratory MDLs;
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the winter season, which was the earliest available time field resources were available to complete the study.

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a).

4.5 Data Usability Assessment

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the SI QAPP Addendum (AECOM, 2021a).

5. Site Inspection Activities

This section describes the environmental investigation and sampling activities that occurred as part of the SI. The SI sampling approach was based on the findings of the PA and implemented in accordance with the following approved documents:

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Camp Rilea,* dated February 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Camp Rilea, Warrenton, Oregon* dated September 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan, Camp Rilea, Warrenton, Oregon* dated September 2021 (AECOM, 2021b).

The SI field activities were conducted from 11, 12, and 18 to 19 January 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, sediment collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

The following samples were collected during the SI and analyzed for a subset of 18 compounds by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15 to fulfill the project DQOs:

- Thirteen (13) soil samples from six boring locations;
- Six grab groundwater samples from six temporary wells;
- Two sediment samples from two locations;
- Thirteen (13) quality assurance (QA)/quality control (QC) samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, and land survey data are provided in **Appendix B3**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

In preparation for the SI field activities, project team members participated in Technical Project Planning (TPP) meetings, performed utility clearance, and sampled decontamination source water. Details for each of these activities are presented below.

5.1.1 Technical Project Planning

The US Army Corps of Engineers (USACE) TPP Process, Engineer Manual (EM) 200-1-2 (USACE, 2016) defines four phases to project planning: 1.) defining the project phase; 2.) determining data needs; 3.) developing data collection strategies; and 4.) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with

defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 30 June 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, ORARNG, USACE, Oregon DEQ, Oregon Health Authority, representatives familiar with the facility, and the regulations. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021a).

A TPP Meeting 3 was held after the field event (TBD) to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM placed a ticket with the USA North 811 “Call Before You Dig” Oregon utility clearance provider to notify them of intrusive work on 12 January 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 11 January 2022 with input from the AECOM field team and Camp Rilea facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

PFAS-free ASTM Type II deionized water was purchased from Grainger and used in this investigation as the main source of decontamination for drilling equipment. Two equipment blanks were collected during the event (CR-ERB-01 and CR-ERB-02) and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water samples associated with the equipment blanks used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021a). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Borings were installed in grass areas where applicable, to avoid disturbing concrete or asphalt surfaces. Soil samples were collected via direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2021a). A GeoProbe® 6712DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1** and depths are provided **Table 5-1**.

In general, three discrete soil samples were anticipated to be collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample

at the mid-point between the surface and the groundwater table. Due to shallow groundwater at AOI1, only the surface soil samples were collected at each of the three boreholes and one shallow subsurface sample was collected at AOI01-02. All samples were collected as planned at AOI2.

The soil cores were continuously logged for lithological descriptions by an AECOM field geologist using the Unified Soil Classification System (USCS). A photoionization detector (PID) was used to screen the breathing zone during boring activities as part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook (i.e., composition notebook). Depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

During the SI, fine- to medium-grained, poorly graded sand was observed as the dominant lithology of the unconsolidated sediments below Camp Rilea. The borings were completed at depths between 7 and 30 feet bgs. These results and facility observations are consistent with the reported depositional environment of the region.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), and pH (USEPA Method 9045D) in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, equipment rinsate blanks were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) using bentonite chips at completion of sampling activities. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® 6712DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-foot section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected after a period of time after well installation to allow groundwater to infiltrate and recharge the temporary well screen intervals. After the recharge period, groundwater samples were collected using a bladder pump with PFAS-free HDPE tubing. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, turbidity, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected. At each well, the turbidity did not reduce to ≤ 25 nephelometric turbidity units (NTU) or stabilize at a level above 25 NTU after one hour of low flow purging. In accordance with the SI QAPP Addendum, purging was limited to one hour prior to sampling. Additionally, a

subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.5**), temporary wells were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with 3/8-inch hydrated bentonite gravel. Upon completion of well abandonment, the ground surface at each location was patched to match existing surrounding conditions.

5.4 Sediment Sampling

Sediment samples were collected from AOI 2 within the catch basin. Sediment samples collected in accordance with the SI QAPP Addendum (AECOM, 2021a).

A sediment coring device (hand auger) was used to collect the sediment sample from the first 2 foot of sediment. The sediment was transferred to a Ziploc bag, where the sample was homogenized and stones in excess of 1 centimeter were removed. The sediment sample locations are shown on **Figure 5-1**, and sample depths are provided **Table 5-1**.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory for analysis by LC/MS/MS compliant with QSM 5.1 Table B-15, in accordance with the SI QAPP Addendum (AECOM, 2021a).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, equipment rinsate blank samples were collected at a rate of 5% and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

5.5 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 19 January 2022. Groundwater elevation measurements were collected from the six new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data is provided in **Table 5-2**.

5.6 Surveying

The northern side of each temporary well casing was surveyed by Oregon-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 19

January 2022 in the applicable Universal Transverse Mercator zone projection with North American Datum of 1983 (NAD83) (horizontal) and World Geodetic System 1984 (WGS 1984) (vertical). The surveyed well data are provided in **Appendix B3**.

5.7 Investigation-Derived Waste

As of the date of this report, the disposal of investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2021a) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were contained in labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and left onsite in a waste storage area designated by ORARNG. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location. Based on laboratory results, containerized soil cuttings will be managed and disposed by ARNG, either by offsite disposal or, where PFAS concentrations are non-detect, ARNG will distribute the soil on the downgradient side of the associated borehole.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were contained in labeled, 55-gallon DOT-approved steel drums, and left onsite in the designated waste storage area specified by ORARNG. The liquid IDW was not sampled and assumes the PFAS characteristics of the associated groundwater samples collected from that source location. Based on laboratory results, containerized liquid IDW will be managed and disposed by ARNG under a separate contract for Treating Liquid Investigation-Derived Material (Purge water, drilling water, and decontamination fluids) (EA Engineering, Science, and Technology, Inc., 2021). ARNG will further coordinate with the ORDEQ to ensure proper disposal is in accordance with OAR Chapter 340 and the Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities were disposed of at a licensed solid waste landfill.

5.8 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.9 Deviations from SI QAPP Addendum

No deviations from the SI QAPP Addendum were identified during the review of field documentation.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Camp Rilea, Oregon

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	1/18/2022 13:40	0 - 2	X				
AOI01-01-SB-4-5	1/18/2022 14:15	4 - 5	X				
AOI01-02-SB-0-2	1/18/2022 12:00	0 - 2	X				
AOI01-02-SB-0-2-D	1/18/2022 12:00	0 - 2	X	X	X		FD
AOI01-02-SB-0-2-MS	1/18/2022 12:00	0 - 2	X	X	X		MS
AOI01-02-SB-0-2-MSD	1/18/2022 12:00	0 - 2	X	X	X		MSD
AOI01-03-SB-0-2	1/18/2022 13:55	0 - 2	X				
AOI02-01-SB-0-2	1/19/2022 11:05	0 - 2	X				
AOI02-01-SB-13-15	1/19/2022 11:45	13 - 15	X				
AOI02-01-SB-22-23	1/19/2022 11:50	22 - 23	X	X	X		
AOI02-01-SB-22-23-D	1/19/2022 11:50	22 - 23	X	X	X		FD
AOI02-02-SB-0-2	1/18/2022 15:10	0 - 2	X				
AOI02-02-SB-13-15	1/18/2022 16:20	13 - 15	X				
AOI02-02-SB-23.5-24.5	1/18/2022 16:25	23.5-24.5	X				
AOI02-03-SB-0-2	1/19/2022 8:55	0 - 2	X				
AOI02-03-SB-13-15	1/19/2022 9:25	13 - 15	X				
AOI02-03-SB-22-23	1/19/2022 9:45	22 - 23	X				
Sediment Samples							
AOI-02-04-SD-0-2	1/19/2022 14:30	0 - 2	X				
AOI-02-05-SD-0-2	1/19/2022 14:00	0 - 2	X				
AOI-02-05-SD-0-2-D	1/19/2022 14:00	0 - 2	X				FD
AOI-02-05-SD-0-2-MS	1/19/2022 14:00	0 - 2	X				MS
AOI-02-05-SD-0-2-MSD	1/19/2022 14:00	0 - 2	X				MSD
Groundwater Samples							
AOI01-01-GW	1/18/2022 16:00	NA	X				
AOI01-02-GW	1/18/2022 14:25	NA	X				
AOI01-02-GW-D	1/18/2022 14:25	NA	X				FD
AOI01-02-GW-MS	1/18/2022 14:25	NA	X				MS
AOI01-02-GW-MSD	1/18/2022 14:25	NA	X				MSD
AOI01-04-GW	1/18/2022 12:55	NA	X				
AOI02-01-GW	1/19/2022 13:50	NA	X				
AOI02-02-GW	1/19/2022 10:15	NA	X				
AOI02-03-GW	1/19/2022 12:00	NA	X				

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Camp Rilea, Oregon

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Quality Control Samples							
CR-ERB-01	1/18/2022 10:45	NA	X				Hand Auger
CR-ERB-02	1/19/2022 13:15	NA	X				DPT Shoe
CR-FRB-01	1/20/2022 9:00	NA	X				NA

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
CR = Camp Rilea
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Camp Rilea, Oregon

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	10	5 - 10	34.25	34.04	4.96	4.75	29.29
	AOI01-02	7	2 - 7	34.34	31.38	4.86	1.90	29.48
	AOI01-04	15	5 - 15	35.86	35.77	6.39	6.30	29.47
2	AOI02-01	30	25 - 30	51.88	47.41	25.71	21.24	26.17
	AOI02-02	30	25 - 30	50.54	48.45	25.14	23.05	25.40
	AOI02-03	30	25 - 30	48.57	48.51	22.82	22.76	25.75

