FINAL
Site Inspection Report
Central Oregon Unit Training Equipment Site
Redmond, 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)
ARNG Installations, Nationwide

May 2023

Prepared for:

Army National Guard Headquarters
111 S. George Mason Drive
Arlington, VA 22204

UNCLASSIFIED

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
%	Percent
µg/kg	Microgram(s) per kilogram
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film-Forming Foam
AOI	Area of Interest
ARNG	Army National Guard
ASTM	ASTM International
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COUTES	Central Oregon Unit Training Equipment Site
CSM	Conceptual site model
DA	United States Department of the Army
DoD	United States Department of Defense
DPT	Direct-push technology
DQI	Data quality indicator
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HQ	Hazard Quotient
HUC	Hydrologic Unit Code
IDW	Investigation-derived waste
ISC	Instrument sensitivity check
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	Liquid chromatography tandem mass spectrometry
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOQ	Limit of quantification

MIL-SPEC	military specification
MS	Matrix spike
MSD	Matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
ODEQ	Oregon Department of Environmental Quality
OMD	Oregon Military Department
ORARNG	Oregon Army National Guard
OSD	Office of the Secretary of Defense
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
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure Inc.

EXECUTIVE SUMMARY

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum regarding *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program* (Assistant Secretary of Defense 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)[1]. These compounds are collectively referred to as "relevant compounds" throughout this document, and the applicable Screening Levels (SLs) are provided below 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 the relevant compounds. This SI was completed at the Central Oregon Unit Training Equipment Site (COUTES) in Redmond, Oregon and determined that no further evaluation under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1 and AOI 2. COUTES will also be referred to as the "Facility" throughout this report.

The Facility, operated by the Oregon ARNG (ORARNG), encompasses approximately 35.5 acres east of Redmond, Oregon. The Facility is located adjacent to and east of the Redmond Airport. The nearest metropolitan area is Redmond, Oregon, 2.2 miles west of the Facility (**Figure 2-1**). Parcels surrounding COUTES are undeveloped land on all boundaries, with the airport owning the land to the west. COUTES occupies 29.1 acres of land administered by the United States Army Corps of Engineers and licensed for use by the Oregon Military Department (OMD) since 1987. The remaining 6.4 acres that COUTES occupies is owned by the City of Redmond and has been used as a National Guard military facility since the lease to OMD began in 1973. Currently, the Facility is used for vehicle maintenance and warehouse storage. Historically, there was a firing range on the eastern portion of the Facility used for training purposes. The Facility includes a maintenance building, wash rack bay, warehouse, and inactive firing range. Directly outside of the Facility boundary are airport runways and taxiways to the west (AECOM, 2020). Access to the Facility is controlled.

[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.

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, no further evaluation under CERCLA is warranted for each of the two AOIs at this time.

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

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

Notes:
1. Assistant Secretary of Defense. July 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. May 2022.
2. 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.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ng/L = nanogram(s) per liter

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Wash Rack Bay	◐	Not Sampled	No further action
2	Wastewater Discharge Area	◐	Not Sampled	No further action
NA	Groundwater Supply Well	Not Sampled	○	No further action

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected

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) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum regarding *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program* (Assistant Secretary of Defense 2022) from the Office of the Secretary of Defense (OSD) dated 6 July 2022. The six compounds listed in the OSD memorandum are referred to as "relevant compounds" throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA).[2] The ARNG performed this SI at the Central Oregon Unit Training Equipment Site (COUTES) in Redmond, Oregon. COUTES is also referred to as the "Facility" throughout this report.

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

1.2 SITE INSPECTION PURPOSE

A PA was performed at COUTES (AECOM Technical Services, Inc. [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.

[2] 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

COUTES encompasses 35.5 acres east of Redmond, Oregon. The Facility is located adjacent to and east of the Redmond Airport. The nearest metropolitan area is Redmond, Oregon, 2.2 miles west of the Facility (**Figure 2-1**). Parcels surrounding COUTES are undeveloped land on all boundaries, with the airport owning the land to the west. COUTES occupies 29.1 acres of land administered by the United States Army Corps of Engineers (USACE) and licensed for use by the Oregon Military Department (OMD) since 1987. The other 6.4 acres that COUTES occupies is owned by the City of Redmond and has been used as a National Guard military facility since the lease to OMD began in 1973. Currently, the Facility is used for vehicle maintenance and warehouse storage. Historically, there was a firing range on the eastern portion of the Facility used for training purposes. The Facility includes a maintenance building, wash rack bay, warehouse, and inactive firing range. Directly outside of the Facility boundary are airport runways and taxiways to the west. Access to the Facility is controlled (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

COUTES is in the Deschutes Columbia Plateau geologic province of Oregon. The Facility mostly comprises undeveloped, vegetated land underlain by volcanic lava flow beds. The areas of the Facility that are paved include the road to enter/exit the Facility and the areas surrounding the buildings in the western installation area and the warehouse and firing range in the eastern installation area. The paved areas are limited at the Facility and primarily flat. In both directions, from west to east and north to south, elevation across the Facility ranges from approximately 3,050 to 3,070 feet (ft) above mean sea level (**Figure 2-2**). Overall, topography at the facility follows a northwest gradient (AECOM 2020). Runoff from the wash pad appeared to flow to the north, but due to the primarily flat nature of the pavement and the drive-through use (north to south or south to north) of the wash rack bay, it was inferred that runoff could be tracked to the south, and overspray could have affected the ground surface to the west.

2.2.1 Geology

The Facility is in a geologic area characterized as basalt and basaltic andesite of the Pleistocene to Holocene ages. This geologic feature occurs primarily along the crest of the Cascade Range, which is located to the west of the Facility. These basaltic lava flows are the most widespread types of surface rocks in the region, with the oldest basalt lava flows exposed west of the Deschutes River, which is located approximately 5 miles west of the Facility. Vents from the lava flows are dispersed throughout the region as lava and cinder cones. The lava terrain covers the region generally as thin sheets of pahoehoe basalt associated with historic fissure eruptions where the surface appears ropy with depressions. These landforms are known as “Lava Badlands.” The lava flows were estimated to extend from the land surface to 50 to 100 ft below ground surface (bgs). Lava Badlands frequently consist of a lava tube system, indicative of a lateral spread of lava. The Redmond Caves is one such lava tube system, located approximately 4 miles northwest of the Facility (AECOM 2020).

The Facility is underlain by volcanic deposits of the Quaternary Period, the most recent period of the Cenozoic era. These volcanic deposits constitute the second major composite stratigraphic unit in the region, which is reported to extend to depths greater than 2,000 ft in some areas. This unit consists of lava flows, domes, vent deposits, pyroclastic deposits, and volcanic sediments. The volcanic bedrock consists of ash and cinders, whereas the sedimentary deposits consist of semi-consolidated sand and gravel eroded from volcanic rocks (AECOM 2020).

Soils beneath the Facility consist primarily of the Deschutes-Stukel complex (designated 35B, 0 to 8% slope) in the northern and western areas of the installation boundary and Stukel-Rock outcrop-Deschutes complex (designated 142B, 0 to 8% slope) south of the installation boundary. Both soil series consist of shallow, well-drained soils with moderately high permeability located in lava plains that formed in ash. The Deschutes complex is characterized as sandy loam in the top 31 inches, followed by basalt at depths below 31 inches. The Stukel complex is characterized as sandy and cobbly sandy loam in the top 11 inches, followed by gravelly sandy loam to depths of 18 inches bgs, and basalt at 18 inches bgs. Bedrock of the Deschutes series is reported at 20 to 40 inches bgs, while bedrock of the Stukel series is reported at 10 to 20 inches bgs (AECOM, 2020).

During the SI, silty sands and gravels were observed as the dominant lithology of the unconsolidated material below COUTES. The borings were completed to depths ranging from 2.1 to 5 feet bgs due to refusal. Weathered basalt was encountered at the bottom of several borings, which is consistent with the regional geology of the area. One sample for grain size analyses was collected at location AOI01-05 and analyzed via ASTM International (ASTM) Standard D-422. The results indicate that the soil samples are comprised primarily of sand (47.7 percent [%]) and silt (29.4%). These results and observations during the SI fieldwork are consistent with the reported depositional environment of the region.

2.2.2 Hydrogeology

The Facility is on the Deschutes Formation, which is the principal aquifer in the Upper Deschutes Basin. With annual precipitation up to 90 inches, the Cascade Range is the principal groundwater recharge area for the Upper Deschutes Basin (WRCC, 2020). Groundwater from the Cascade Range flows through the permeable volcanic rock toward the east into the Upper Deschutes Basin, then discharges to streams or flows through the subsurface of the Deschutes Formation, eventually discharging to streams. Groundwater discharge to streams is the principal mechanism of groundwater losses in the system because stream elevation is lower than the groundwater table. Groundwater discharges to streams occur west of the Facility, surrounding the confluence of the Deschutes River (west of Bend, Oregon). The Deschutes River maintains substantial flow during regional dry periods. Stream discharge varies by location and seasonal precipitation. Regionally, the water table fluctuates in association with recharge. Infiltration of precipitation in the region occurs from rainfall, snowmelt, canal and stream leaks, and irrigation water. The United States Geological Survey (USGS) estimated annual recharge from infiltration of precipitation in the area surrounding the Facility ranges from 0 to 1.5 inches. Recharge averages 35 to 40% of the annual precipitation measured throughout the Upper Deschutes Basin (AECOM 2020).

Groundwater flow generally follows the topographic gradient, which is to the northwest. Groundwater flow may vary in localized areas where groundwater recharges to surface water or near locations of groundwater extraction (e.g., supply wells). Groundwater flow at the Facility was not determined during the SI but is inferred to flow to the northwest, based on available regional information. The upper-most saturated zone is hundreds of feet below ground surface and within bedrock (AECOM, 2020). Groundwater sampling during the SI was limited to the collection of groundwater from one existing supply well; therefore, synoptic water level measurements for determining flow direction were not collected. Perched groundwater was not encountered during the SI activities. More information is provided in Section 5.3.

An onsite water supply well is located in the central portion of the Facility, outside the northeastern corner of the maintenance building (Well #59860) (**Figure 2-3**). The well was completed in 2013 to a depth of 600 ft bgs, with a screened interval of 517 to 597 ft bgs. Depth to groundwater reported on installation drilling records was 341 ft bgs. A well installation log is provided in **Appendix E**. Prior to the use of this well, COUTES obtained drinking water from Well #3954, which was located east of the maintenance building and was abandoned in 2018. The abandoned well was completed in May 1979 to a depth of 425 ft bgs; depth to water measured during installation was reported at 390 ft bgs.

The Oregon Department of Environmental Quality (ODEQ) maintains a well protection program to assist public water systems with protecting their sources of drinking water. ODEQ defines drinking water source areas based on the location of a supply well and the associated upgradient area representing groundwater that will reach the supply well within 10 years. The upgradient end (10-year travel time) of one of these source areas for Redmond Water Department Well #2 extends to within approximately 700 ft of the northwestern boundary of the Facility; Well #2 is located more than 2 miles northwest of the COUTES boundary (ODEQ 2017, 2020).

The nearest USGS monitoring well is located approximately 8 miles east of the Facility (Site No. CROO0001954). This well was drilled to 450 ft bgs, and depth to groundwater ranged from 245 to 315 ft bgs between 1981 and 2018 (AECOM 2020).

Based on USEPA's Unregulated Contaminant Monitoring Rule 3 data (samples collected between 2013 and 2016), no PFAS were detected in a public water system above 70 parts per trillion within 20 miles of the Facility, including the cities of Redmond and Bend, which were sampled in 2013 and 2014. PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable; it is possible that low concentrations of PFAS, if present below 2014 detection limits, would be detected if analyzed today (AECOM 2020).

2.2.3 Hydrology

The Facility is in the North Unit Main Canal subwatershed (USGS Hydrologic Unit Code [HUC] 12), which is within the Lone Pine Creek-Crooked River (HUC 10) watershed of the Lower Crooked subbasin (HUC 8), of the Deschutes Basin (HUC 6). No surface water features are located at the Facility. The nearest offsite surface waterbody is the North Unit Main Canal less than 0.5 mile east of the Facility (Figure 2-4). The North Unit Main Canal flows toward the northeast. The Deschutes River is located approximately 5 miles west of COUTES, flowing to

the north, and is a major tributary to the Columbia River (located along the Oregon-Washington border). No wetlands are located at the Facility (AECOM 2020).
The Facility is primarily unpaved; paved areas include the roadway, the parking areas surrounding the buildings, and the wash rack bay area. Surface stormwater runoff from paved areas flows into stormwater catch basins located in the western installation area. Stormwater runoff to unpaved areas infiltrates into the soil. Surface water runoff at COUTES would occur only during heavy precipitation events when precipitation exceeds the infiltration rate of the soil (AECOM 2020).

2.2.4 Climate

Climate in the Deschutes Basin is considered semiarid: moderate with cool, wet winters and warm, dry summers. The climate is driven by air masses developing in the Pacific Ocean (approximately 150 miles west of COUTES) and moving east over the Cascade Range (approximately 35 miles west of COUTES). The Deschutes Basin experiences annual and long-term climate variability with a large differential of temperature extremes over the course of the year, but not on any given day. Precipitation decreases significantly east of the Cascade Range (WRCC 2020, AECOM 2020).

2.2.5 Current and Future Land Use

The nearest urban area is the City of Redmond, approximately 2 miles west of the Facility. The Redmond Airport is immediately adjacent to the west of the Facility. Oregon State Highway 126 is located less than 0.25 mile north of the Facility. Highway 126 travels east/west from Redmond to Prineville to the east and Sisters to the west. Land surrounding the Facility is undeveloped, with the airport owning the land to the west. The Facility is zoned as Rural Industrial. Land surrounding the Facility is zoned as Exclusive Farm Use Alfalfa (EFUAL – Alfalfa Subzone) to the north, east, and south and as Airport Limited to the west. Properties farther west and northwest of the Facility are zoned as industrial. Access to the Facility is controlled (AECOM 2020).

According to the United States Census Bureau, the estimated population of Redmond was 30,011 in 2017. Based on the population estimates, Redmond's population increased by nearly 3,800 between 2010 and 2017. The population of Redmond is expected to increase to 45,724 by 2025. Redmond's urban growth boundary was amended in 2019 to cover over 2,000 acres of additional land for residential and industrial land expansion, in addition to the Military Department's National Guard Armory. Redmond's urban growth boundary is located approximately 2 miles to the northwest of the Facility and is not expected to encroach upon the Facility. The Oregon Army National Guard's (ORARNG) preliminary future use plans include adding a new facility drinking water well and replacing the current wash rack (AOI 1) with an upgraded wash rack. Other long-term plans for the future use of COUTES are unknown. According to the Deschutes County Comprehensive Plan, land zoned as Exclusive Farm Use shall be preserved in order to protect farmlands. Therefore, future land development of the Facility and adjacent lands is not expected to be for purposes other than as currently zoned (AECOM 2020).