Notes:

[1] Temporary well screen set above total depth to capture groundwater interface

bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

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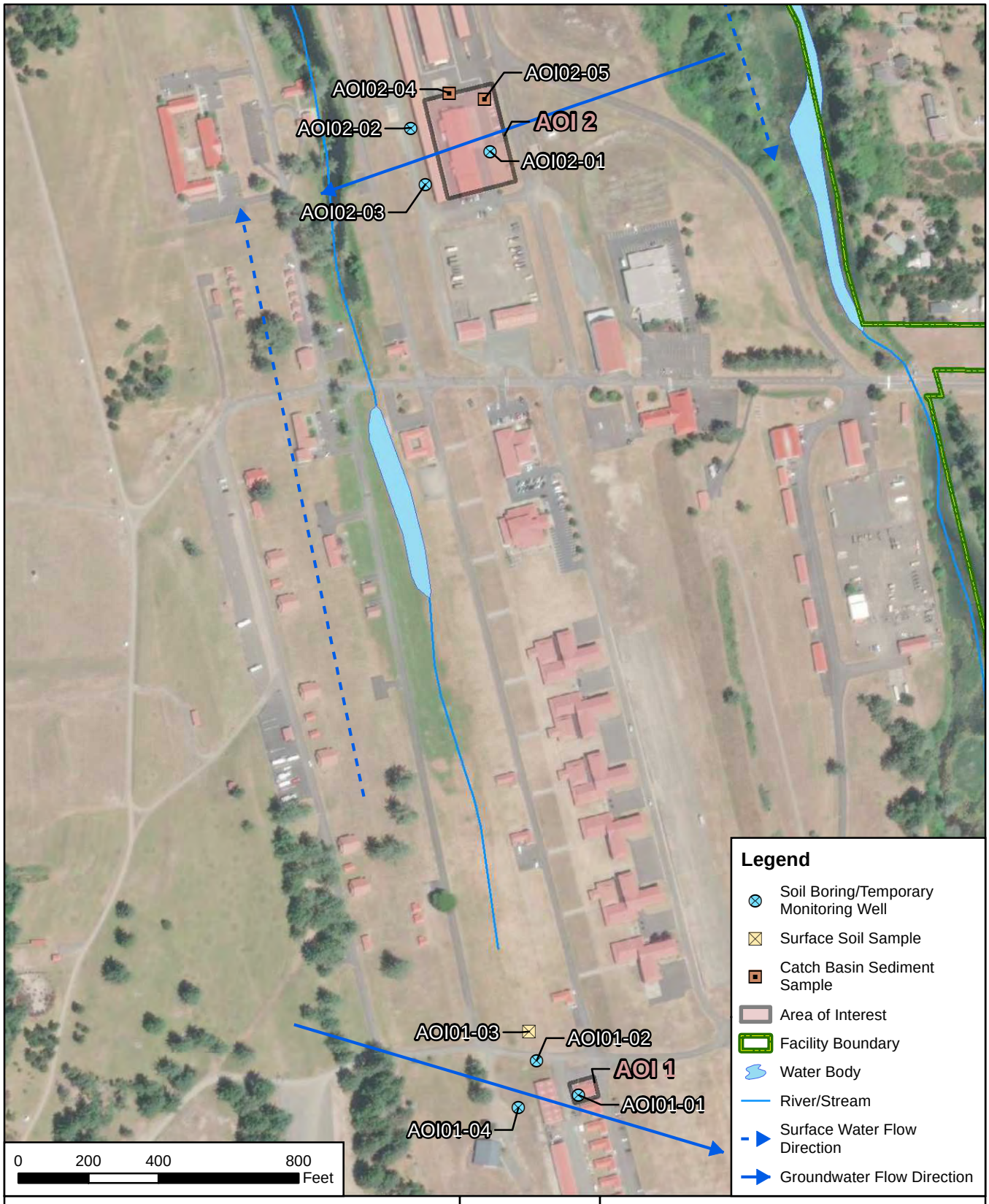

CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	9/19/2022	GIS BY	MS	9/19/2022
SCALE	1:4,800	CHK BY	MB	9/19/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/19/2022

N

Site Inspection Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.4**. **Table 6-2** through **Table 6-6** present results in soil, groundwater, or sediment for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 6 July 2022 (Assistant Secretary of Defense, 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1** below.

Table 6-1: Screening Levels (Soil and Groundwater)

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

The data in the subsequent sections are compared to the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the facility: the residential scenario is applied to surface soil results (0 to 2 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 Soil Physicochemical Analyses

To provide basic soil parameter information, soil samples were analyzed for TOC and pH, which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC and pH sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy 2006; Guelfo and Higgins, 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC, 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Former Fire Station – Building 7241. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Surface soil was sampled from 0 to 2 feet bgs at boring locations AOI01-01 through AOI01-03 and from the shallow subsurface at 4 to 5 feet bgs from AOI01-01. Deep subsurface soil was not collected at AOI 1 due to shallow groundwater conditions.

PFOA, PFOS, and PFNA were detected in soil at estimated concentrations less than 1 µg/kg and were about two orders of magnitude below their respective SLs in surface soil. PFHxS and PFBS were not detected in surface soil.

PFOA, PFOS, and PFNA were detected in the single shallow subsurface soil at estimated concentrations less than 1 µg/kg and were at least three orders of magnitude below their respective SLs. PFHxS and PFBS were not detected in shallow subsurface soil.

6.3.2 AOI 1 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring wells AOI01-01, AOI01-02, and AOI01-04. The results for detected relevant compounds are summarized below. PFNA and PFBS were not detected in any groundwater samples.

- PFOA was detected above the SL of 6 ng/L at AOI01-01, with a concentration of 7.66 ng/L.
- PFOA was detected below the SL of 6 ng/L at AOI01-02, with a concentration of 1.29 J ng/L.

- PFOS was detected below the SL of 4 ng/L at AOI01-02, with a concentration of 3.13 J ng/L.
- PFHxS was detected below the SL of 39 ng/L at AOI01-01, with a concentration of 1.86 J ng/L.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFNA were detected in soil below their respective SLs. PFOA in groundwater was detected above the SL of 6 ng/L at AOI01-01. Based on the exceedance of an SL in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil, groundwater, and sediment in comparison to SLs for AOI 2: UTES: Former Firetruck Parking – Building 7156. The results in soil, groundwater, and sediment are summarized on **Table 6-2** through **Table 6-6**. Soil, groundwater, and sediment results are presented on **Figure 6-1** through **Figure 6-9**.

6.4.1 AOI 2 Soil Analytical Results

Figure 6-1 through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

Surface soil was sampled from 0 to 2 feet bgs, from the shallow subsurface interval of 13 to 15 feet bgs, and deep subsurface interval of 22 to 24.5 feet bgs at boring locations AOI02-01 through AOI02-03.

PFOA, PFHxS, PFNA, and PFBS were detected in soil at estimated concentrations less than 1 µg/kg and were at least two orders of magnitude below their respective SLs in surface soil. PFOS was detected below the SL of 13 µg/kg at AOI02-01 and AOI02-03, with concentrations ranging from 0.138 J to 5.86 µg/kg, respectively.

PFHxS and PFBS were detected in shallow subsurface soil at estimated concentrations less than 1 µg/kg and were at least four orders of magnitude below their respective SLs. PFOS was detected in shallow subsurface soil above 1 µg/kg but was almost two orders of magnitude below the respective SL at AOI02-03. PFOA and PFNA were not detected in shallow subsurface soil.

PFOS, PFHxS, and PFBS were detected in deep subsurface soil at estimated concentrations. PFOA and PFNA were not detected in deep subsurface soil.

- PFOS was detected at AOI02-02, with a concentration of 3.23 µg/kg.
- PFHxS was detected at AOI02-02, with a concentration of 0.436 J µg/kg.
- PFBS was detected at AOI02-02, with a concentration of 0.056 J µg/kg.

6.4.2 AOI 2 Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring wells AOI2-01 through AOI2-03. Results are summarized below.

- PFOS was detected above the SL of 4 ng/L at AOI02-01, with a concentration of 32.9 ng/L. PFOS was detected at concentrations of 1.81 J ng/L or lower in the other two wells.
- PFOA was detected below the SL of 6 ng/L at all three locations, with concentrations ranging from 1.02 J ng/L to 3.93 ng/L.
- PFHxS was detected below the SL of 39 ng/L at all three locations, with concentrations ranging from 1.38 J ng/L to 14.1 ng/L.
- PFNA was detected below the SL of 6 ng/L at AOI02-01, with a concentration of 1.10 J ng/L.
- PFBS was detected below the SL of 601 ng/L at AOI02-01, with a concentration of 0.787 J ng/L.

6.4.3 AOI 2 Sediment Analytical Results

Sediment was sampled at two locations (AOI02-04 and AOI02-05) within the two catch basins that surround Building 7156 storage area and general parking area. PFOA and PFNA were not detected in both sediment sample locations. **Figure 6-8** through **Figure 6-9** present the ranges of detections in sediment. **Table 6-6** summarizes the sediment results. SLs are not available for sediment and these results are presented for informational purposes only.

- PFOS was detected in both sediment samples (including one duplicate sample) at concentrations ranging from 0.301 J µg/kg to 0.584 J µg/kg.
- PFHxS was detected at AOI02-05 (including one duplicate sample) at concentrations ranging of 0.093 J µg/kg and 0.132 J µg/kg.
- PFBS was detected at AOI02-05 (including one duplicate sample) at concentrations ranging of 0.045 J µg/kg and 0.047 J µg/kg.