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 species are listed as federally endangered, threatened, proposed, and/or candidate species (USFWS, 2022):

- Insects: Monarch butterfly, *Danaus plexippus* (candidate)
- Mammals: Gray wolf, *Canis lupus* (endangered)

2.3 HISTORY OF PFAS USE

Two potential PFAS release areas were identified at the Facility during the PA (AECOM 2020). According to the PA Report, PFAS were potentially released to the ground surface within the boundary of COUTES in an area where vehicles, including fire trucks, are washed and in the wash rack bay discharge area. A description of each AOI is presented in **Section 3**.

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Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

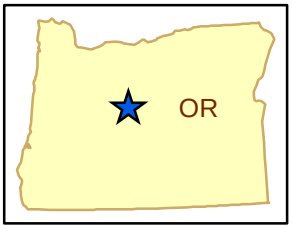
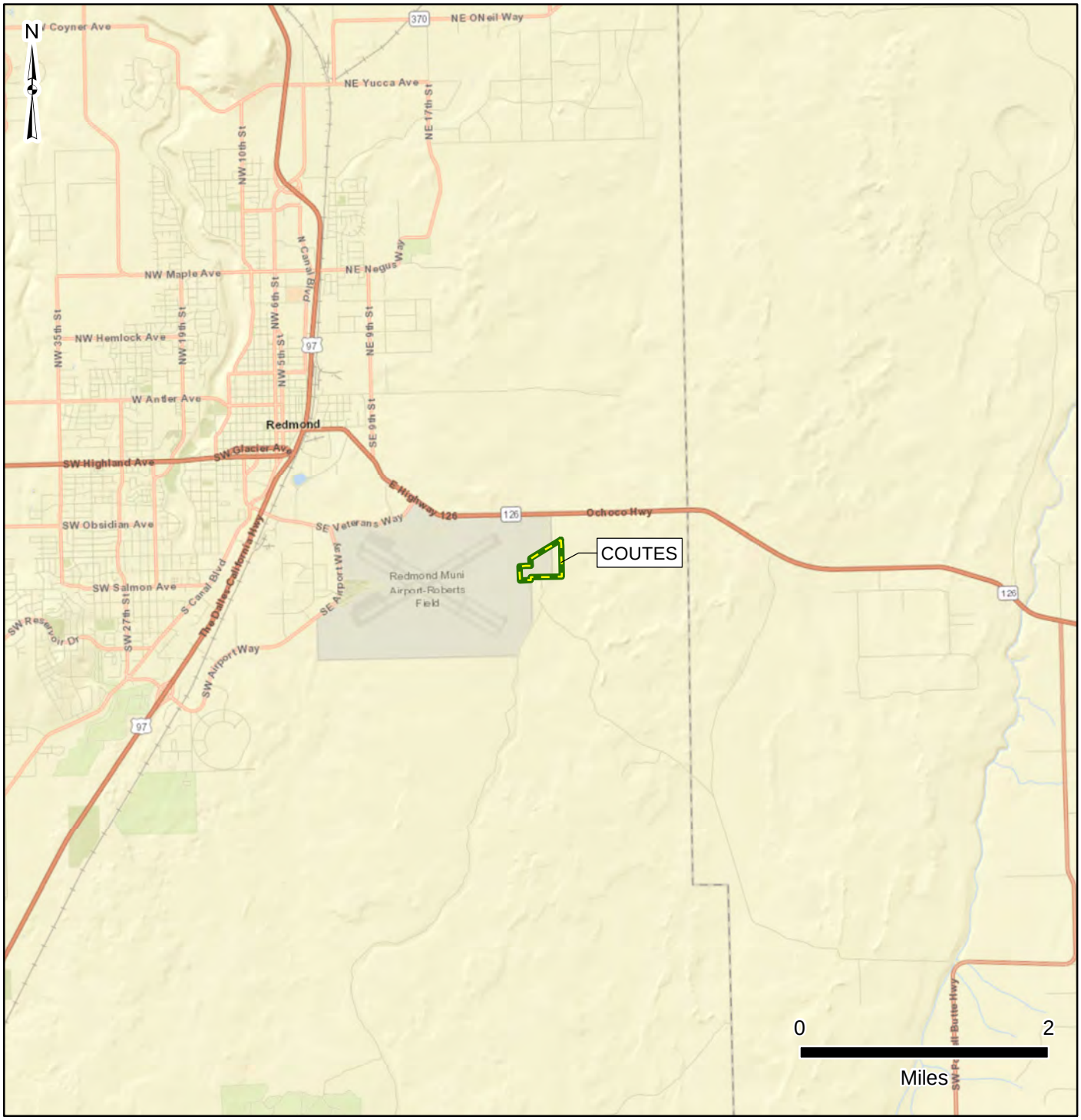


Figure 2-1
Facility Location



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 2-1 Facility Location.mxd - stephane.descombes - 5/1/2023 - 12:38:49 PM

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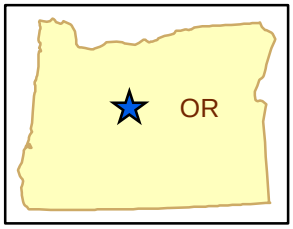
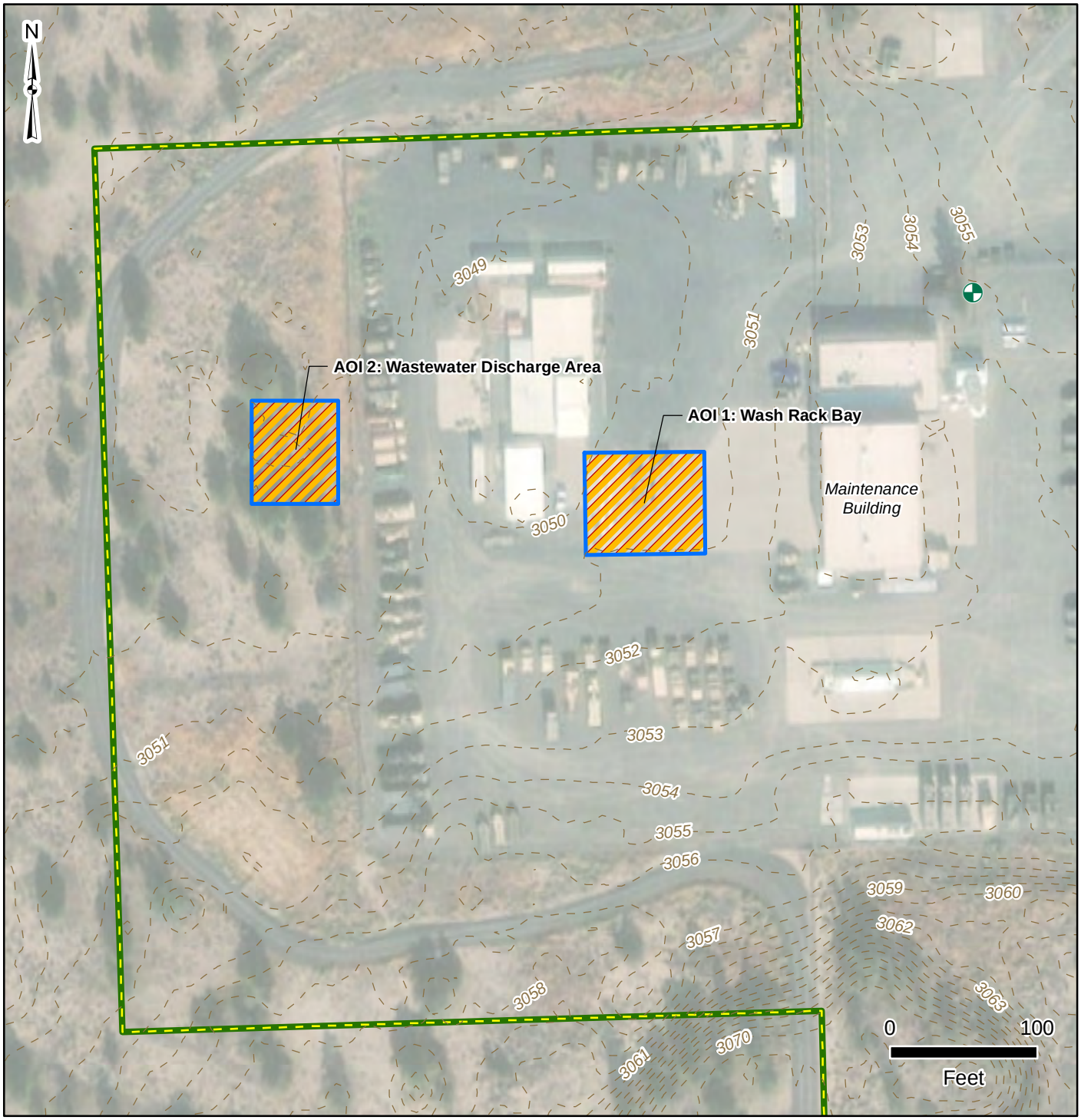
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 2-2
Facility Topography





Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Topography

- Elevation Contour (1 ft. interval, NAVD88 datum)

Well Type

- Facility Water Supply Well

Data Sources:
ESRI 2020
AECOM 2020
NOAA 2021

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 2-2 Facility Topography.mxd - stephane.descombes - 5/1/2023 - 12:37:36 PM

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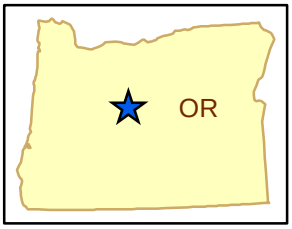

Figure 2-3
Groundwater Features

Facility Data

Facility Boundary

Well Type

Facility Water Supply Well

Hydrology

Intermittent Creek/Stream
Perennial Creek/Stream
Artificial Path
Waterbody
Wetlands

Hydrogeology

Approximate Regional Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 2-3 Groundwater Features.mxd - stephane.descombes - 5/1/2023 - 12:36:44 PM

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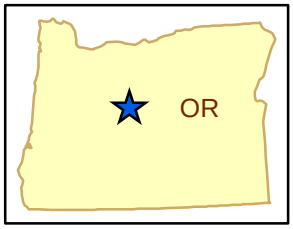
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 2-4
Surface Water Features



Facility Data

Facility Boundary

Well Type

Facility Water Supply Well

Hydrology

Surface Water Flow Direction
Intermittent Creek/Stream
Perennial Creek/Stream
Artificial Path
Waterbody
Wetlands
Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 2-4 Surface Water Features.mxd - stephane.descombes - 5/1/2023 - 12:35:48 PM

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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 COUTES and grouped into two AOIs identified as: AOI 1 Wash Rack Bay and AOI 2 Wastewater Discharge Area. The AOIs are shown on **Figure 3-1**.

3.1 AOI 1 – WASH RACK BAY

AOI 1 consists of an uncovered wash rack bay located at the Facility to the west, south, and east of the oil/water separator building and west of the maintenance hangar. According to interviewed personnel, Facility equipment and vehicles, including OMD fire trucks, are washed in this area. The fire trucks are washed only during the summer months, and hoses are not flushed. According to interviewed OMD personnel, the OMD fire trucks have not historically used or currently contain AFFF. The duration of the Facility's use of the wash rack, in addition to the potential historical presence of AFFF contained in OMD fire trucks, is not known (AECOM 2020).

3.2 AOI 2 – WASTEWATER DISCHARGE AREA

AOI 2 consists of an area inside the facility boundary where treated wash water (processed through the oil/water separator/AOI 1) combined with stormwater has been discharged via irrigation under a Water Pollution Control Facility National Pollutant Discharge Elimination System permit since 2001 (type GEN17B, Water Quality File No. 111416) (ODEQ 2021). The discharge point is a sprinkler head (approximately 7 feet above the ground surface) which is located beyond the western side of the Facility's motor pool fencing, approximately 200 ft to the west and downgradient of the wash rack bay. This discharge area is unpaved with a natural vegetative cover. The duration of the Facility's use of the wash rack and discharge to the discharge area, in addition to the potential historical presence of AFFF contained in OMD fire trucks, is not known (AECOM 2020).

3.3 ADJACENT SOURCES

One potential off-facility source of PFAS is adjacent to the Facility and is not under the control of the ARNG. A description of the off-facility source is presented below and shown on **Figure 3-1**.

3.3.1 The Redmond Municipal Airport

The Redmond Municipal Airport is less than 2 miles west of the Facility, with the runway as little as 1,800 ft from the center of the Facility. According to the PA, environmental impacts at the airport occurred in relation to aircraft rescue and firefighting events. None of the listed compounds were PFAS-containing material. The PA did not provide information on AFFF use at the airport. The airport is downgradient of the Facility.

Information available online includes the layout of the Redmond Airport; the fire station is located just west of the intersection of the runways, approximately 1 mile west of the COUTES boundary, and fire training exercises have recently been conducted near the United States Forest

Service buildings north of the runways, approximately 0.7-mile northwest of the Facility (AOPA 2022). An article acquired since the finalization of the PA indicates that "foam" was used for firefighting at the airport (The Bulletin 2020); however, the training operations and fire station are down- or cross-gradient from the Facility, based on the inferred regional groundwater flow direction.