6.4.4 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil below their respective SLs. PFOS was detected above the SL of 4 ng/L in groundwater at AOI02-01. PFOS, PFHxS, and PFBS were detected in sediment at AOI 2. There are no established SLs for sediment; therefore, these results are presented for informational purposes only. Based on the exceedances of the SL in groundwater, further evaluation at AOI 2 is warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Camp Rilea

Area of Interest		AOI01								AOI02					
Sample ID		AOI01-01-SB-0-2		AOI01-02-SB-0-2		AOI01-02-SB-0-2-D		AOI01-03-SB-0-2		AOI02-01-SB-0-2		AOI02-02-SB-0-2		AOI02-03-SB-0-2	
Sample Date		01/18/2022		01/18/2022		01/18/2022		01/18/2022		01/19/2022		01/18/2022		01/19/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.087	J
PFHxS	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.736	J
PFNA	19	0.271	J	ND	U	ND	U	ND	U	ND	U	0.025	J	ND	U
PFOA	19	0.150	J	ND	U	ND	U	ND	U	0.090	J	ND	U	0.132	J
PFOS	13	0.313	J	0.117	J	0.075	J	ND	U	0.138	J	ND	U	5.86	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, Camp Rilea

Area of Interest		AOI01		AOI02					
Sample ID		AOI01-01-SB-4-5		AOI02-01-SB-13-15		AOI02-02-SB-13-15		AOI02-03-SB-13-15	
Sample Date		01/18/2022		01/19/2022		01/18/2022		01/19/2022	
Depth		4-5 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)									
PFBS	25000	ND	U	ND	U	ND	U	0.063	J
PFHxS	1600	ND	U	ND	U	ND	U	0.521	J
PFNA	250	0.103	J	ND	U	ND	U	ND	U
PFOA	250	0.146	J	ND	U	ND	U	ND	U
PFOS	160	0.102	J	ND	U	ND	U	3.82	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AOI	Area of Interest
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, Camp Rilea

Area of Interest	AOI02							
Sample ID	AOI02-01-SB-22-23		AOI02-01-SB-22-23-D		AOI02-02-SB-23.5-24.5		AOI02-03-SB-22-23	
Sample Date	01/19/2022		01/19/2022		01/18/2022		01/19/2022	
Depth	22-23 ft		22-23 ft		23.5-24.5 ft		22-23 ft	
Analyte	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)								
PFBS	ND	U	ND	U	0.056	J	ND	U
PFHxS	ND	U	ND	U	0.436	J	ND	U
PFNA	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U
PFOS	ND	U	ND	U	3.23		ND	U

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
µg/kg	micrograms per kilogram

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Camp Rilea

Area of Interest		AOI01								AOI02					
Sample ID		AOI01-01-GW		AOI01-02-GW		AOI01-02-GW-D		AOI01-04-GW		AOI02-01-GW		AOI02-02-GW		AOI02-03-GW	
Sample Date		01/18/2022		01/18/2022		01/18/2022		01/18/2022		01/19/2022		01/19/2022		01/19/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)															
PFBS	601	ND	U	ND	U	ND	U	ND	U	0.787	J	ND	U	ND	U
PFHxS	39	1.86	J	ND	U	ND	U	ND	U	14.1		1.38	J	1.82	J
PFNA	6	ND	U	ND	U	ND	U	ND	U	1.10	J	ND	U	ND	U
PFOA	6	7.66		1.14	J	1.29	J	ND	U	3.93		2.90	J	1.02	J
PFOS	4	ND	U	3.13	J	2.61	J	ND	U	32.9		0.922	J	1.81	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022 Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	duplicate
DL	detection limit
GW	groundwater
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

Table 6-6
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Sediment
Site Inspection Report, Camp Rilea

Area of Interest	AOI02					
Sample ID	AOI02-04-SD-0-2		AOI02-05-SD-0-2		AOI02-05-SD-0-2-D	
Sample Date	01/19/2022		01/19/2022		01/19/2022	
Depth	0-2 ft		0-2 ft		0-2 ft	
Analyte	Result	Qual	Result	Qual	Result	Qual
Sediment, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)						
PFBS	ND	U	0.045	J	0.047	J
PFHxS	ND	U	0.093	J	0.132	J
PFNA	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U
PFOS	0.506	J	0.301	J	0.584	J

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SD	sediment
µg/kg	micrograms per kilogram

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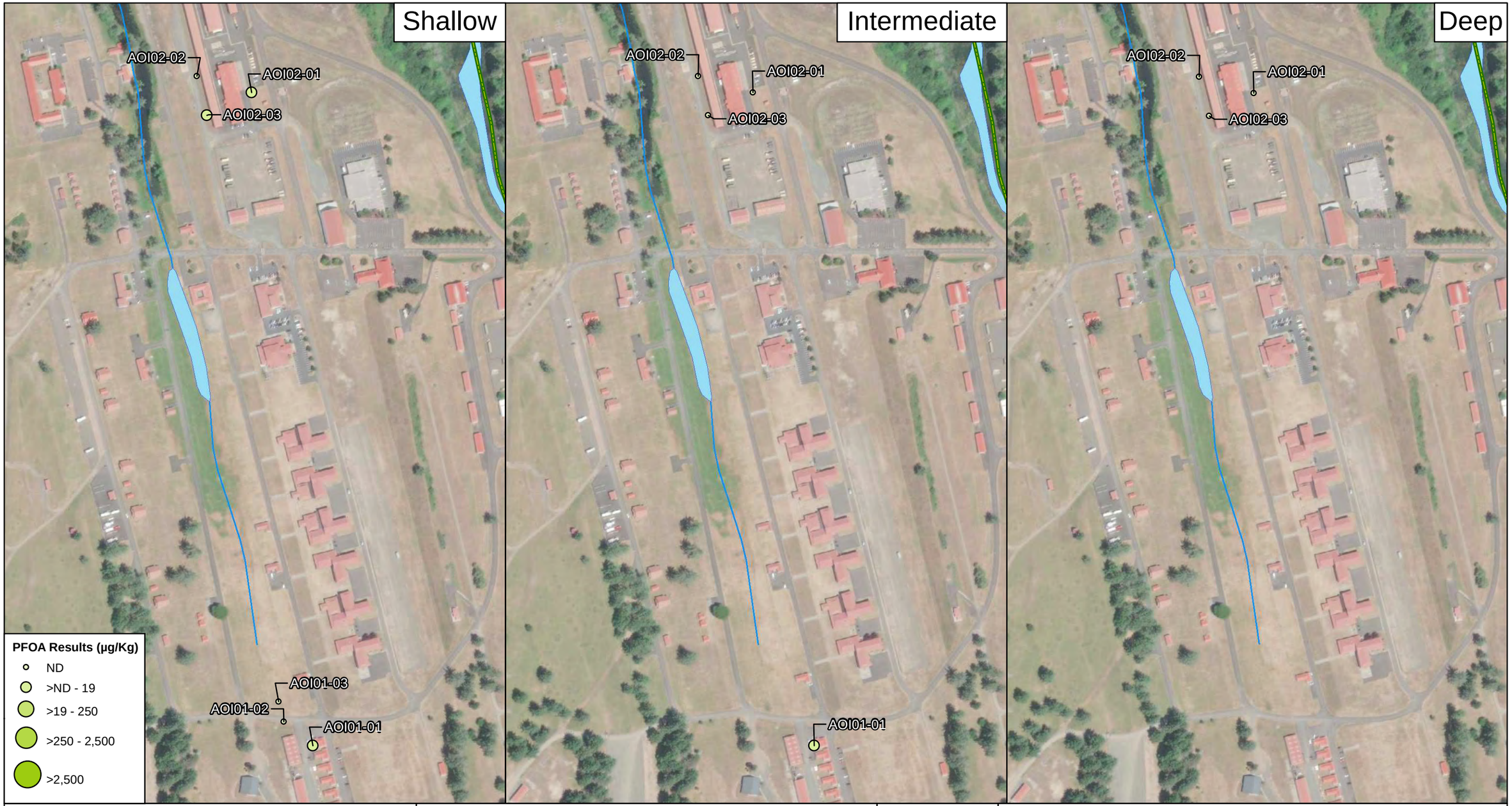

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SCALE	1:4,800	CHK BY	JH	8/17/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/17/2022