Army National Guard Site Inspections
Site Inspection Report
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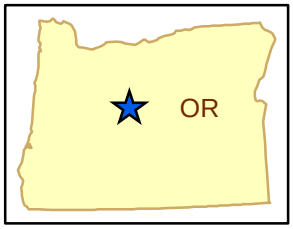
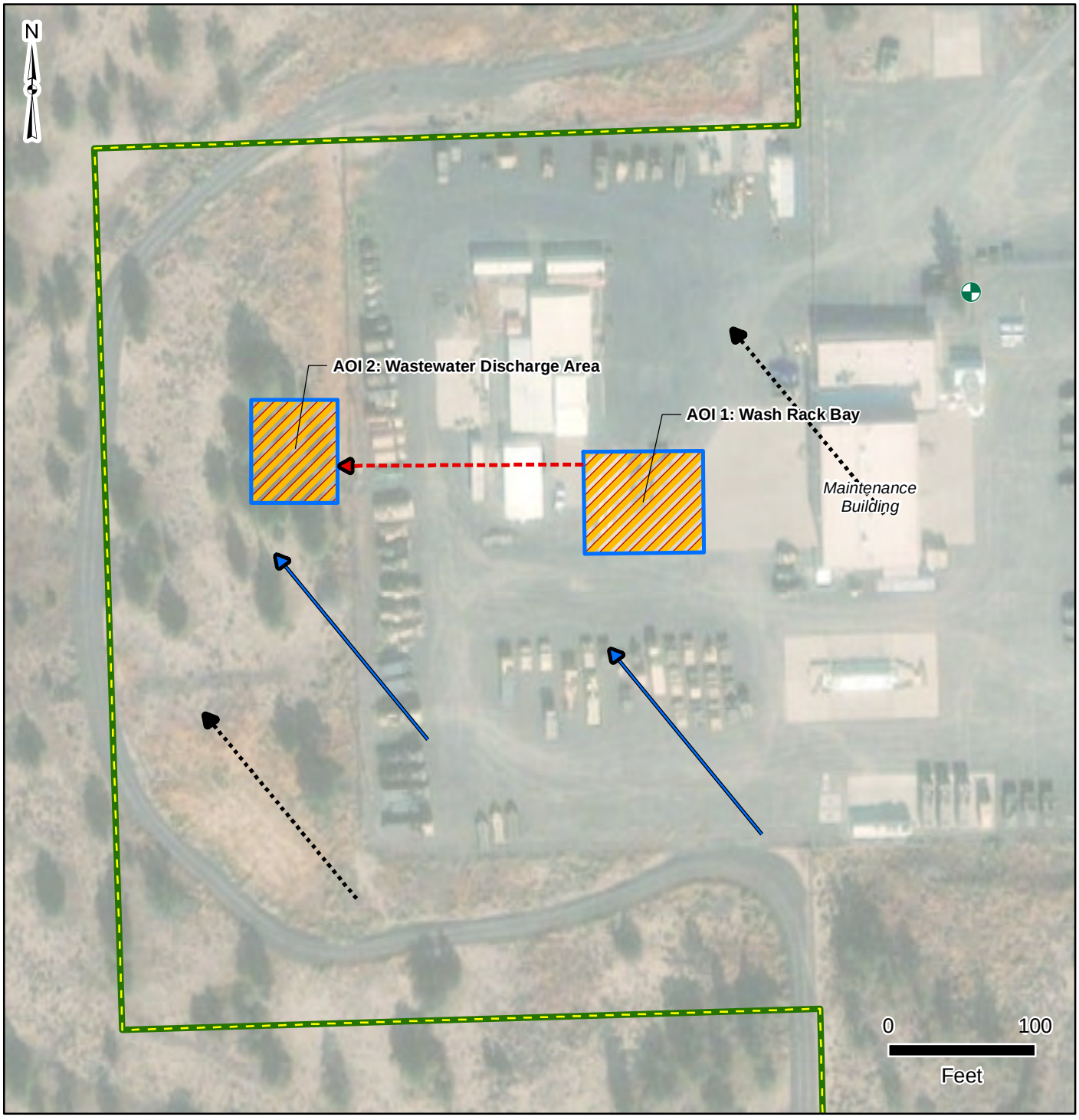
Figure 3-1
Areas of Interest





Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction
- General direction of flow through subsurface piping from the Wash Rack Bay to the Wastewater Discharge Area

Well Type

- Facility Water Supply Well

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 3-1 Areas of Interest.mxd - stephane.descombes - 5/1/2023 - 12:34:20 PM

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the data quality objective (DQO) process and outlined in the SI Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (EA/Wood [3]2020a), 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 the 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 for the SI include the following:

- The PA Report for COUTES (AECOM 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP–QAPP Addendum (EA/Wood 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 horizontally by the property limits of the Facility (**Figure 2-1** and **Figure 2-2**). The scope of the SI was bounded vertically by the depth of borings (maximum depth of 5 feet bgs). 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 earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). Data were

[3] Wood Environment & Infrastructure Solutions, Inc ("Wood"), EA's primary subcontractor on the PFAS SI's was acquired by WSP on September 21, 2022. Due to the acquisition, we have changed our name to WSP USA Environment & Infrastructure Inc. ("WSP"). No other aspects of our legal entity or capabilities have changed for this project. The term Wood has been replaced with WSP where applicable. Documents prepared by Wood are still referenced as Wood.

compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA/Wood 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 UFP-QAPP Addendum (EA/Wood 2021a, 2020a).

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 was implemented in accordance with the following approved documents.

- *Final Preliminary Assessment Report, Central Oregon Unit Training Equipment Site, Oregon,* dated August 2020 (AECOM 2020)
- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA 2020a)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Central Oregon Unit Training Equipment Site, Oregon* dated August 2021 (EA/Wood 2021a)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA 2020b)
- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum* for COUTES, Oregon*,* dated April 2021 (EA/Wood 2021b).

The SI field activities were conducted from 23 to 24 September 2021 and consisted of utility clearance, direct-push technology (DPT) boring and soil sample collection, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood 2021a), except as noted in **Section 5.7**.

The following samples were collected during the SI and analyzed for 24 compounds via liquid chromatography/tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) Version 5.3 Table B-15 to fulfill the project DQOs:

- 20 soil samples from 10 boring locations;
- One grab groundwater sample from the Facility potable water supply well;
- Five 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 medium. 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**, land survey data are provided in **Appendix B3**, and a Field Change Request form is provided in **Appendix B4**. 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 and performed utility clearance. Details of these activities are presented below.

5.1.1 Technical Project Planning

The USACE TPP Process, Engineer Manual (EM) 200-1-2 (Department of the Army 2016a) 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 14 July 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 included ARNG, the ORARNG, ODEQ, USACE, and representatives familiar with the Facility, the regulations, and the community. 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 UFP-QAPP Addendum (EA/Wood 2021a).

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

5.1.2 Utility Clearance

Wood[4] contacted the Oregon Utility Notification Center to notify them of intrusive work at the Facility. Wood contracted APS, Inc., a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 23 September 2021 with input from the Wood field team. General locating services and ground-penetrating radar (GPR) were used to complete the clearance. Additionally, Facility drawings were reviewed to supplement the private locate results, and representatives from Pacific Power and CenturyLink utilities met Wood's field crew on site to clear utilities at AOI 2. The City of Redmond and the Federal Aviation Administration were notified through the public utility locate ticket prior to drilling activities and did not reply with any concerns about the planned drilling area. The first few feet of each boring were precleared to the extent reasonably feasible by Wood's drilling subcontractor, Steadfast Services, LLC, using a hand auger to verify utility clearance in shallow subsurface locations where utilities would typically be encountered. See **Section 5.7** for further details regarding this deviation from the UFP-QAPP Addendum.

[4] Work was conducted by Wood Environment & Infrastructure Solutions, Inc., prior to the acquisition by WSP.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

PFAS-free water used for decontamination of drilling equipment and equipment blanks was provided by Eurofins. Prior to mobilization, the water from Eurofins was certified by the laboratory to be PFAS-free by analysis for PFAS by LC/MS/MS compliant with QSM Version 5.3, Table B-15 (DoD 2019a). The certified water was then bottled and shipped to WSP for use as decontamination and equipment blank water during the SI field work.

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures appendix to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA 2021*).* A Geoprobe® 7822DT 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 2 ft of each boring. The soil boring locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. Several boring locations were adjusted within a 3-foot offset for reasons including drill rig access, utility avoidance, and bias toward sampling within observed drainage features. The total depth of each boring is shown in **Table 5-2**.

Three discrete soil samples were planned to be collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was to be collected approximately 1 ft above the perched groundwater table, if encountered, and one collected at the mid-point between the surface and the perched groundwater (not to exceed 15 ft bgs). If refusal was encountered at 6 ft bgs or shallower, only two discrete soil samples were planned to be collected per boring: one surface soil sample (0 to 2 ft bgs) and one sample approximately 1 ft above refusal, assuming perched groundwater was not encountered.

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

During the SI, silty sands and gravels were observed as the dominant lithology of the unconsolidated material. The borings were completed to depths ranging from 2.1 to 5 feet bgs due to refusal. Competent rock, observed as weathered basalt, was encountered at the bottom of several borings, which is consistent with the regional geology of the area. Neither perched groundwater nor saturated soils were encountered in the borings.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle 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 procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Standard D-422) in accordance with the UFP-QAPP Addendum (EA/Wood 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, one equipment blank (EB) was collected per day and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

DPT borings were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA/Wood 2021a). Boreholes were filled using bentonite chips, hydrated, and capped with a concrete plug where concrete was penetrated. Five of the seven borings in AOI 1 were installed in locations where the surface was covered with gravel, while borings COUTES-AOI01-03 and COUTES-AOI01-05 were installed in areas paved with concrete. Borings in AOI 2 were installed in an unpaved area, and surrounding soil was used to cover the bentonite fill.

5.3 GROUNDWATER GRAB SAMPLING

The static groundwater level at COUTES is estimated to be approximately 340 to 390 feet bgs based on measurements documented during installation of the facility drinking water wells. No temporary wells were installed at the Facility during the SI field activities as groundwater was not encountered in any of the borings. An existing potable supply well is present at COUTES and was available for sampling during the SI investigation; however, because the existing drinking water well is located cross-gradient to the AOIs, the results from this well are considered informational and they may not be reflective of groundwater associated with the AOIs.

Groundwater was collected from the Facility water supply well used for drinking water at the Facility in accordance with the UFP-QAPP Addendum. The supply well has a total depth of 600 ft bgs, a screened interval of 517 to 597 ft bgs, and a previously recorded depth to water of 341 ft bgs. The groundwater sample was collected from a spigot at the surface in the pumphouse of the supply well. The sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The well was purged for approximately 15 minutes; purged water was discharged to the ground surface outside the well house using a hose attached to the spigot at the wellhead. The hose was removed for sample collection. Water quality parameters (e.g., temperature, 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**) after the grab sample was collected. Samples were packaged on ice and transported via FedEx under standard chain-of-custody procedures to the laboratory

and analyzed for PFAS by LC/MS/MS, compliant with QSM Version 5.3, Table B-15 in accordance with the UFP-QAPP Addendum (EA/Wood 2021a).

One water field duplicate was collected and analyzed for the same parameters as the accompanying sample. One MS/MSD was collected and analyzed for the same parameters as the accompanying sample. One field blank was collected in accordance with the UFP-QAPP Addendum (EA/Wood 2021a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment.

5.4 SURVEYING

Each boring location was surveyed using a Trimble R12i real-time kinematic Global Navigation Satellite System Receiver on the Oregon Real-Time Network. Positions were collected in the applicable Universal Transverse Mercator zone projection using the North American Datum of 1983 (horizontal) and North American Vertical Datum of 1988 (vertical), both measured in meters. Survey data were collected on 24 September 2021 and are provided in **Appendix B3**.

5.5 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS 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 UFP-QAPP Addendum (EA/Wood 2021a).

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purge water and decontamination fluids) generated during the SI activities were drummed separately in 55-gallon steel drums approved by the United States Department of Transportation. The IDW drums were subsequently stored within secondary containment in a dedicated indoor area within the Facility. The IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location. The IDW disposal is being managed under a separate contract by EA. Specifics on the disposal of solid and liquid IDW will be addressed in an IDW Technical Memorandum.

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.

5.6 LABORATORY ANALYTICAL METHODS

Samples were analyzed by LC/MS/MS, compliant with QSM Version 5.3 Table B-15, at Eurofins in Lancaster, Pennsylvania, a DoD ELAP and NELAP-certified laboratory.

One soil sample was also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D, and grain size using ASTM Standard D-422.

5.7 DEVIATIONS FROM SI UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on conditions encountered during field activities. These deviations were discussed among EA, Wood, ARNG, ORARNG, and USACE. Deviations from the UFP-QAPP Addendum are noted below:

- After evaluation of drainage patterns in both AOIs during the utility locate site visit, the field team determined the proposed boring locations as shown in the UFP-QAPP Addendum did not comprehensively cover the area most likely to be affected by tracking/drainage from the potential source areas. The field team suggested relocating and/or adding boring locations to more comprehensively investigate the area most likely to be affected by drainage from the potential source areas. Three boring locations were added to AOI 1 (COUTES-AOI01-05, COUTES-AOI01-06, and COUTES-AOI01-07). In order to communicate these changes, and receive approval and concurrence among WSP, EA, ARNG, USACE, and ORARNG, a field change request was submitted to ARNG on 16 September 2021.

- The locations of borings at AOI 2 were adjusted based on field observations and the location of existing septic system components. In order to communicate these changes, and receive approval and concurrence among WSP, EA, ARNG, USACE, and ORARNG, a field change request was submitted to ARNG on 16 September 2021.

- Hand augering was not performed to a depth of 5 feet, as prescribed in the UFP-QAPP Addendum. At all boring locations in AOI 1 and AOI 2, subsurface lithology prevented the hand auger bit from penetrating farther than 2 feet beneath the surface in all locations. A thorough private utility locate, Facility drawings, and field observations provided sufficient evidence to proceed with DPT boring activities.

- Borings at all boring locations within AOI 1 and AOI 2 were not advanced to the maximum planned boring depth of 13 to 15 ft bgs. Refusal at basalt bedrock was encountered at depths ranging between 2.1 and 5 ft bgs.

In addition, the UFP-QAPP Addendum contained an error regarding the soil extraction holding time. The PFAS extraction holding time for soil should have been identified as 28 days, consistent with the Programmatic UFP-QAPP (EA 2020a). Holding times for soil (as per the programmatic UFP-QAPP) were met.

The actual locations of all borings in AOI 1 and AOI 2 are shown on **Figure 5-1**. The Field Change Request Form is provided in **Appendix B4**.

Table 5-1. Site Inspection Samples by Medium
COUTES, Oregon
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
COUTES-AOI01-01-1	9/23/21	1.0	X				
COUTES-AOI01-01-2	9/23/21	2.0	X				
COUTES-AOI01-02-1	9/23/21	1.0	X				MS/MSD Collected
COUTES-AOI01-02-3	9/23/21	3.0	X				
COUTES-AOI01-03-1	9/23/21	1.0	X				Parent Sample of COUTES-AOI01-FD01
COUTES-AOI01-FD01	9/23/21	1.0	X				FD
COUTES-AOI01-03-3	9/23/21	3.0	X				
COUTES-AOI01-04-1	9/23/21	1.0	X				Parent Sample of COUTES-AOI01-FD02
COUTES-AOI01-FD02	9/23/21	1.0	X				FD
COUTES-AOI01-04-3	9/23/21	3.0	X				
COUTES-AOI01-05-2	9/23/21	2.0	X	X	X	X	
COUTES-AOI01-05-4	9/23/21	4.0	X				
COUTES-AOI01-06-1	9/23/21	1.0	X				
COUTES-AOI01-06-4	9/23/21	4.0	X				
COUTES-AOI01-07-1	9/23/21	1.0	X				
COUTES-AOI01-07-2	9/23/21	2.0	X				
COUTES-AOI02-01-1	9/23/21	1.0	X				
COUTES-AOI02-01-2	9/23/21	2.0	X				
COUTES-AOI02-02-1	9/23/21	1.0	X				
COUTES-AOI02-02-2	9/23/21	2.0	X				
COUTES-AOI02-03-1	9/23/21	1.0	X				MS/MSD Collected
COUTES-AOI02-03-3	9/23/21	3.0	X				Parent Sample of COUTES-AOI02-FD01
COUTES-AOI02-FD01	9/23/21	3.0	X				FD
Groundwater Samples							
COUTES-Well-0921	9/24/21	-	X				MS/MSD Collected Parent Sample of COUTES-FD01
Blank Samples							
COUTES-FB-01	9/24/21	-	X				Collected during sampling of COUTES-Well-0921
COUTES-EB-01	9/23/21	-	X				Equipment Blank Collected from DPT Probe Shoe

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
FD = field duplicate
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 and Temporary Well Screen Intervals
COUTES, Oregon
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	COUTES-AOI01-01	3.0	-
	COUTES-AOI01-02	4.5	-
	COUTES-AOI01-03	4.5	-
	COUTES-AOI01-04	4.0	-
	COUTES-AOI01-05	5.0	-
	COUTES-AOI01-06	5.0	-
	COUTES-AOI01-07	3.5	-
2	COUTES-AOI02-01	2.1	-
	COUTES-AOI02-02	3.0	-
	COUTES-AOI02-03	4.0	-

Notes:
Boring depths are the depth at which refusal was reached during drilling.
Abbreviations:
- = not applicable; groundwater not encountered
bgs = below ground surface
ft = feet

Army National Guard Site Inspections
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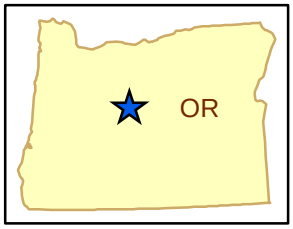
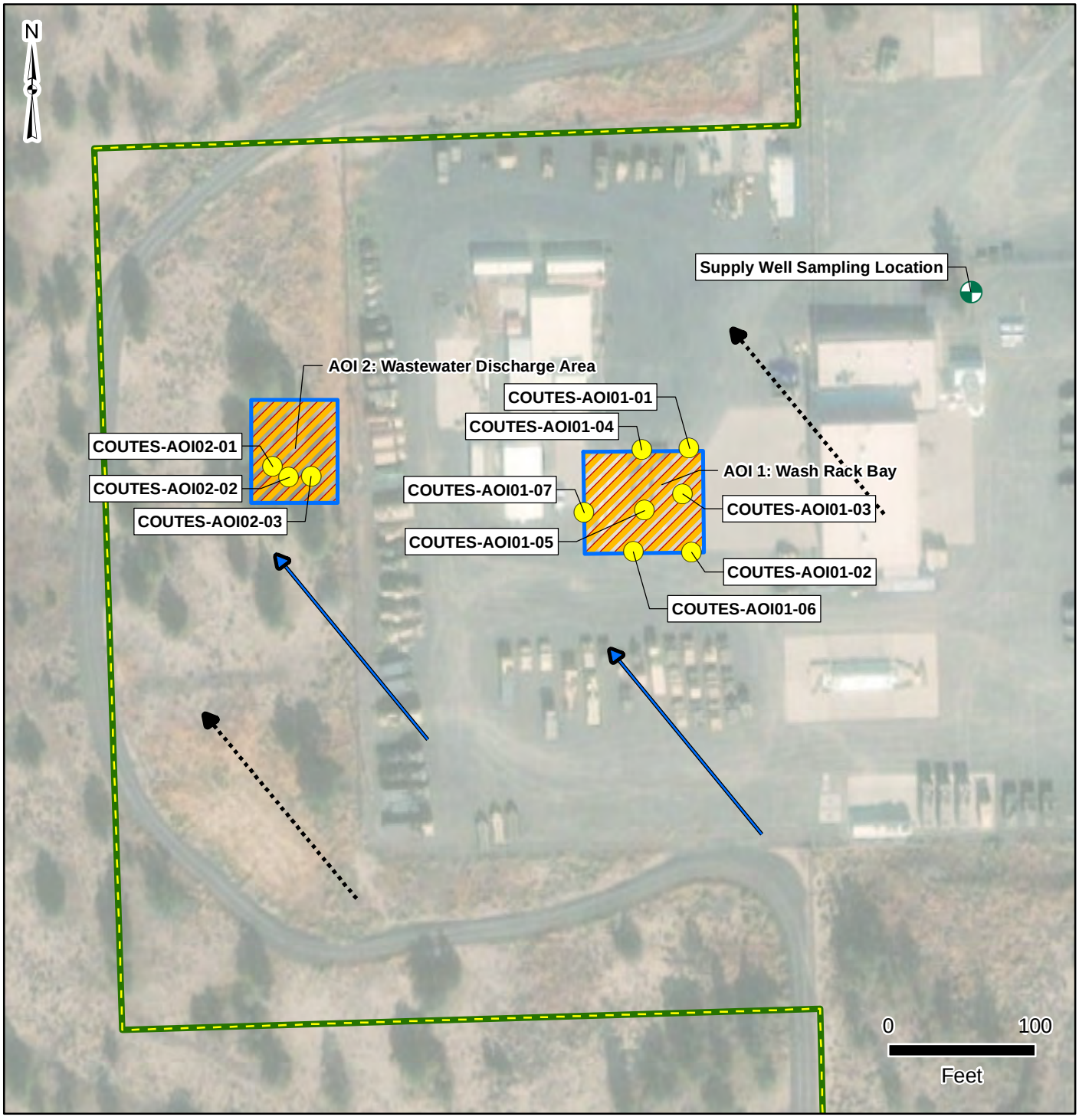


Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release

Sample Location
- Soil Boring Location
- Facility Water Supply Well

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 5-1 Site Inspection Sample Locations.mxd - stephane.descombes - 5/1/2023 - 12:31:38 PM

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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 **Sections 6.3 and 6.4**. SLs for relevant compounds, for both soil and groundwater, are presented in **Table 6-1**. **Table 6-2** through **Table 6-4** present results in soil and groundwater 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 (Assistant Secretary of Defense 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum 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 in **Table 6-1**.

Table 6-1. Screening Levels (Soil and Groundwater)
COUTES, Oregon
Site Inspection Report

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

Notes:
1. Assistant Secretary of Defense. July 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. May 2022.
2. 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.

Abbreviations:
µg/kg = microgram(s) per kilogram
bgs = below ground surface
ft = feet
ng/L = nanogram(s) per liter

The data in the subsequent sections are compared against 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, one soil sample was analyzed for TOC, pH, and grain size, which are important for evaluating transport through the soil medium. **Appendix E** contains the results of the TOC, pH, and grain size 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 PFAS 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 in comparison to SLs for AOI 1: Wash Rack Bay. The soil results are summarized in **Table 6-2** and **Table 6-3**. Soil results are presented on **Figure 6-1** through **Figure 6-5**.

6.3.1 AOI 1 Soil Analytical Results

Soil samples were collected from seven boring locations associated with AOI 1 during the SI. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** and **Table 6-3** summarize the soil results for the relevant compounds.

Surface soil (0 to 2 feet bgs) was sampled from boring locations COUTES-AOI01-01 through COUTES-AOI01-07. Soil was also sampled from shallow subsurface soil (3 to 4 feet bgs) at each boring location in this AOI.

PFOA, PFOS, and/or PFNA were detected in surface soil at concentrations below their respective SLs at five out of seven boring locations, at detected concentrations ranging from 0.27 to 0.62 J microgram(s) per kilogram (µg/kg) (estimated) for PFOA, 0.34 J (estimated) to 2.5 µg/kg for PFOS, and 0.23 to 0.28 J µg/kg (estimated) for PFNA. PFBS and PFHxS were not detected in surface soil samples.

PFOA was detected in shallow subsurface soil at a concentration below its SL at one out of five boring locations with subsurface soil samples collected, at a detected concentration of

0.35 J µg/kg (estimated). PFOS, PFBS, PFHxS, and PFNA were not detected in shallow subsurface soil at AOI 1.

6.3.2 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFNA were detected in soil below their respective SLs. Based on the lack of exceedances of the SLs, further evaluation at AOI 1 is not warranted.

6.4 AOI 2

This section presents the analytical results for soil in comparison to SLs for AOI 2: Wastewater Discharge Area. The soil results are summarized in **Table 6-2** and **Table 6-3**. Soil results are presented on **Figure 6-1** through **Figure 6-5**.

6.4.1 AOI 2 Soil Analytical Results

Soil samples were collected from three boring locations associated with AOI 2 during the SI. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** and **Table 6-3** summarize the soil results.

Surface soil (0 to 2 feet bgs) was sampled from boring locations COUTES-AOI02-01 through COUTES-AOI02-03. Soil was also sampled from shallow subsurface soil (3 feet bgs) at one boring location COUTES-AOI02-03.

PFOA and PFOS were detected in surface soil at concentrations below their respective SLs at all three boring locations, at detected concentrations ranging from 0.27 to 0.52 µg/kg (estimated) for PFOA, and 0.39 (estimated) and 1.0 µg/kg for PFOS. PFBS, PFHxS, and PFNA were not detected in surface soil at AOI 2.

PFOA and PFOS were detected in shallow subsurface soil at concentrations below their respective SLs at boring COUTES-AOI02-03, at concentrations of 0.23 J µg/kg and 0.25 J µg/kg (estimated), respectively. PFOA and PFOS were not detected in the field duplicate sample at this same location. PFBS, PFHxS, and PFNA were not detected in shallow subsurface soil at AOI 2.

6.4.2 Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil below their respective SLs. Based on the lack of exceedances of the SLs, further evaluation at AOI 2 is not warranted.

6.5 POTABLE SUPPLY WELL

The UFP-QAPP Addendum stated that if perched groundwater was encountered during boring installation, it would be sampled; however, perched groundwater was not encountered in the borings completed for the SI. An existing potable water supply well at the Facility was sampled in accordance with the UFP-QAPP Addendum.

The static groundwater level at COUTES is estimated to be approximately 340 to 390 feet bgs based on measurements documented during installation of the facility drinking water wells. An existing potable supply well is present at COUTES and was available for sampling during the SI investigation; however, because the existing drinking water well is located cross-gradient to the AOIs, the results from this well are considered informational and they may not be reflective of groundwater associated with the AOIs.

6.5.1 Groundwater Analytical Results

Table 6-4 and **Figure 6-6 and Figure 6-7** present the sampling location and results of the groundwater sample.

The water supply well is located northeast and cross-gradient of the AOIs (**Figure 3-1**). PFAS was not detected in groundwater and, therefore, the relevant compounds did not exceed the SLs.

6.5.2 Conclusions

Based on the results of the SI, the groundwater sample collected did not exceed the SLs for the relevant compounds. Based on the lack of exceedances of the SLs, further evaluation of groundwater at the Facility is not warranted.

Table 6-2
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Surface Soil
COUTES, Oregon

	Area of Interest	AOI 1															
	Location ID	COUTES-AOI01-01				COUTES-AOI01-01				COUTES-AOI01-02				COUTES-AOI01-03			
	Sample Name	COUTES-AOI01-01-1				COUTES-AOI01-01-2				COUTES-AOI01-02-1				COUTES-AOI01-03-1			
	Parent Sample ID																
	Depth	1 ft				2 ft				1 ft				1 ft			
	Sample Date	9/23/2021				9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorooctanoic acid (PFOA)	19	0.27	0.40	0.60	J	0.52	0.44	0.65	J	0.31	0.38	0.58	J	<	0.47	0.70	U
Perfluorooctanesulfonic acid (PFOS)	13	<	0.40	0.60	U	<	0.44	0.65	U	0.34	0.38	0.58	J	<	0.47	0.70	U
Perfluorobutanesulfonic acid (PFBS)	1,900	<	1.6	2.0	U	<	1.7	2.2	U	<	1.5	1.9	U	<	1.9	2.3	U
Perfluorohexanesulfonic acid (PFHxS)	130	<	0.40	0.60	U	<	0.44	0.65	U	<	0.38	0.58	U	<	0.47	0.70	U
Perfluorononanoic acid (PFNA)	19	<	0.40	0.60	U	<	0.44	0.65	U	0.26	0.38	0.58	J	<	0.47	0.70	U

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 direct 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.

Chemical Abbreviations

PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations

< analyte not detected above the LOD
AOI Area of Interest
DL detection limit
ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg microgram(s) per kilogram

Table 6-2
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Surface Soil
COUTES, Oregon

	Area of Interest	AOI 1															
	Location ID	COUTES-AOI01-03				COUTES-AOI01-04				COUTES-AOI01-04				COUTES-AOI01-05			
	Sample Name	COUTES-AOI01-FD01				COUTES-AOI01-04-1				COUTES-AOI01-FD02				COUTES-AOI01-05-2			
	Parent Sample ID	COUTES-AOI01-03-1								COUTES-AOI01-04-1							
	Depth	1 ft				1 ft				1 ft				2 ft			
	Sample Date	9/23/2021				9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorooctanoic acid (PFOA)	19	<	0.44	0.65	U	0.62	0.43	0.65	J	0.47	0.41	0.62	J	<	0.42	0.64	U
Perfluorooctanesulfonic acid (PFOS)	13	<	0.44	0.65	U	2.5	0.43	0.65		1.8	0.41	0.62	J	0.34	0.42	0.64	J
Perfluorobutanesulfonic acid (PFBS)	1,900	<	1.7	2.2	U	<	1.7	2.2	U	<	1.7	2.1	U	<	1.7	2.1	U
Perfluorohexanesulfonic acid (PFHxS)	130	<	0.44	0.65	U	<	0.43	0.65	U	<	0.41	0.62	U	<	0.42	0.64	U
Perfluorononanoic acid (PFNA)	19	<	0.44	0.65	U	0.23	0.43	0.65	J	<	0.41	0.62	U	0.28	0.42	0.64	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. Soil Screening levels based on residential scenario for direct 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.

Chemical Abbreviations

PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations

< analyte not detected above the LOD
AOI Area of Interest
DL detection limit
ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg microgram(s) per kilogram

Table 6-2
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Surface Soil
COUTES, Oregon

	Area of Interest	AOI 1												AOI 2			
	Location ID	COUTES-AOI01-06				COUTES-AOI01-07				COUTES-AOI01-07				COUTES-AOI02-01			
	Sample Name	COUTES-AOI01-06-1				COUTES-AOI01-07-1				COUTES-AOI01-07-2				COUTES-AOI02-01-1			
	Parent Sample ID																
	Depth	1 ft				1 ft				2 ft				1 ft			
	Sample Date	9/23/2021				9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorooctanoic acid (PFOA)	19	0.40	0.39	0.59	J	<	0.40	0.60	U	<	0.45	0.67	U	0.45	0.53	0.79	J
Perfluorooctanesulfonic acid (PFOS)	13	0.46	0.39	0.59	J	<	0.40	0.60	U	<	0.45	0.67	U	1.0	0.53	0.79	
Perfluorobutanesulfonic acid (PFBS)	1,900	<	1.6	2.0	U	<	1.6	2.0	U	<	1.8	2.2	U	<	2.1	2.6	U
Perfluorohexanesulfonic acid (PFHxS)	130	<	0.39	0.59	U	<	0.40	0.60	U	<	0.45	0.67	U	<	0.53	0.79	U
Perfluorononanoic acid (PFNA)	19	<	0.39	0.59	U	<	0.40	0.60	U	<	0.45	0.67	U	<	0.53	0.79	U

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 direct 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.