Facility Boundary
Water Body
River/Stream

0 200 400 800 Feet

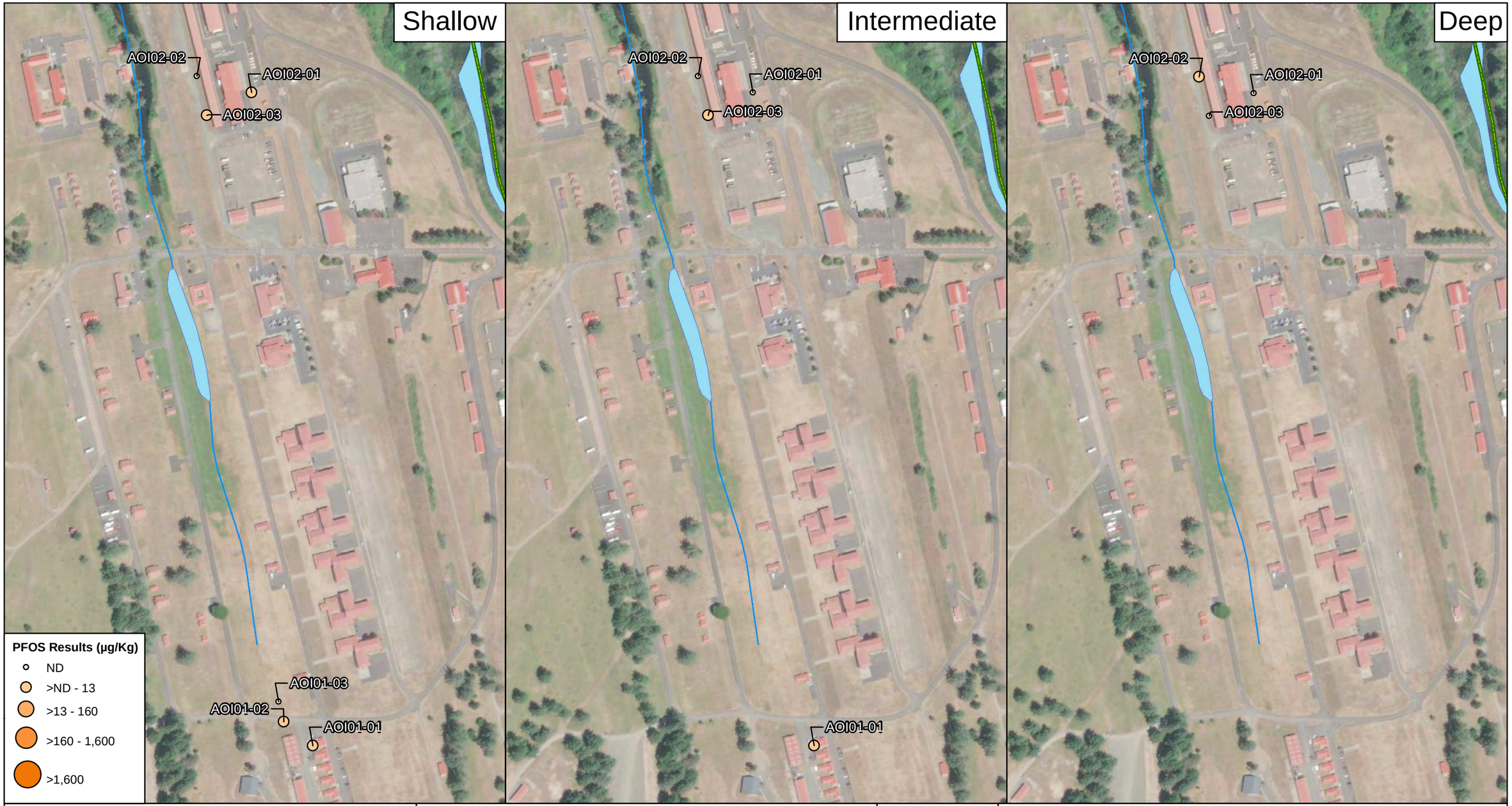
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-1



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SCALE	1:4,800	CHK BY	JH	8/11/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/11/2022

Facility Boundary
Water Body
Wetland
River/Stream

0 200 400 800 Feet

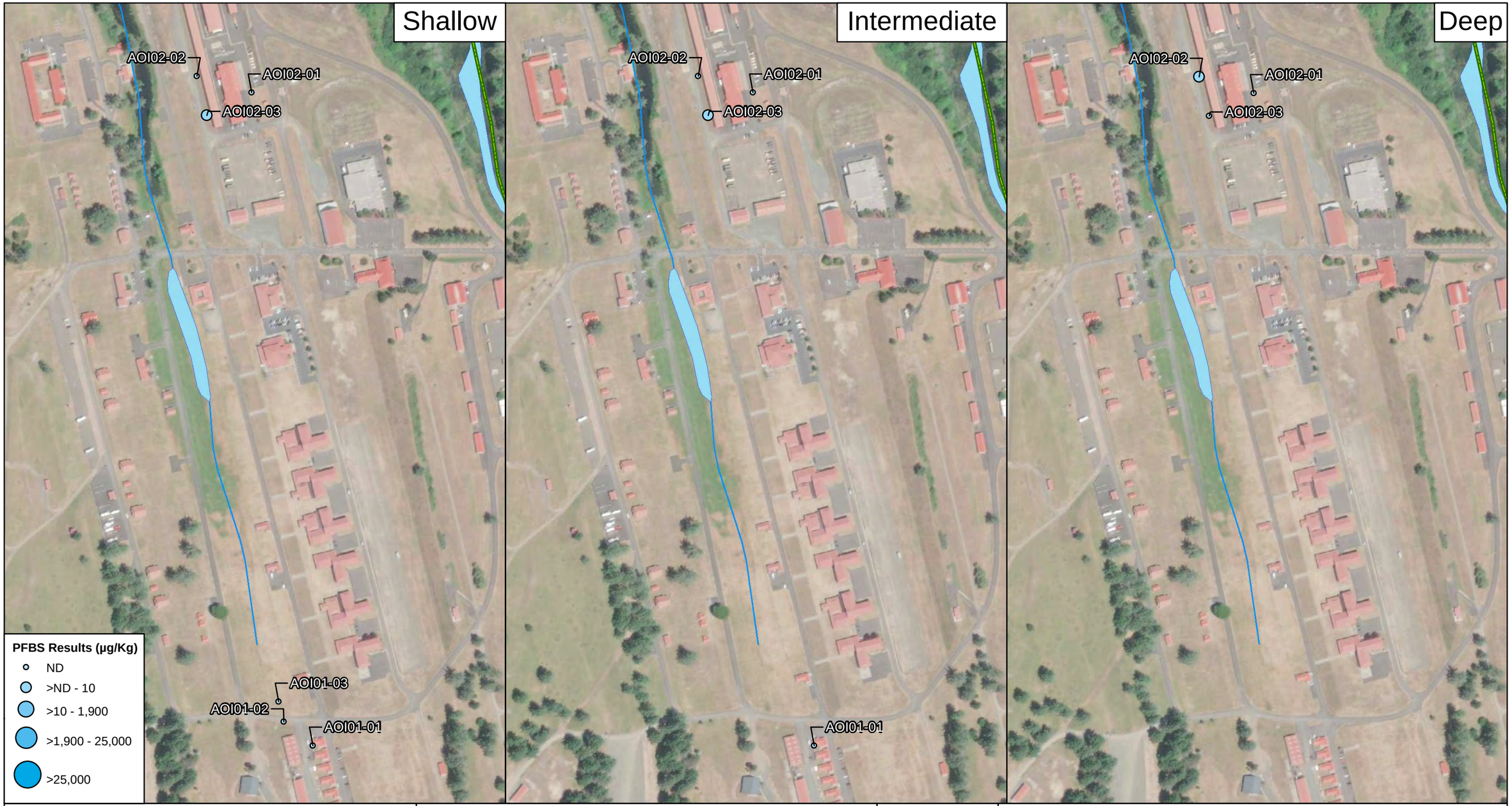
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFOS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-2



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PROJECT	Site Inspection at Camp Rilea, OR			
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SCALE	1:4,800	CHK BY	JH	8/11/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/11/2022

Facility Boundary
Water Body
Wetland
River/Stream

0 200 400 800 Feet

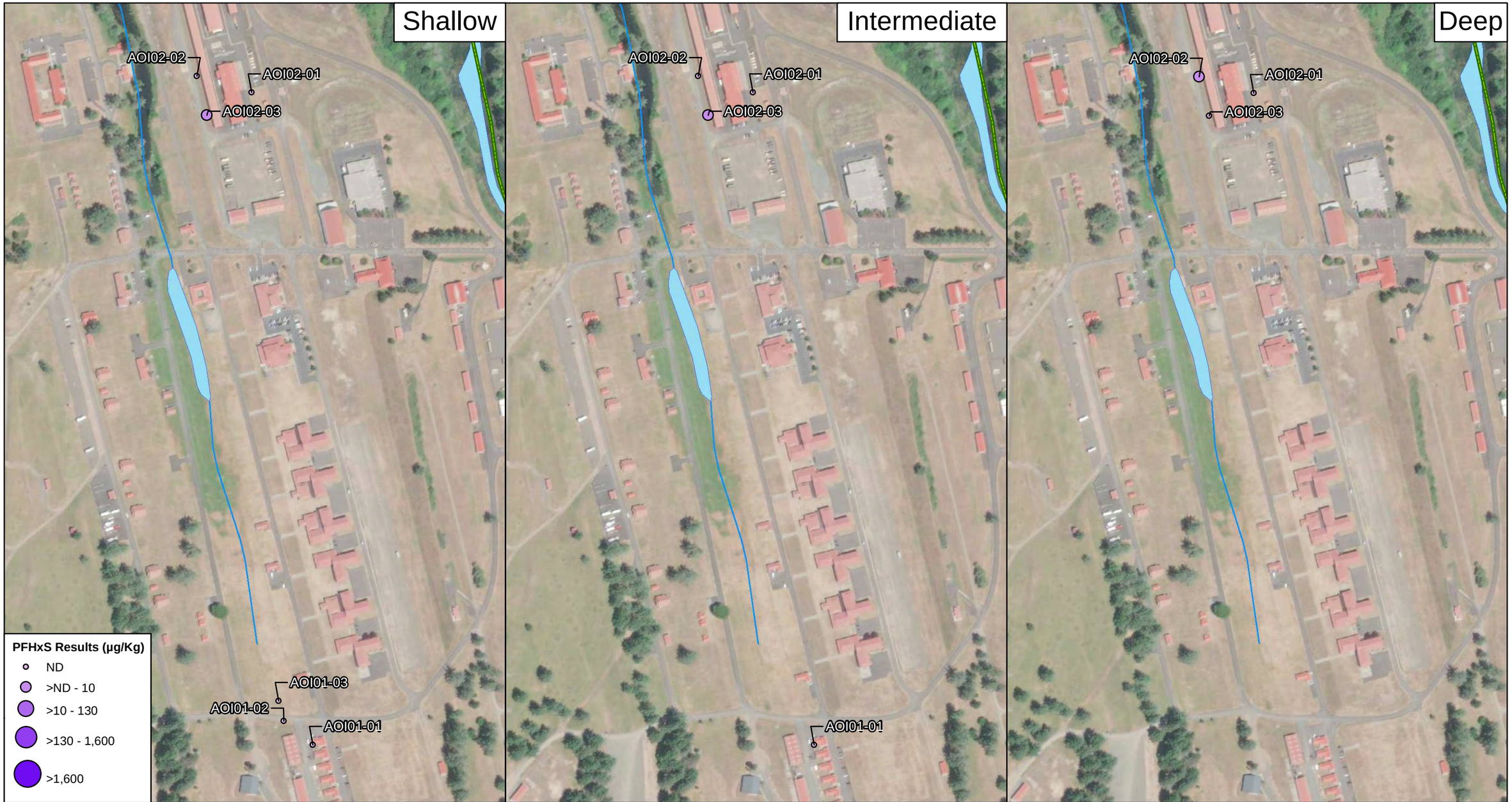
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFBS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-3