Chemical Abbreviations

PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations

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AOI Area of Interest
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ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg microgram(s) per kilogram

Table 6-2
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Surface Soil
COUTES, Oregon

	Area of Interest	AOI 2															
	Location ID	COUTES-AOI02-01				COUTES-AOI02-02				COUTES-AOI02-02				COUTES-AOI02-03			
	Sample Name	COUTES-AOI02-01-2				COUTES-AOI02-02-1				COUTES-AOI02-02-2				COUTES-AOI02-03-1			
	Parent Sample ID																
	Depth	2 ft				1 ft				2 ft				1 ft			
	Sample Date	9/23/2021				9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorooctanoic acid (PFOA)	19	0.42	0.48	0.71	J	0.52	0.48	0.72	J	0.27	0.45	0.67	J	0.37	0.46	0.69	J
Perfluorooctanesulfonic acid (PFOS)	13	0.99	0.48	0.71		0.54	0.48	0.72	J	0.59	0.45	0.67	J	0.39	0.46	0.69	J
Perfluorobutanesulfonic acid (PFBS)	1,900	<	1.9	2.4	U	<	1.9	2.4	U	<	1.8	2.2	U	<	1.8	2.3	U
Perfluorohexanesulfonic acid (PFHxS)	130	<	0.48	0.71	U	<	0.48	0.72	U	<	0.45	0.67	U	<	0.46	0.69	U
Perfluorononanoic acid (PFNA)	19	<	0.48	0.71	U	<	0.48	0.72	U	<	0.45	0.67	U	<	0.46	0.69	U

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 direct 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.

Chemical Abbreviations

PFAS per- and polyfluoroalkyl substances
PFBS perfluorobutanesulfonic acid
PFHxS perfluorohexanesulfonic acid
PFNA perfluorononanoic acid
PFOA perfluorooctanoic acid
PFOS perfluorooctanesulfonic acid

Acronyms and Abbreviations

< analyte not detected above the LOD
AOI Area of Interest
DL detection limit
ft feet
HQ hazard quotient
LC/MS/MS liquid chromatography with tandem mass spectrometry
LOD limit of detection
OSD Office of the Secretary of Defense
Qual interpreted qualifier
USEPA United States Environmental Protection Agency
µg/kg microgram(s) per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Shallow Subsurface Soil
COUTES, Oregon

Area of Interest		AOI 1															
Location ID		COUTES-AOI01-02				COUTES-AOI01-03				COUTES-AOI01-04				COUTES-AOI01-05			
Sample Name		COUTES-AOI01-02-3				COUTES-AOI01-03-3				COUTES-AOI01-04-3				COUTES-AOI01-05-4			
Parent Sample ID																	
Depth		3 ft				3 ft				3 ft				4 ft			
Sample Date		9/23/2021				9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15																	
Perfluorooctanoic acid (PFOA)	250	<	0.41	0.62	U	<	0.43	0.64	U	0.35	0.44	0.65	J	<	0.45	0.67	U
Perfluorooctanesulfonic acid (PFOS)	160	<	0.41	0.62	U	<	0.43	0.64	U	<	0.44	0.65	U	<	0.45	0.67	U
Perfluorobutanesulfonic acid (PFBS)	25,000	<	1.7	2.1	U	<	1.7	2.1	U	<	1.7	2.2	U	<	1.8	2.2	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	<	0.41	0.62	U	<	0.43	0.64	U	<	0.44	0.65	U	<	0.45	0.67	U
Perfluorononanoic acid (PFNA)	250	<	0.41	0.62	U	<	0.43	0.64	U	<	0.44	0.65	U	<	0.45	0.67	U

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.

Chemical Abbreviations

PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

<	analyte not detected above the LOD
AOI	Area of Interest
DL	detection limit
ft	feet
HQ	hazard quotient
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
OSD	Office of the Secretary of Defense
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
µg/kg	microgram(s) per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Shallow Subsurface Soil
COUTES, Oregon

	Area of Interest	AOI 1				AOI 2							
	Location ID	COUTES-AOI01-06				COUTES-AOI02-03				COUTES-AOI02-03			
	Sample Name	COUTES-AOI01-06-4				COUTES-AOI02-03-3				COUTES-AOI02-FD01			
	Parent Sample ID									COUTES-AOI02-03-3			
	Depth	4 ft				3 ft				3 ft			
	Sample Date	9/23/2021				9/23/2021				9/23/2021			
Analyte	**Screening Level [a]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Soil, PFAS (LC/MS/MS) (µg/kg) compliant with QSM Version 5.3 Table B-15													
Perfluorooctanoic acid (PFOA)	250	<	0.45	0.67	U	0.23	0.46	0.68	J	<	0.48	0.72	U
Perfluorooctanesulfonic acid (PFOS)	160	<	0.45	0.67	U	0.25	0.46	0.68	J	<	0.48	0.72	U
Perfluorobutanesulfonic acid (PFBS)	25,000	<	1.8	2.2	U	<	1.8	2.3	U	<	1.9	2.4	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	<	0.45	0.67	U	<	0.46	0.68	U	<	0.48	0.72	U
Perfluorononanoic acid (PFNA)	250	<	0.45	0.67	U	<	0.46	0.68	U	<	0.48	0.72	U

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 D

Chemical Abbreviations

PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

<	analyte not detected above the LOD
AOI	Area of Interest
DL	detection limit
ft	feet
HQ	hazard quotient
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
OSD	Office of the Secretary of Defense
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
µg/kg	microgram(s) per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFHxS, and PFNA Results in Groundwater
COUTES, Oregon

	Location ID	COUTES-WELL				COUTES-WELL			
	Sample Name	COUTES-WELL-0921				COUTES-FD01			
	Parent Sample ID					COUTES-WELL-0921			
	Sample Date	9/24/2021				9/24/2021			
Analyte	**Screening Level [1]**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
Water, PFAS (LC/MS/MS) (ng/L)									
Perfluorooctanoic acid (PFOA)	6	<	0.89	1.8	U	<	0.86	1.7	U
Perfluorooctanesulfonic acid (PFOS)	4	<	0.89	1.8	U	<	0.86	1.7	U
Perfluorobutanesulfonic acid (PFBS)	601	<	0.89	1.8	U	<	0.86	1.7	U
Perfluorohexanesulfonic acid (PFHxS)	39	<	0.89	1.8	U	<	0.86	1.7	U
Perfluorononanoic acid (PFNA)	6	<	0.89	1.8	U	<	0.86	1.7	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

(1) 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

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

Chemical Abbreviations

PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

<	analyte not detected above the LOD
DL	detection limit
HQ	hazard quotient
LOD	limit of detection
OSD	Office of the Secretary of Defense
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanograms per liter

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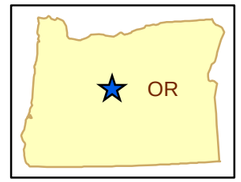
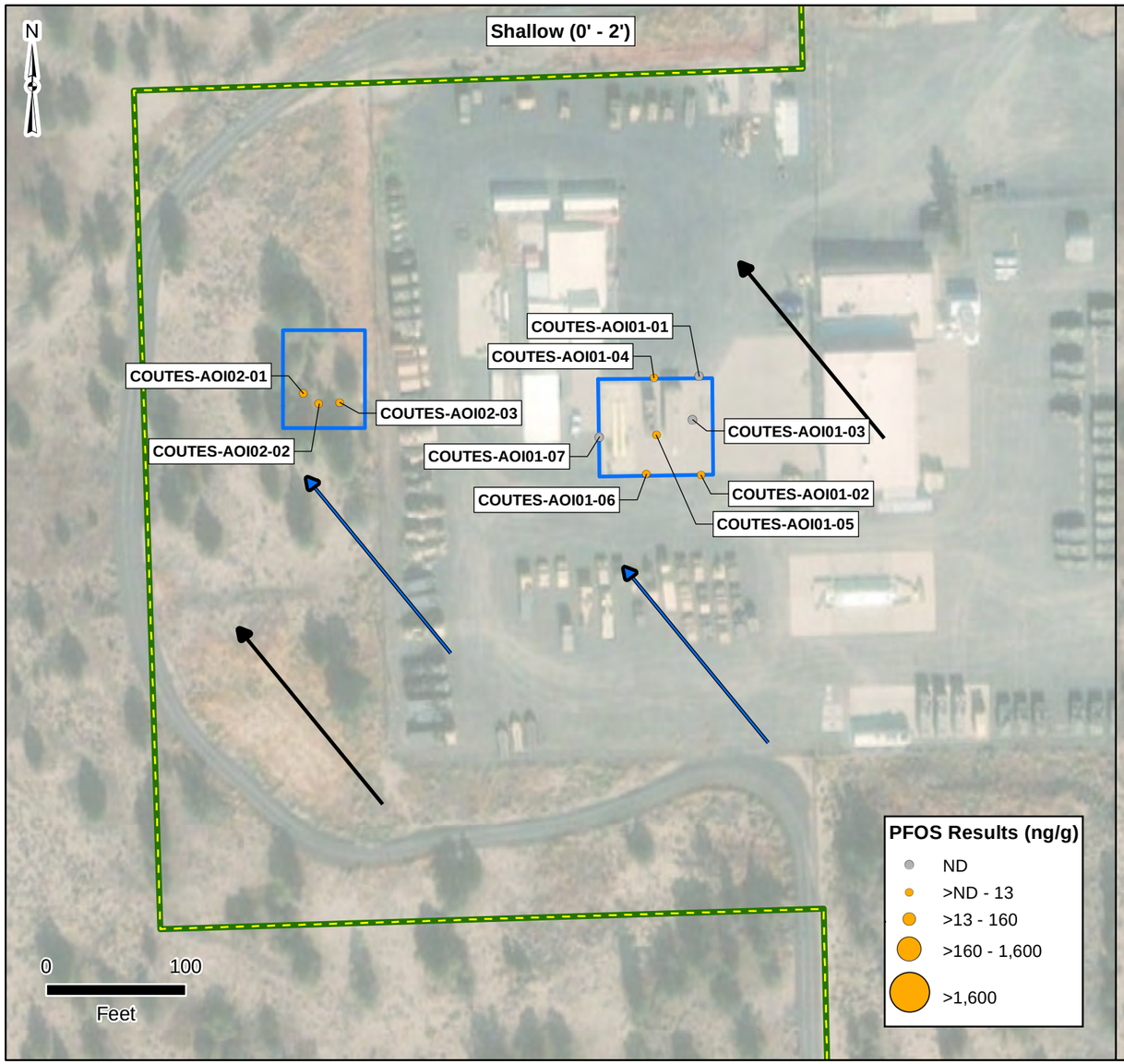
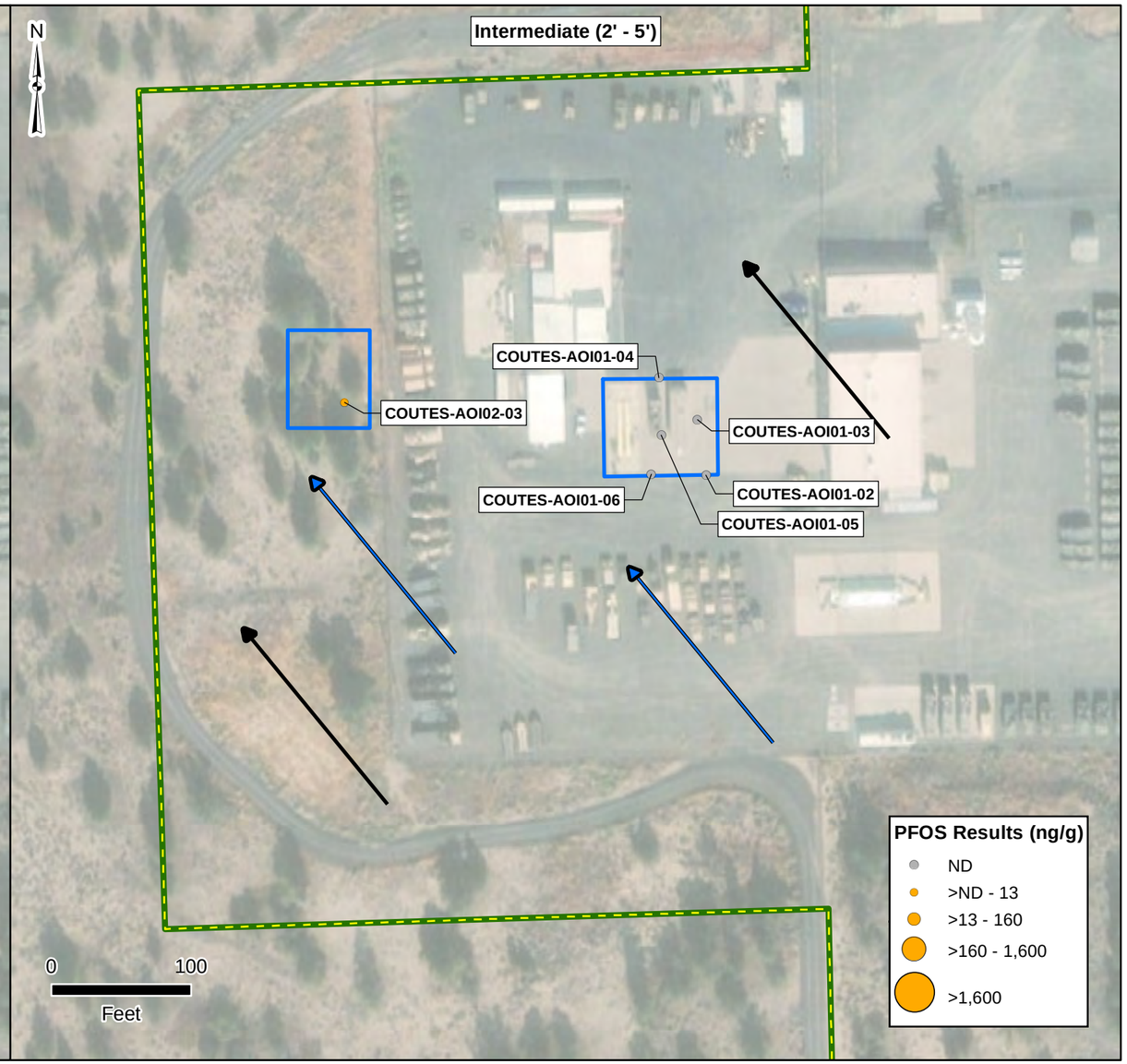
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-1
PFOS Detections in Soil







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-1 PFOS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:43:06 PM

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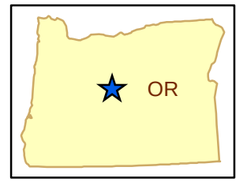
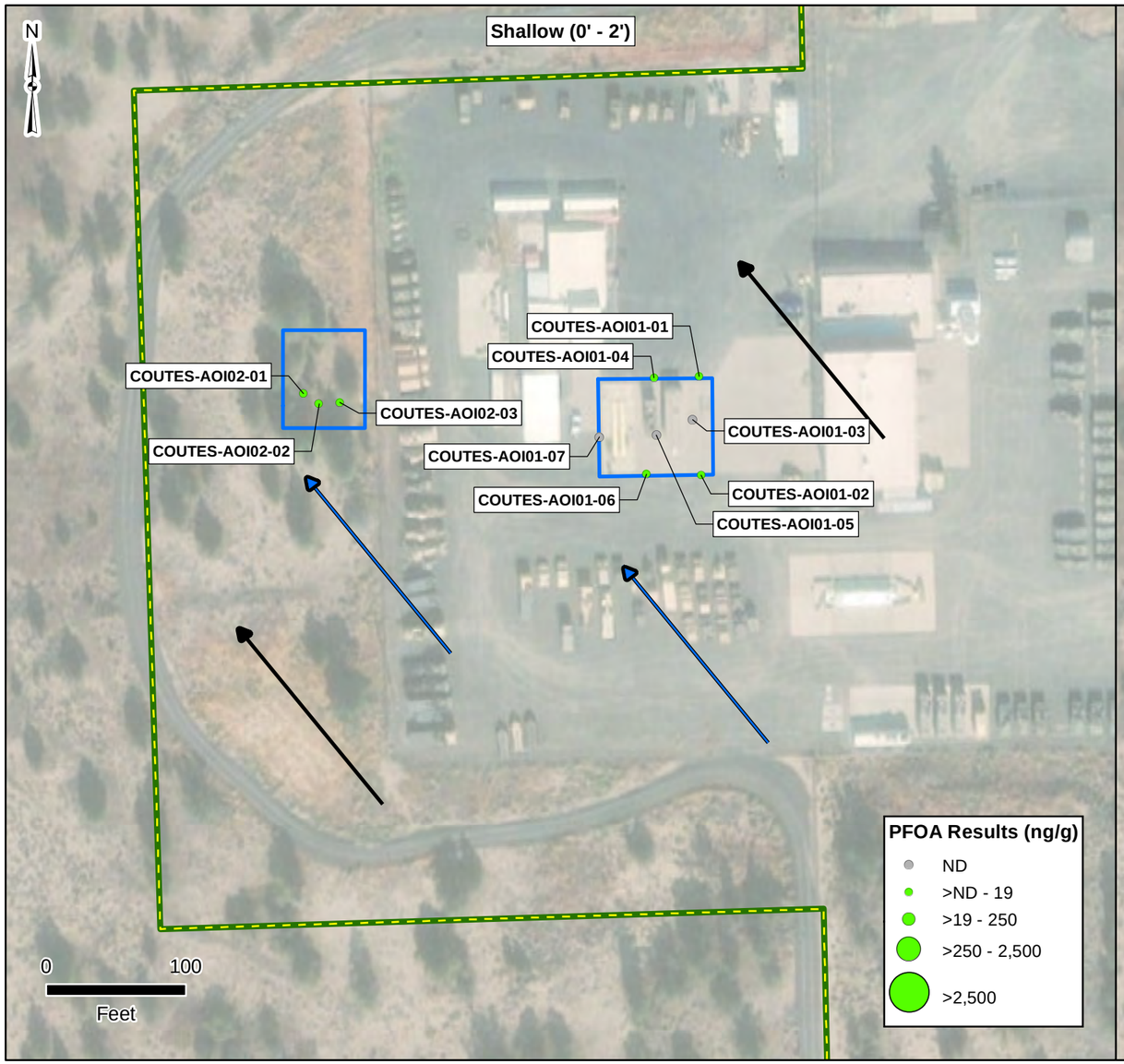
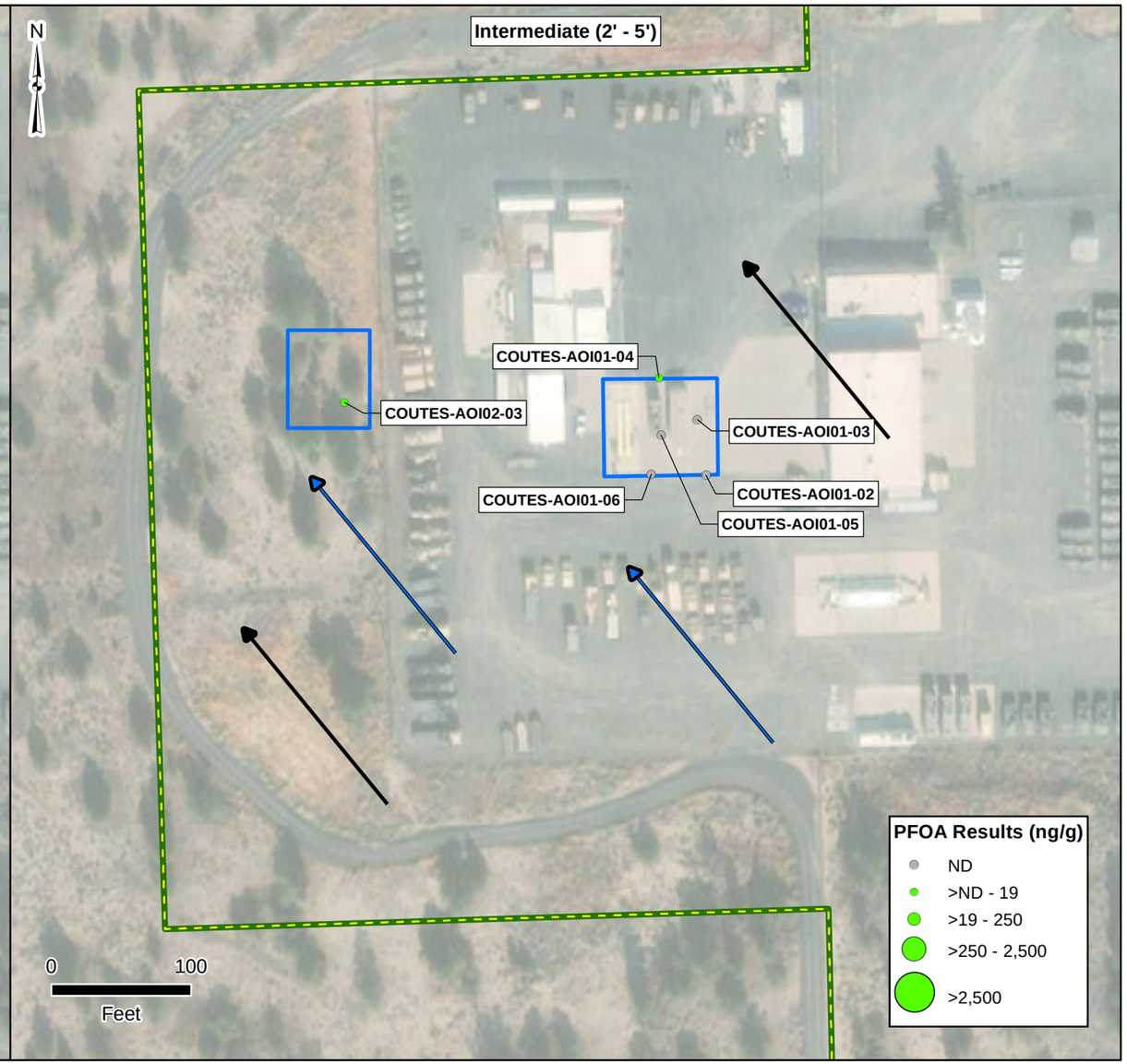
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-2
PFOA Detections in Soil







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

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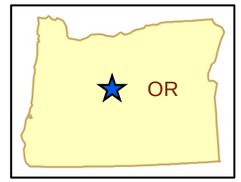
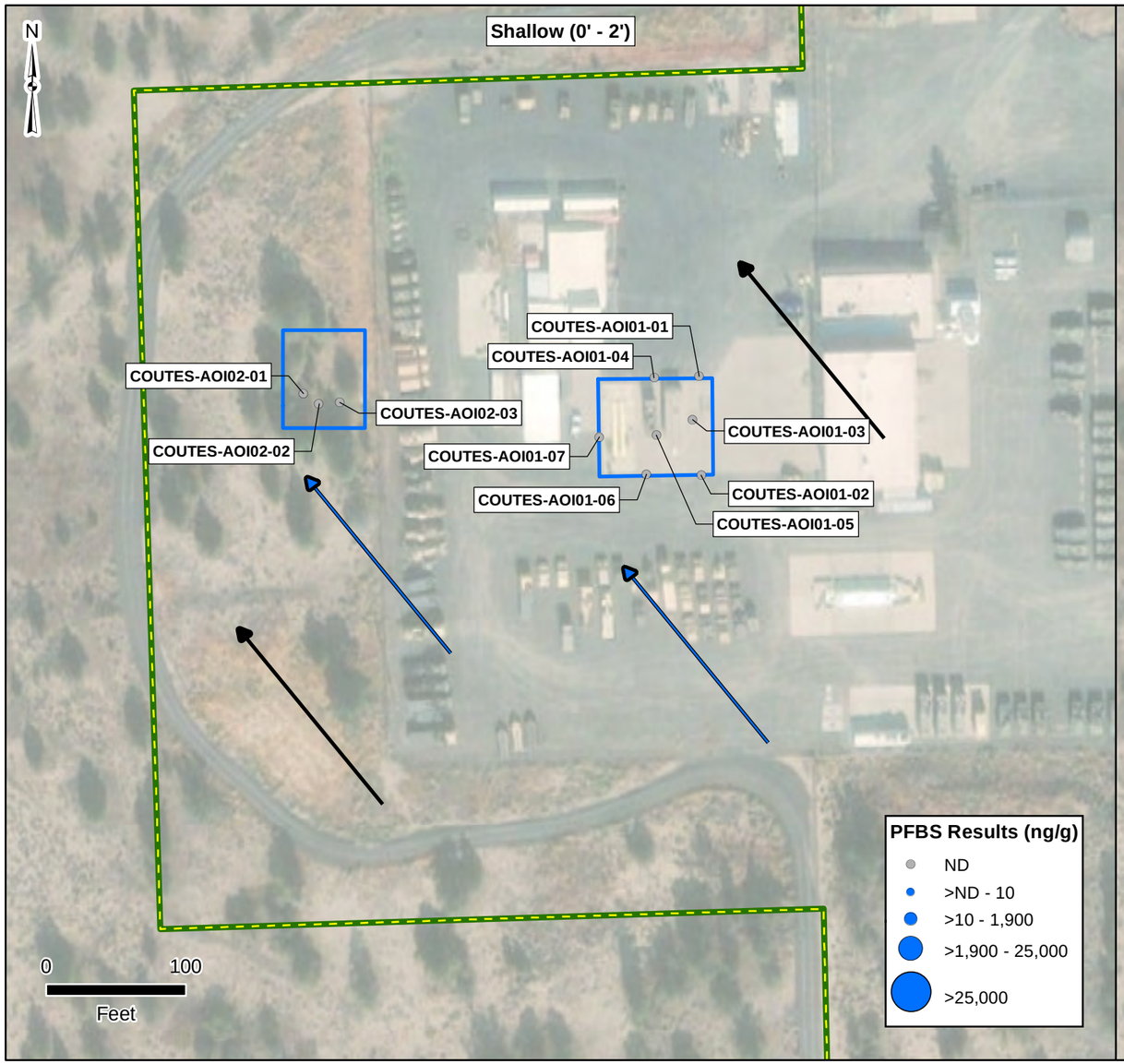
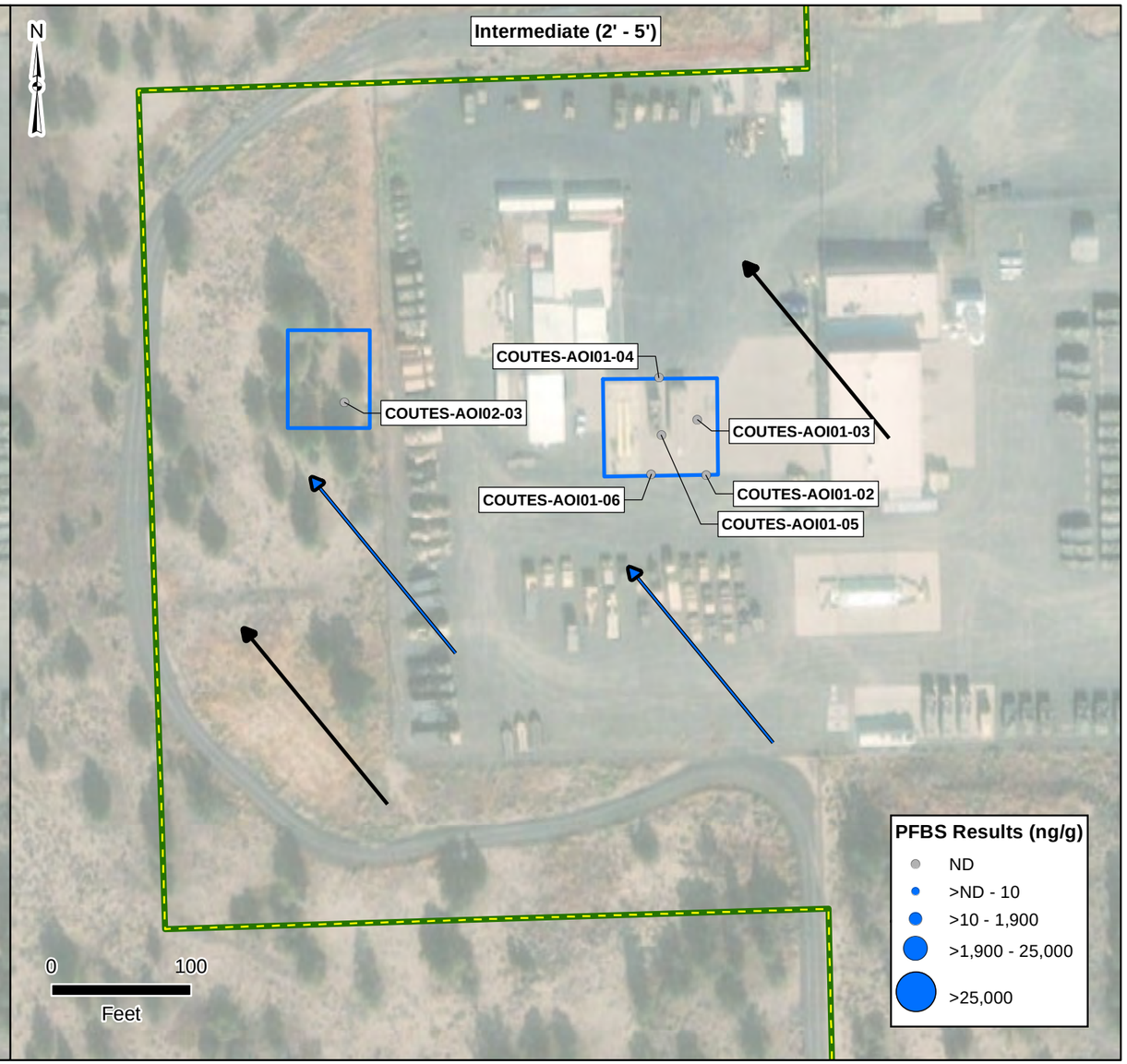
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-3
PFBS Detections in Soil