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
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SCALE	1:4,800	CHK BY	JH	8/11/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/11/2022

Facility Boundary
Water Body
Wetland
River/Stream

0 200 400 800 Feet

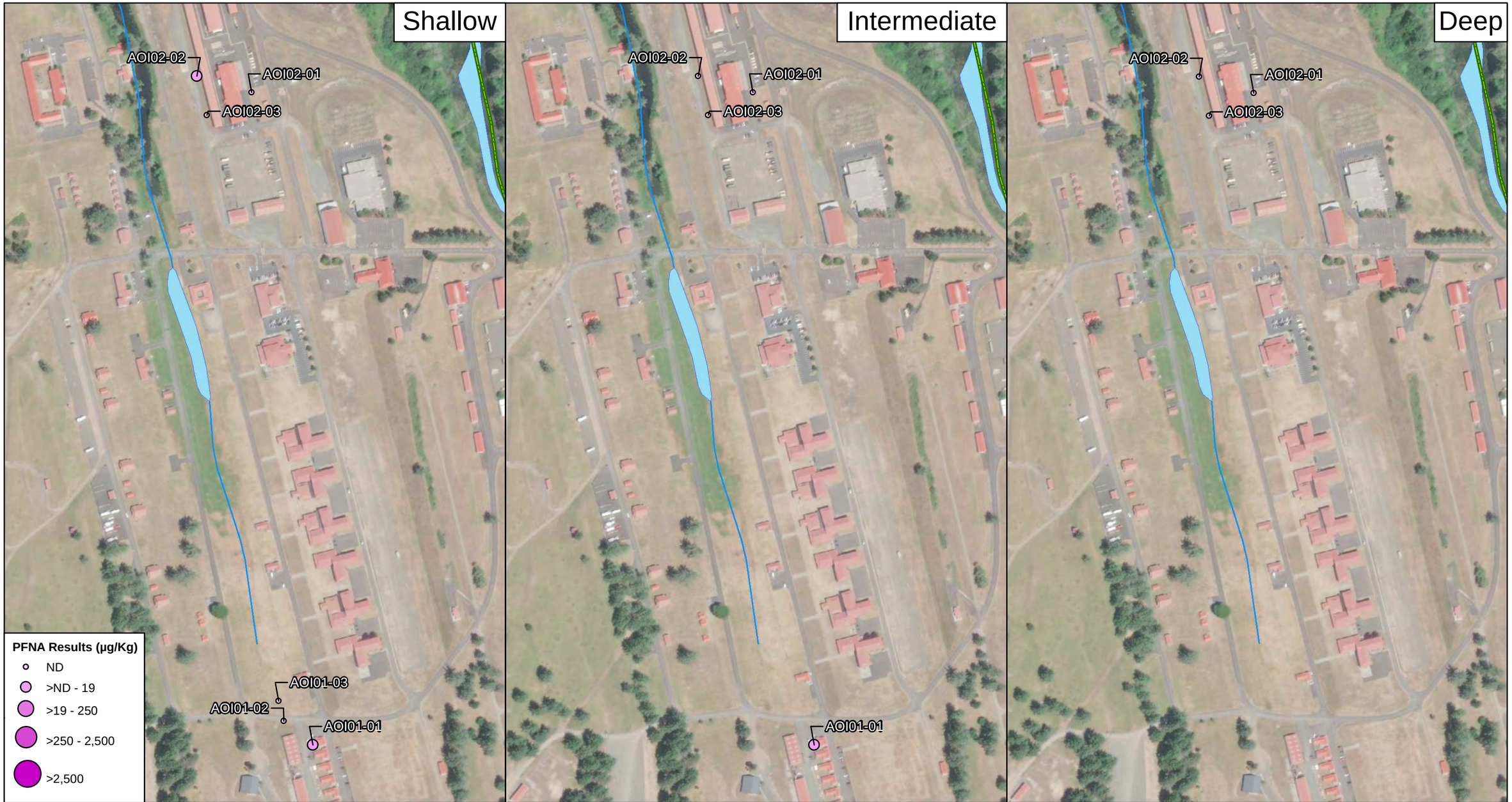
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFHxS Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-4



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	8/11/2022	GIS BY	MS	8/11/2022
SCALE	1:4,800	CHK BY	JH	8/11/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/11/2022

Facility Boundary
Water Body
Wetland
River/Stream

0 200 400 800 Feet

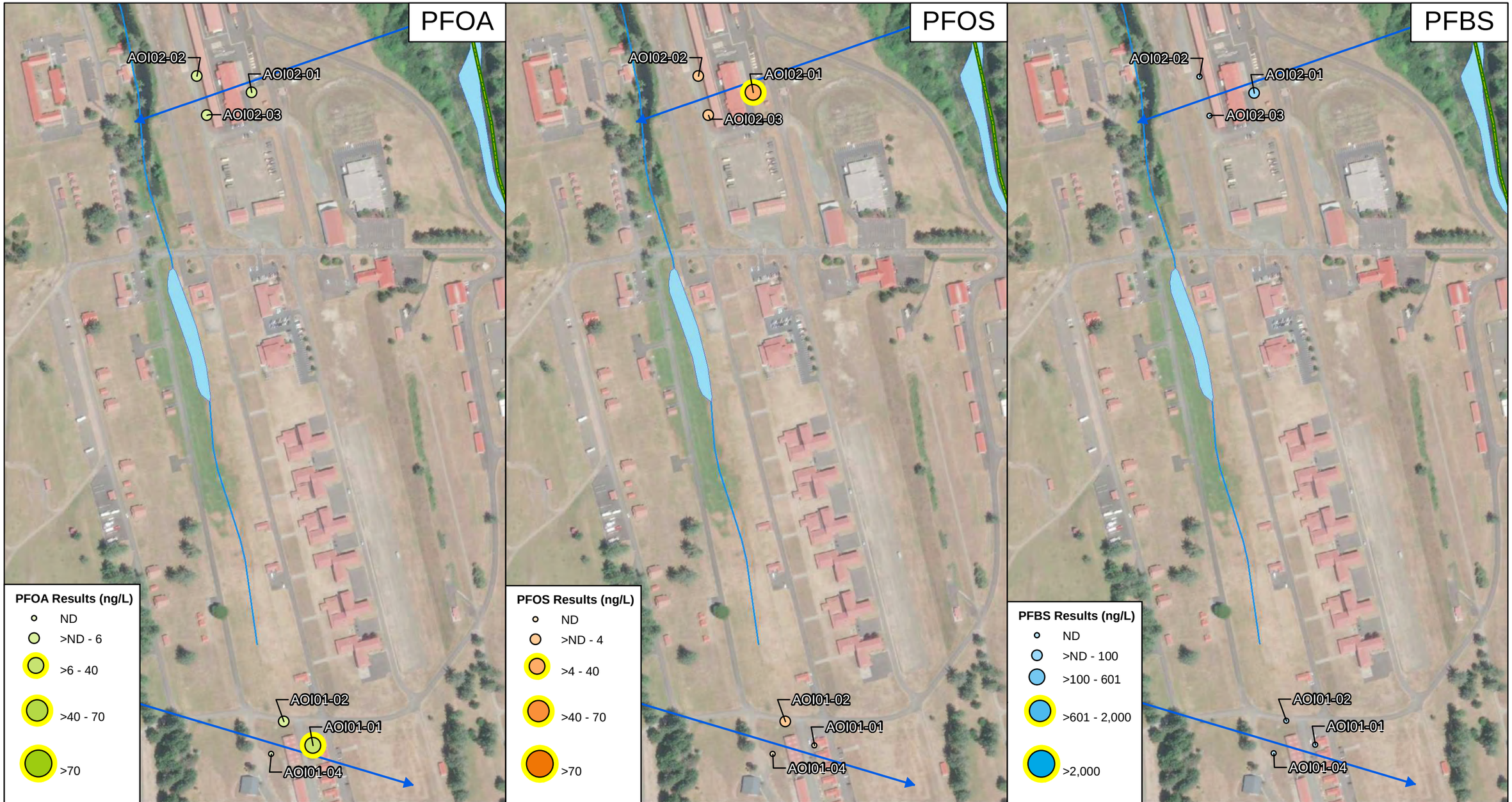
Exceedances of the OSD SL are depicted with a yellow halo.
Depth intervals shown represent respective sampling position within a given soil boring location.