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-3 PFBS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:33:33 PM

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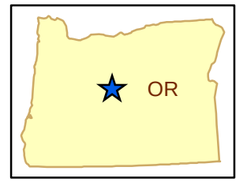
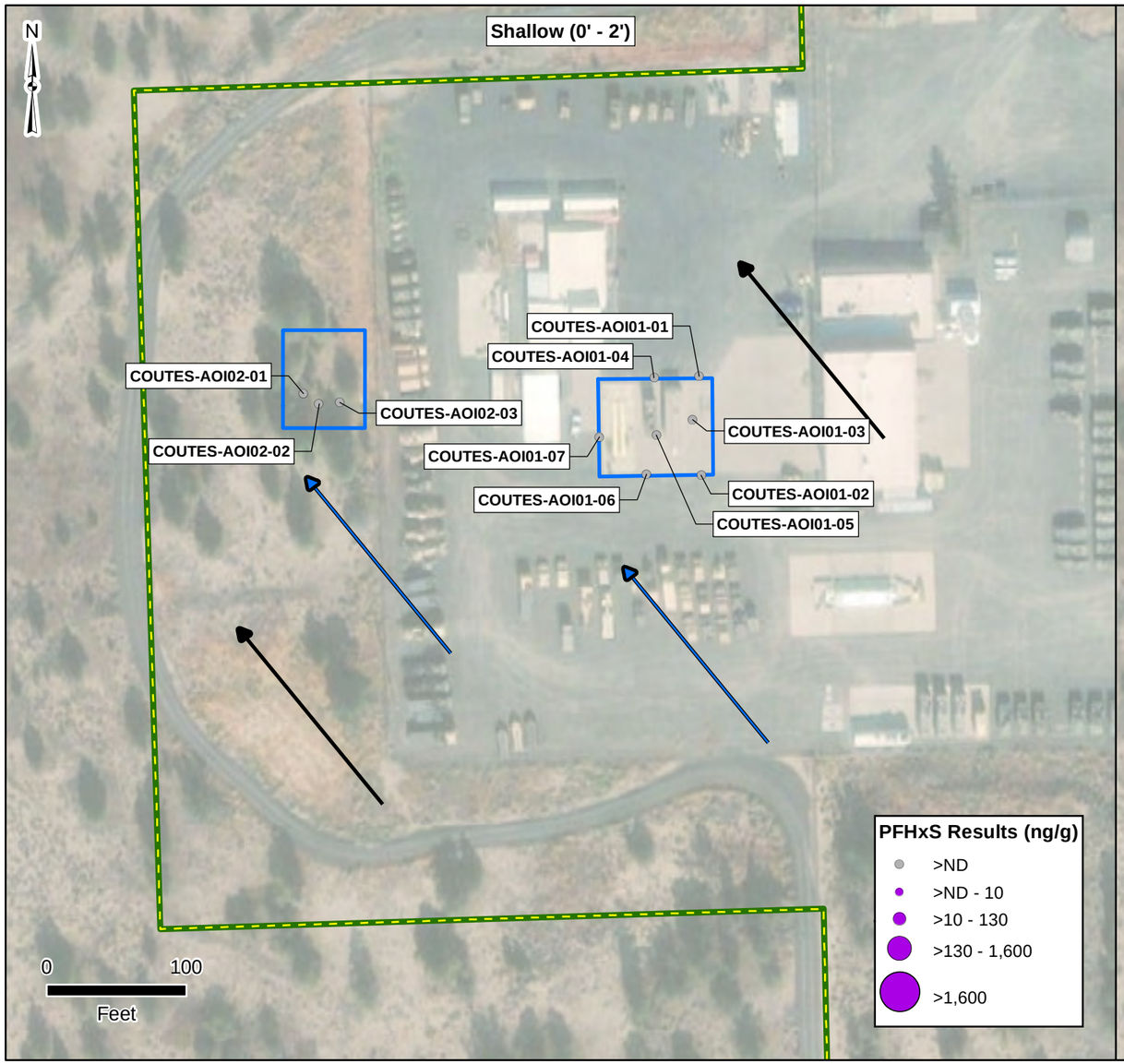
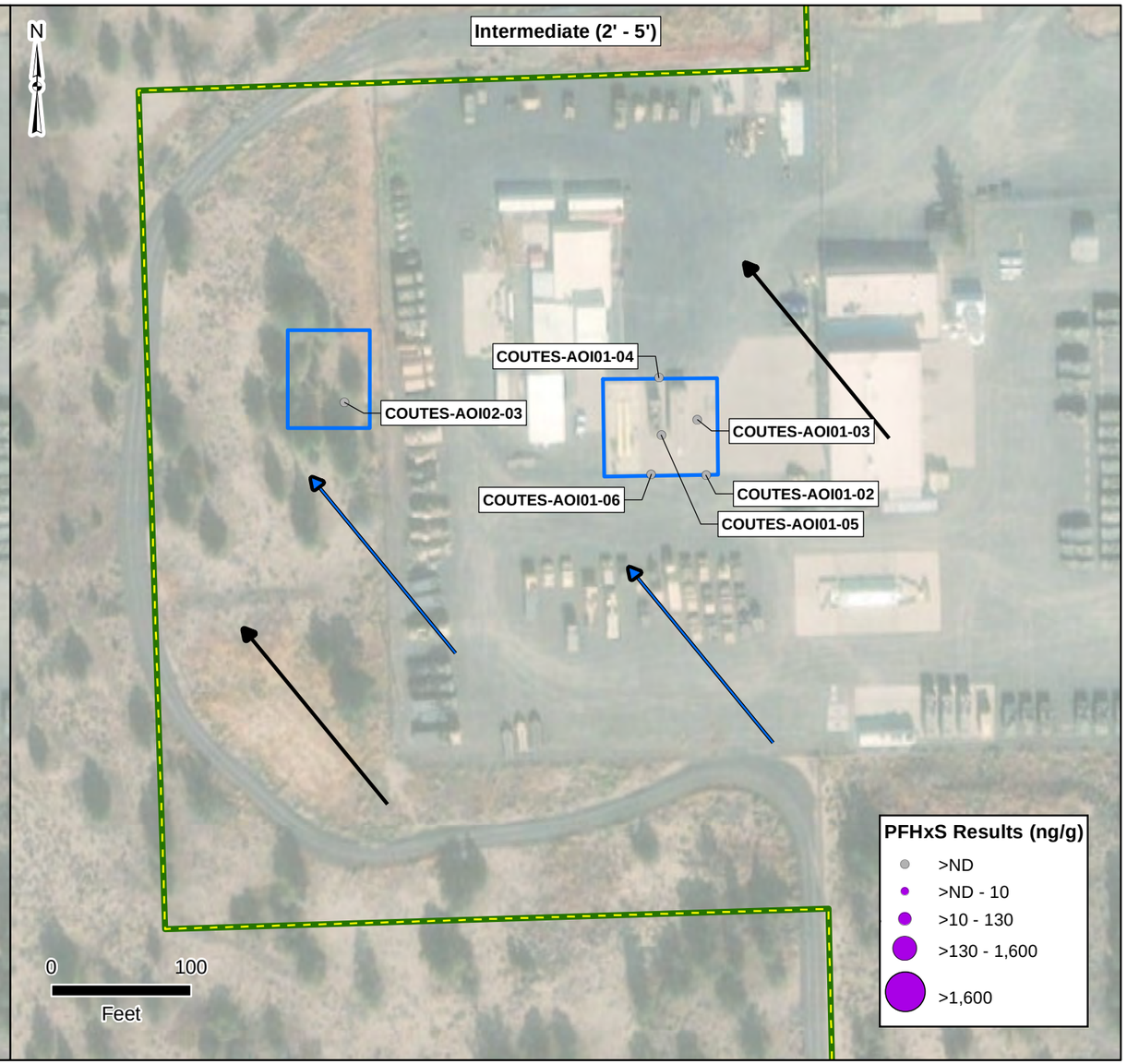
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-4
PFHxS Detections in Soil







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-4 PFHxS Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:33:12 PM

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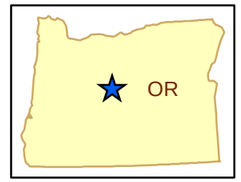
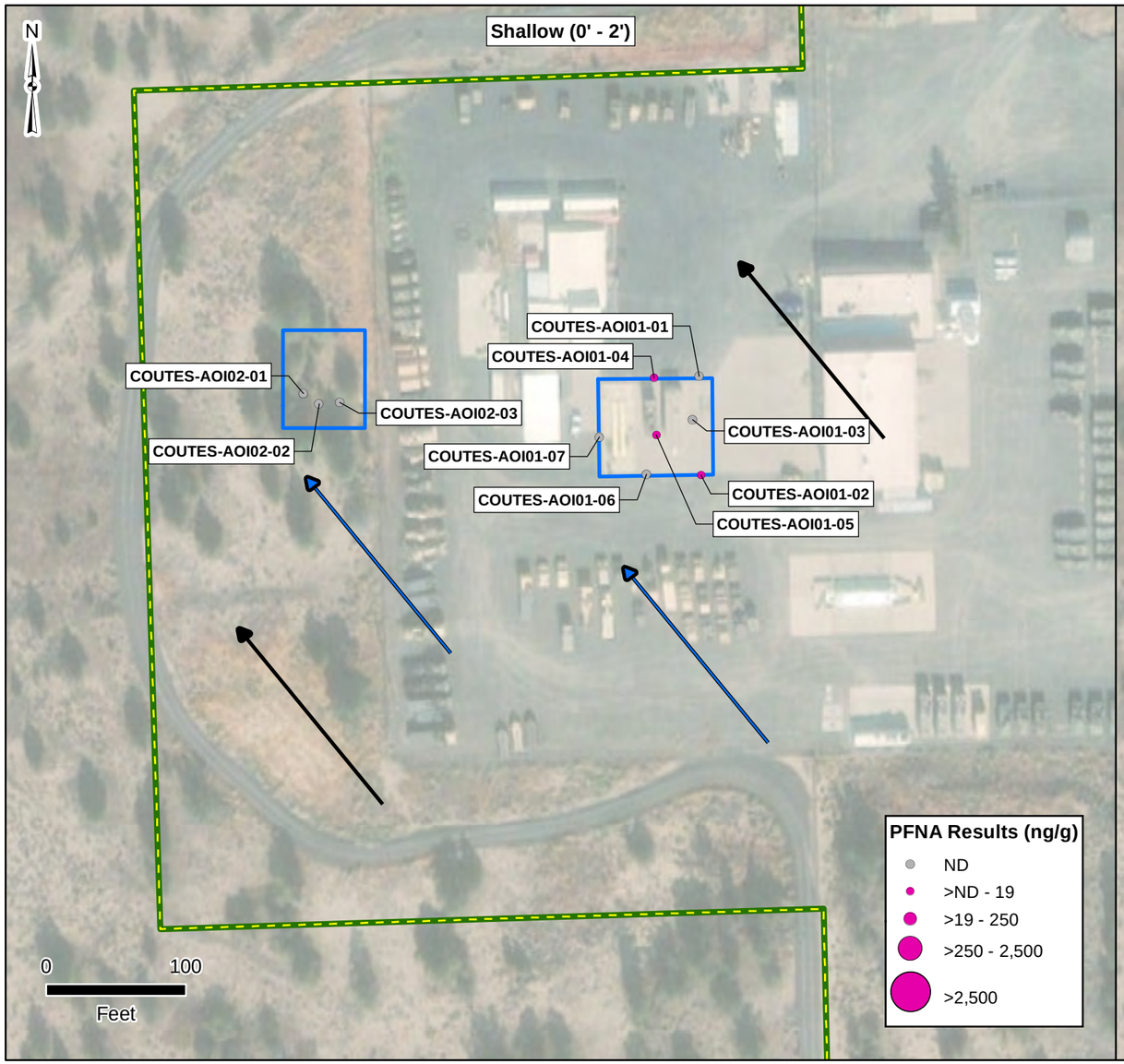
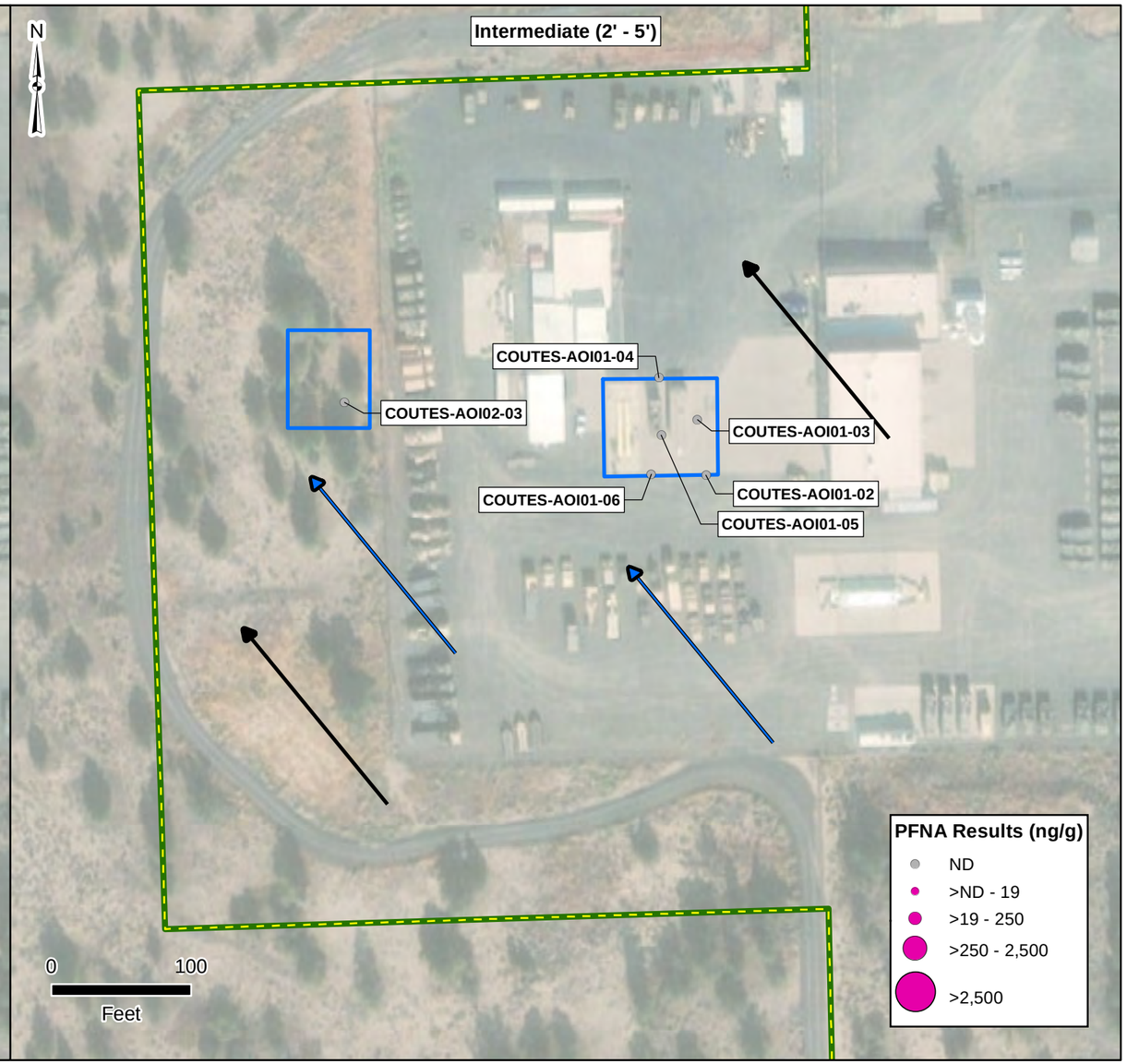
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-5
PFNA Detections in Soil