N

PFNA Detections in Soil

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-5



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:4,800	CHK BY	JH	10/5/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/5/2022

Facility Boundary
Water Body
Wetland
River/Stream
Groundwater Flow Direction

0 200 400 800 Feet

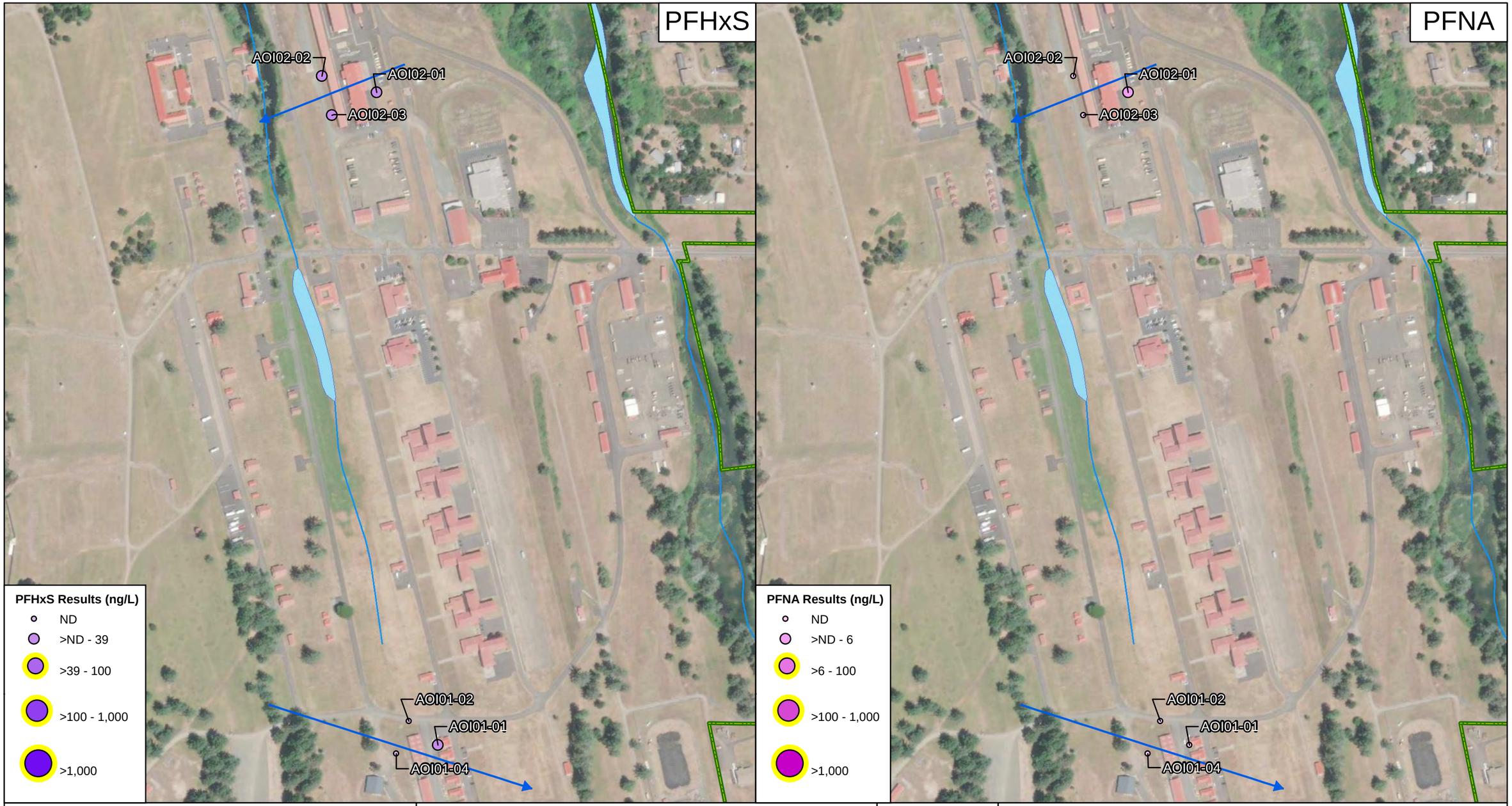
Exceedances of the OSD SL are depicted with a yellow halo.

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-6



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	8/31/2022	GIS BY	MS	8/31/2022
SCALE	1:4,800	CHK BY	JH	8/31/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/31/2022

Facility Boundary
Water Body
Wetland
River/Stream
Groundwater Flow Direction

0 200 400 800 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

N

PFHxS, and PFNA Detections in Groundwater

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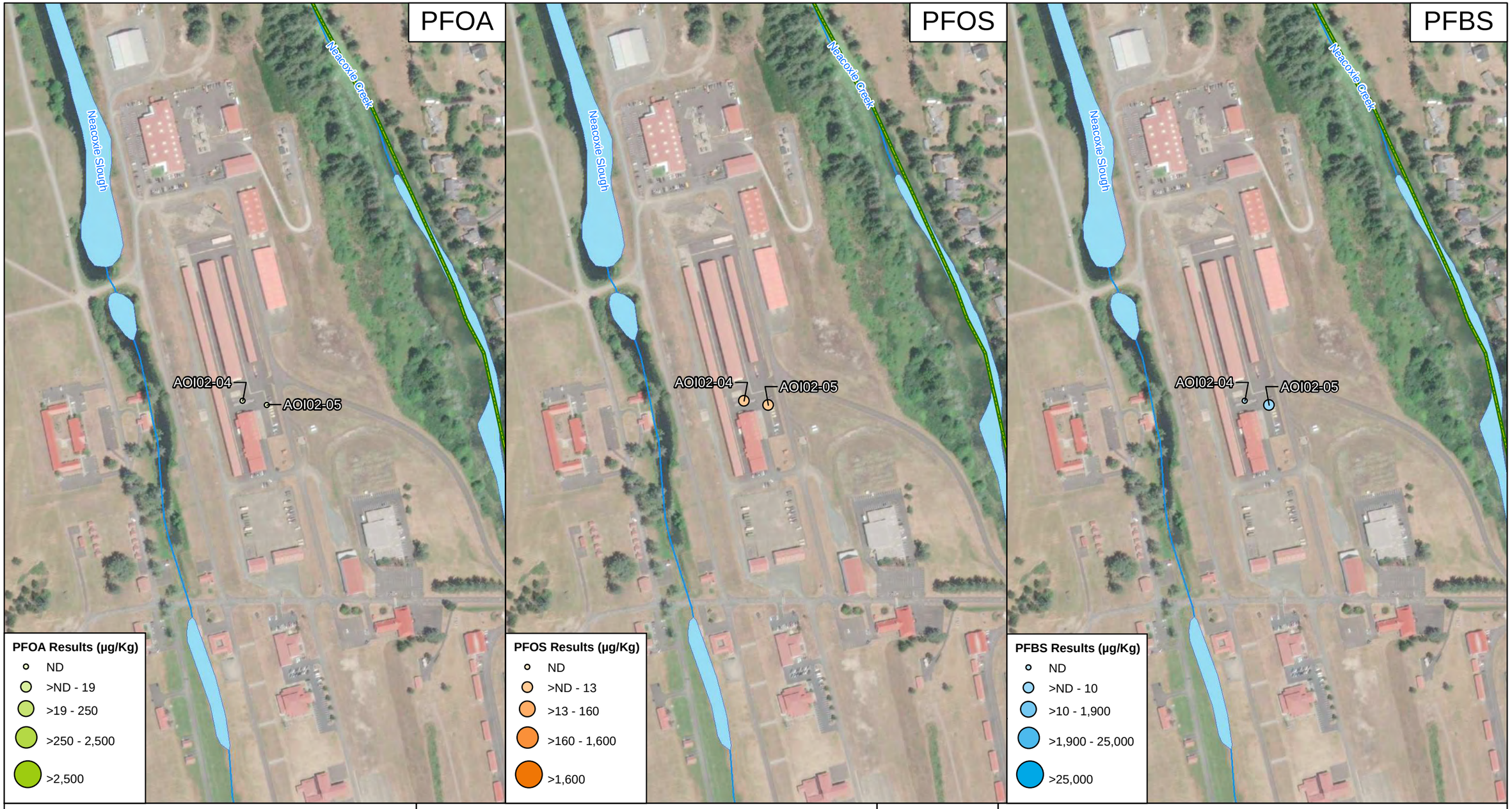
Germantown, MD 20876

Figure 6-7



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	10/3/2022	GIS BY	MS	10/3/2022
SCALE	1:4,800	CHK BY	JH	10/3/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/3/2022

Facility Boundary
Water Body
Wetland
River/Stream

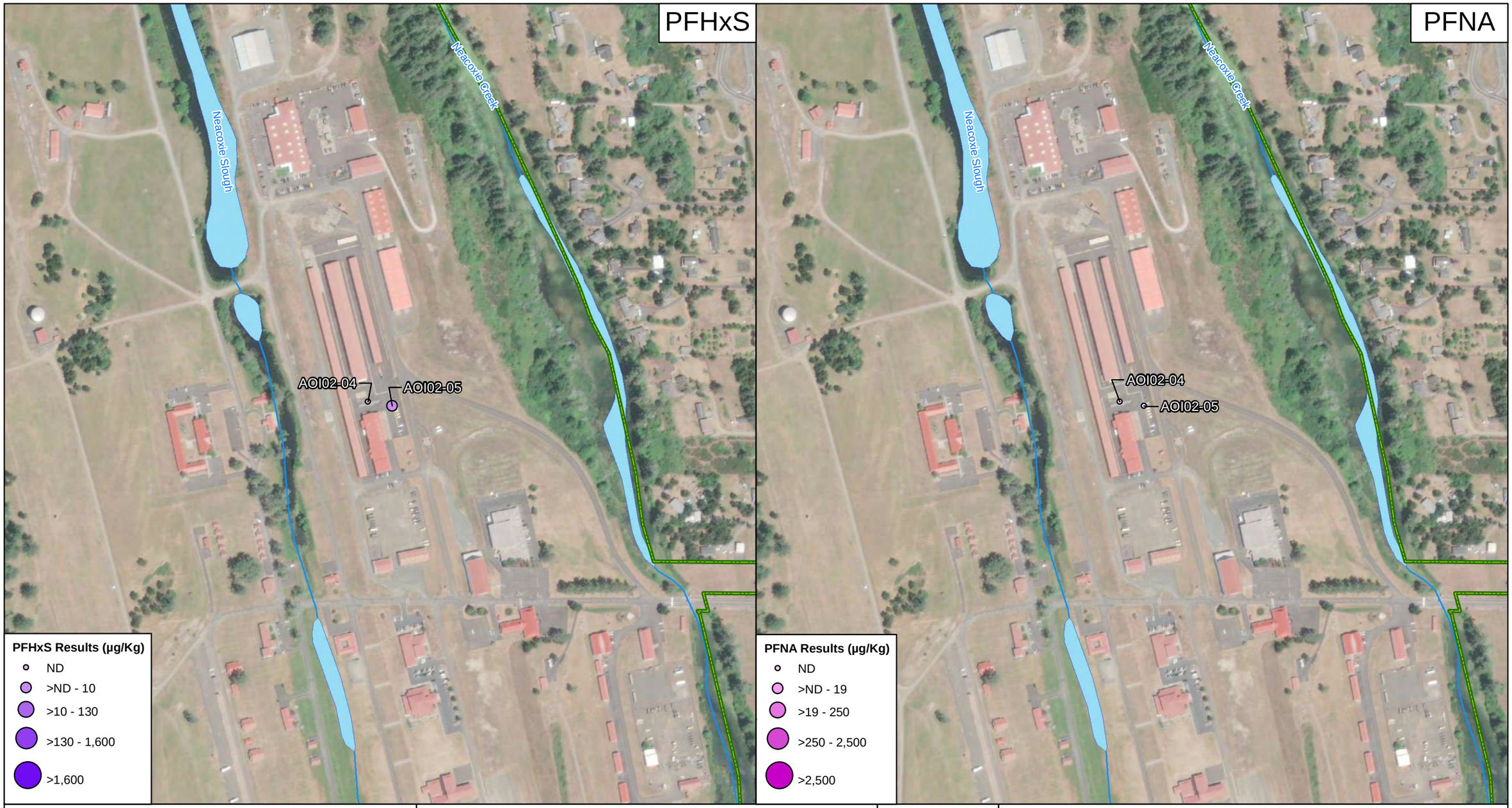
0 200 400 800 Feet

N

PFOA, PFOS, and PFBS Detections in Sediment

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-8



CLIENT	ARNG			
PROJECT	Site Inspection at Camp Rilea, OR			
REVISED	10/3/2022	GIS BY	MS	10/3/2022
SCALE	1:4,800	CHK BY	JH	10/3/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/3/2022

Facility Boundary
Water Body
Wetland
River/Stream

0 200 400 800 Feet

N

PFHxS, and PFNA Detections in Sediment

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 6-9

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** and **Figure 7-2**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

1. Contaminant source;
2. Environmental fate and transport;
3. Exposure point;
4. Exposure route; and
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with an incomplete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of relevant compounds above the SLs. Areas with an identified potentially complete pathway that have detections of the relevant compounds above the SLs may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in an RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers, residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 and AOI 2 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Former Fire Station – Building 7241, where controlled AFFF releases through washing firetrucks carrying AFFF, flushing out lines used for AFFF discharge at other locations, and storage of AFFF may have occurred potentially as early as 1970.

Relevant compounds were detected in surface and subsurface soil at AOI 1, at concentrations below the SLs. No ongoing construction was observed at the facility during the SI. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and future construction workers are potentially complete. The facility is gated; however, residential structures are located approximately 0.3 miles to the east of AOI 1. Therefore, the incidental ingestion and inhalation of dust exposure pathways for the off-facility residential, recreational user, and trespasser receptors are considered potentially complete.

The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 is the UTES Former Firetruck Parking area surrounding Building 7156 in the central/eastern portion of the facility. Two firetrucks with tank capacities of approximately 50 gallons each reportedly contained AFFF and were present at the facility from 1989 until an unknown period of time. AFFF from the former firetrucks was reportedly never deployed at the facility. OMD maintenance personnel performed minor repairs and maintenance of the former firetrucks at the UTES.

Relevant compounds were detected in surface and subsurface soil at AOI 2, at concentrations below the SLs. No ongoing construction was observed at the facility during the SI. Site workers and future construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for site workers and future construction workers are potentially complete. The facility is gated; however, residential structures are located approximately 600 feet to the east of AOI 2. Therefore, the incidental ingestion and inhalation of dust exposure pathways for the off-facility residential, recreational user, and trespasser receptors are considered potentially complete.

Construction workers could contact constituents in subsurface soil via incidental ingestion. Therefore, the subsurface soil exposure pathway for future construction workers is potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

The SI results in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors based on the aforementioned criteria. Drinking water at the facility is supplied by two onsite water supply wells. Public groundwater systems are used for drinking water sources on properties surrounding the facility, including the Sunset Lake RV Park (located approximately 0.5 miles to the south) and the City of Warrenton (located less than 1 mile to the north).

7.2.1 AOI 1

Relevant compounds were in groundwater detected at AOI 1; PFOA was detected above the SL. The onsite water supply wells are located in the central/western portion of the facility, northwest of AOI 1, and are not interpreted to be downgradient from the Former Fire Station. Additionally, the public groundwater system drinking water sources are not hydraulically downgradient from AOI 1. Therefore, the groundwater exposure pathway via ingestion is considered incomplete for off-facility residents, recreational users, and trespassers. Additionally, the site worker ingestion exposure pathway via drinking water receptors is considered incomplete; however, incidental ingestion may occur via shallow groundwater contact, as discussed in the paragraph below.

Active construction was not observed at the facility during the SI. Depths to water measured at AOI 1 during the SI in January 2022 ranged from 1.90 to 6.30 feet bgs. The construction worker exposure scenario assumes excavation occurs at depths at or above 15 feet bgs. Therefore, the incidental ingestion exposure pathway for future construction workers, as well as site workers, is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOS was detected above the SL in groundwater at AOI 2. The onsite water supply wells located in the central/western portion of the facility and to the west and downgradient of AOI 2; therefore, the groundwater exposure pathway via ingestion is considered potentially complete for site workers. The public groundwater system drinking water sources were not observed to be hydraulically downgradient from AOI 2 during the SI. Therefore, the groundwater exposure pathway via ingestion is considered incomplete for off-facility recreational users and residents.

Depths to water measured at AOI 2 in January 2022 during the SI ranged from 21.14 to 23.05 feet bgs. Therefore, the incidental ingestion exposure pathway for future construction workers is considered incomplete. There is no current active construction at the facility. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in sediment were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria. At AOIs where sediment samples were not collected, the SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Surface water and sediment samples were not collected at AOI 1; however, relevant compounds were detected in soil and groundwater at AOI 1. It is possible that these compounds may have migrated from soil and shallow groundwater to the nearby Neacoxie Creek to the east-southeast of the facility. Due to potential recreational use of the nearby Neacoxie Creek, the surface water and sediment ingestion exposure pathways for off-facility recreational users are considered potentially complete. Surface water is not used as drinking water in the vicinity, so the surface water ingestion pathway for residential receptors is incomplete.

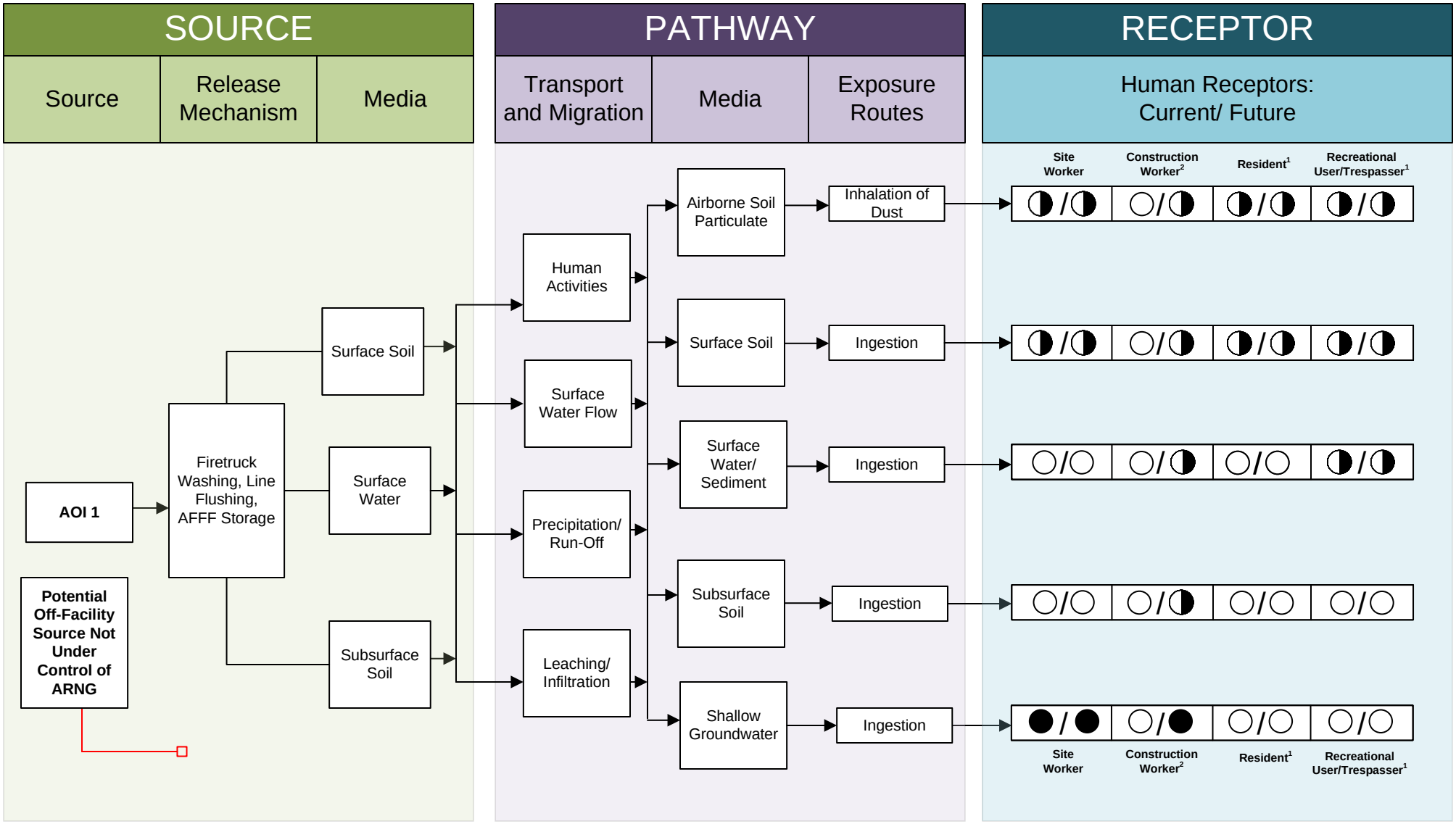
An onsite wastewater treatment system with two sewage lagoons is located to the southeast of AOI 1. As a result, the ingestion pathway for surface water and sediment is potentially complete for future construction workers during ground disturbing activities and trespassers. Facility workers are unlikely to access the sewage lagoons; therefore, the ingestion exposure pathway for site workers is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

Relevant compounds were detected in sediment samples collected from within the two catch basins that surround Building 7156 storage area and general parking area. Surface water samples were not collected, however PFAS are water soluble and may have been leached from the sediment into the surface water. The closest surface water body is the Neacoxie Slough located approximately 200 feet to the west of AOI 2. Due to potential recreational use of the Neacoxie Slough that flows to the north, the surface water and sediment ingestion exposure pathway for off-facility recreational users is considered potentially complete. The ingestion of surface water

exposure pathways for the off-facility residential receptors are considered incomplete for the same reasons established for AOI 1.

Based on the SI results, the ingestion pathway for surface water and sediment is potentially complete for future construction workers during ground disturbing activities and trespassers. Facility workers are unlikely to access the catch basins; therefore, the ingestion exposure pathway for site workers is considered incomplete. The CSM for AOI 2 is presented on **Figure 7-2**.



LEGEND

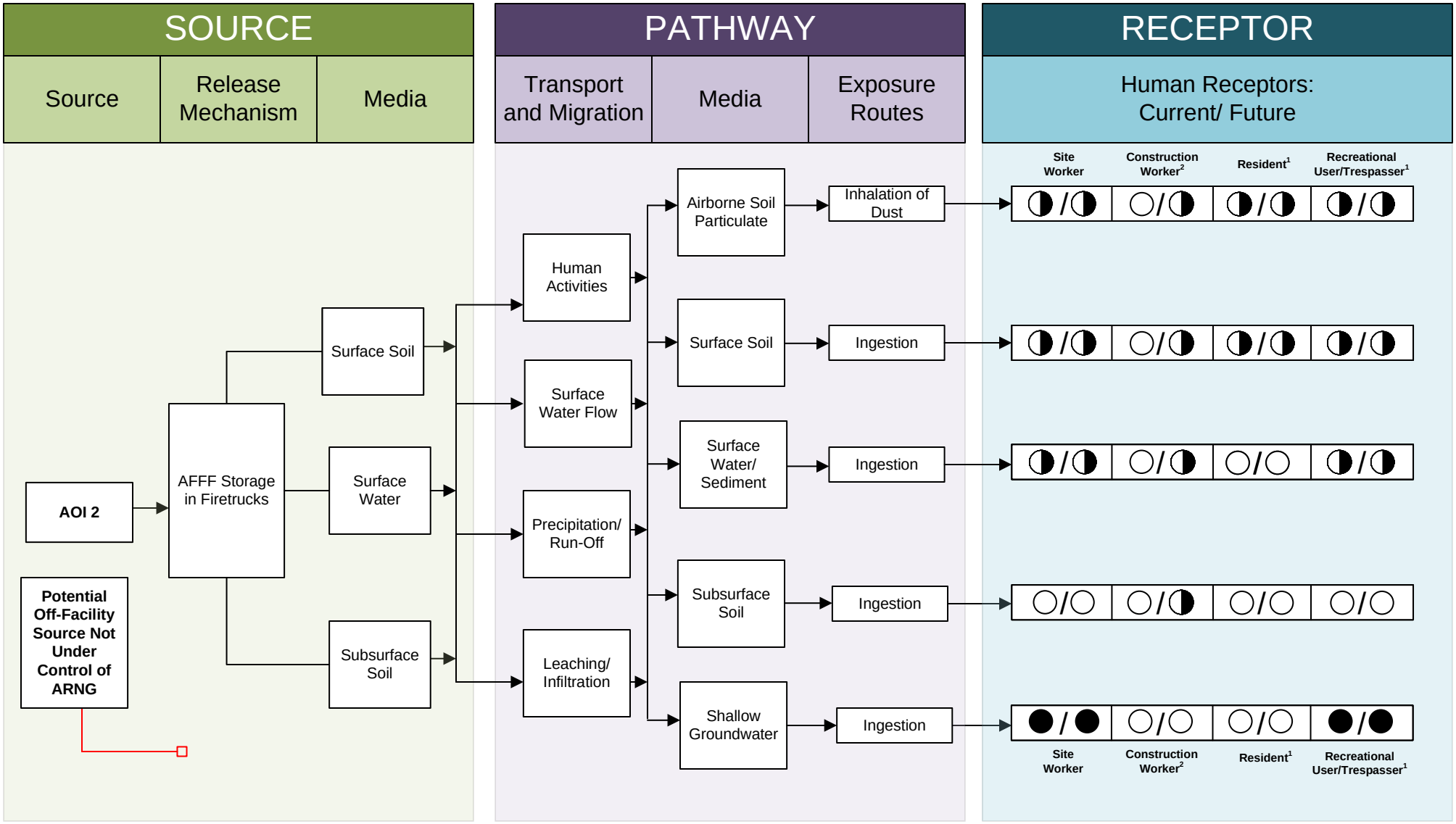
- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

NOTES

1. The resident and recreational users refer to off-site receptors.
2. Construction was not observed during SI field activities.

Figure 7-1
Conceptual Site Model, AOI 1
Camp Rilea, Warrenton, Oregon

AECOM



LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

NOTES

1. The resident and recreational users refer to off-site receptors.
2. Construction was not observed during SI field activities.

Figure 7-2
Conceptual Site Model, AOI 2
Camp Rilea, Warrenton, Oregon

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8. Summary and Outcome

This section summarizes SI activities and findings. The most significant findings are summarized in this section and are reproduced directly or abstracted from information contained in this report. The outcome provides general and comparative interpretations of the findings relative to the SLs.

8.1 SI Activities

The SI field activities were conducted from 11, 12, and 18 to 19 January 2022 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, sediment sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- Thirteen (13) soil samples from six boring locations;
- Six grab groundwater samples from six temporary wells;
- Two sediment samples from two locations;
- Thirteen (13) QA/QC samples.

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOIs, which are described in **Section 7**.

8.2 Outcome

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1: Former Fire Station – Building 7241 and AOI 2: UTES: Former Firetruck Parking – Building 7156. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to receptors from AOI 1 and AOI 2 from sources on the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - The detected concentrations of PFOA, PFOS, PFBS, PFHxS, and PFNA in soil at AOI 1 were below respective SLs.
    - PFOA in groundwater exceeded the 6 ng/L SL at one of the three well locations, AOI01-01, at a concentration of 7.66 ng/L. The remaining detected relevant compound concentrations were below the SLs.
    - Based on the results of the SI, further evaluation of AOI 1 is warranted in an RI.

- At AOI 2:
    - The detected concentrations of PFOA, PFOS, PFBS, PFHxS, and PFNA in soil at AOI 2 were below their SLs.
    - PFOS in groundwater exceeded the 4 ng/L SL at one of the three well locations, AOI02-01, at a concentration of 32.9 ng/L. The remaining detected relevant compound concentrations were below the SLs.
    - PFOS, PFHxS, and PFBS were detected in sediment at AOI 2. There are no established SLs for sediment, and the results are presented for informational purposes only.
    - Based on the results of the SI, further evaluation of AOI 2 is warranted in an RI.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table 8-1 summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

Table 8-1: Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Former Fire Station – Building 7241	◐	●	Proceed to RI
2	UTES: Former Firetruck Parking – Building 7156	◐	●	Proceed to RI

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

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