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-5 PFNA Detections in Soil.mxd - stephane.descombes - 5/1/2023 - 12:32:41 PM

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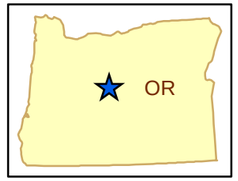
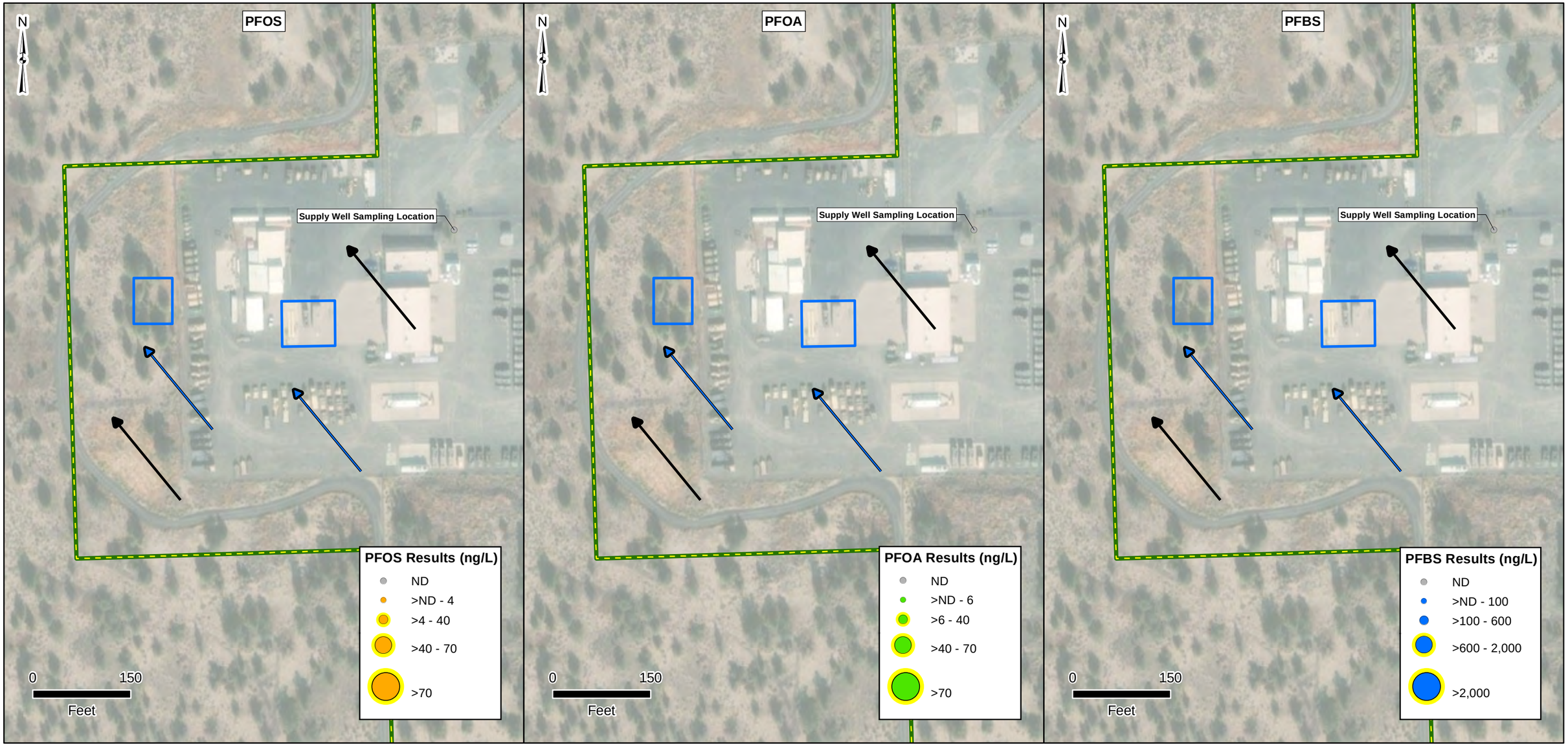
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-6
PFOS, PFOA, and PFBS Detections in Groundwater





Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-6 PFOS-PFOA-PFBS Detections in Groundwater.mxd - stephane.descombes - 5/1/2023 - 12:32:15 PM

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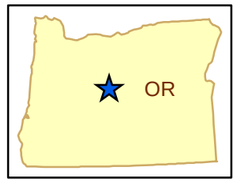
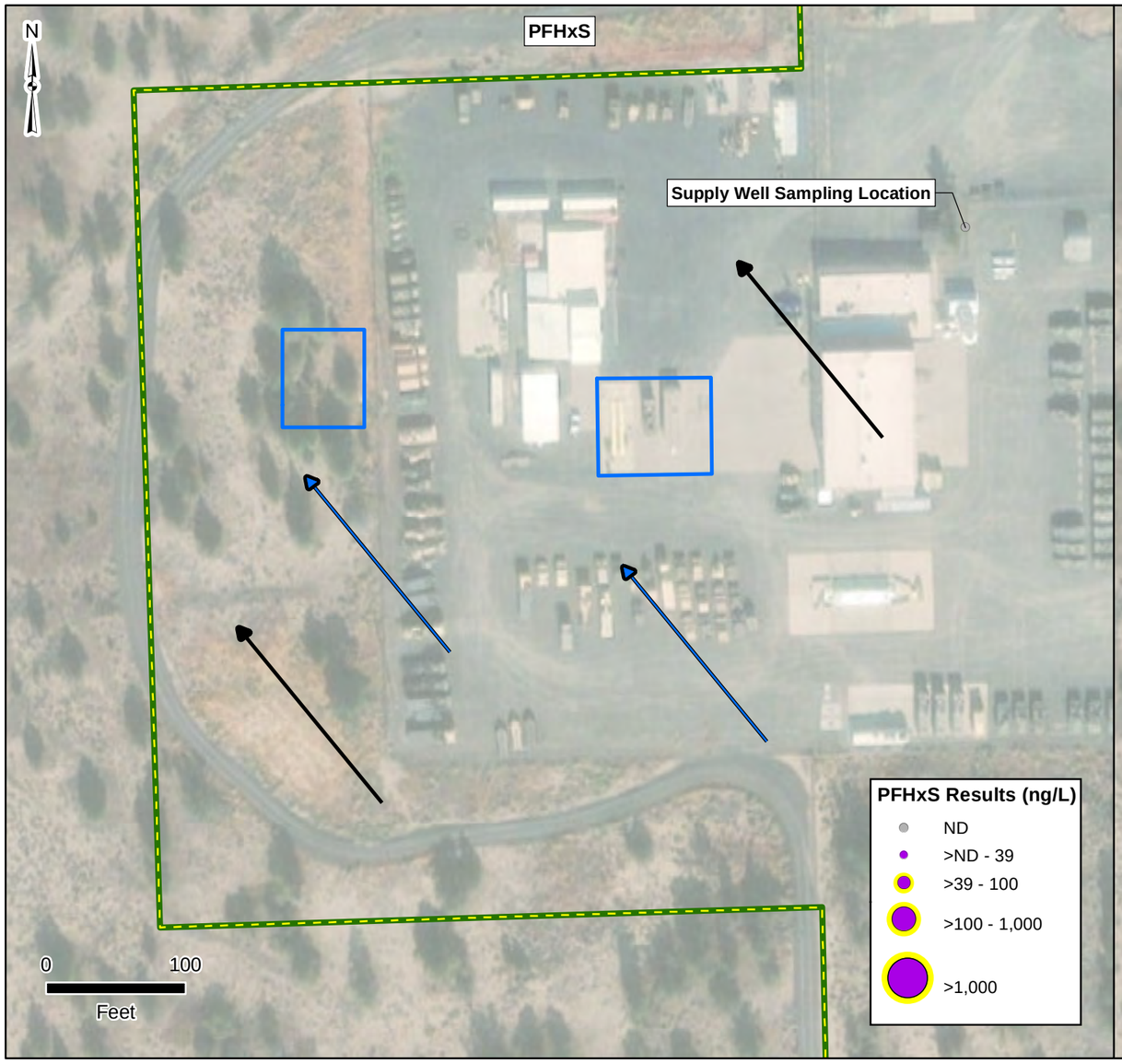
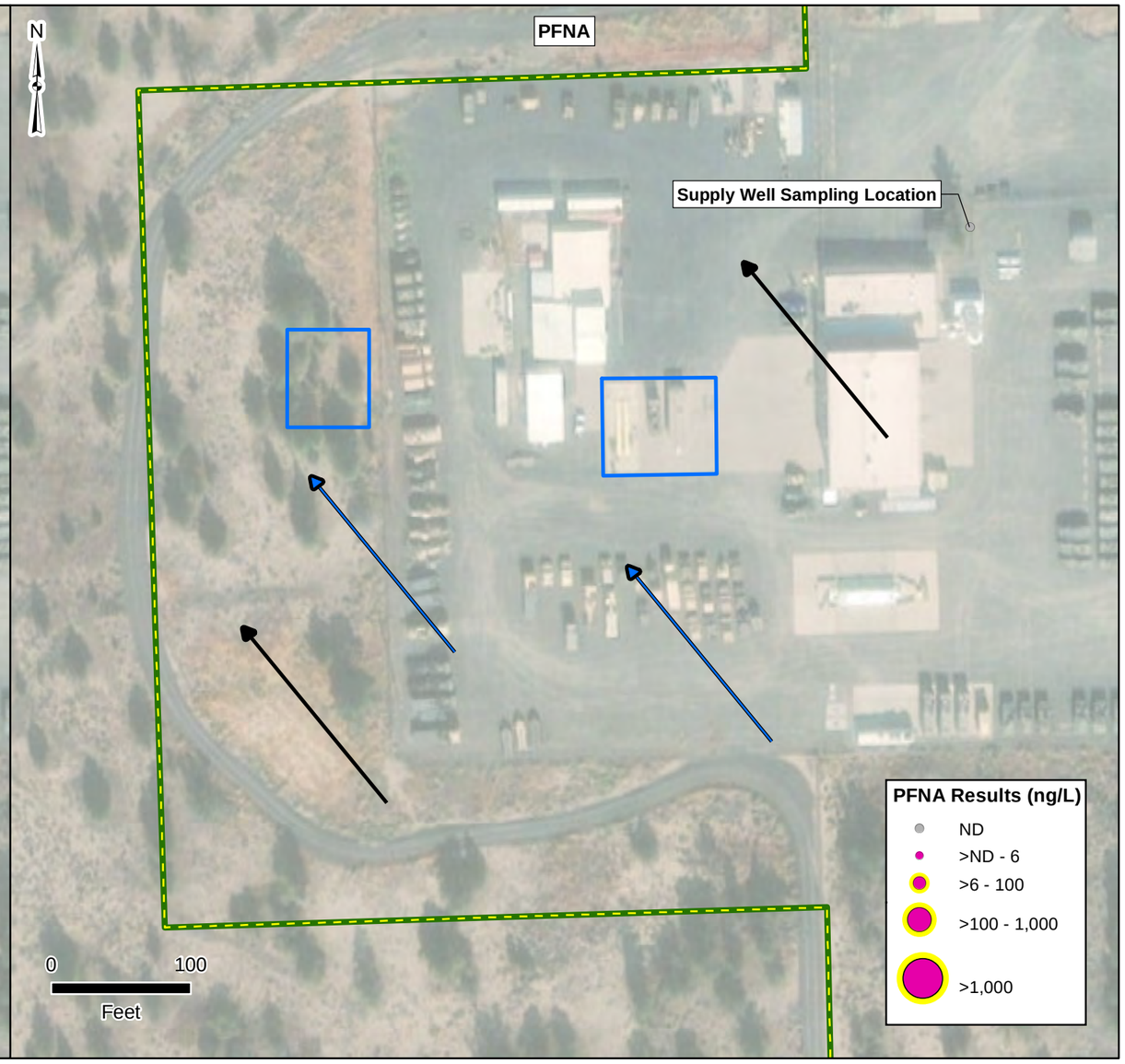
Army National Guard Site Inspections
Site Inspection Report
COUTES, Oregon

Figure 6-7
PFHxS & PFNA Detections in Groundwater







Facility Data
- Facility Boundary
- Area of Interest

Hydrology
- Surface Water Flow Direction
- Approximate Regional Groundwater Flow Direction

Note:
ND = Not Detected
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....May 2023
Prepared By:.....WSP
Prepared For:.....USACE
Projection:.....NAD 83 UTM 10N

K:\NGB Contract\ARNG PFAS SI\COUTES Redmond\13.0 GIS_SI\Figure 6-7 PFHxS & PFNA Detections in Groundwater.mxd - stephane.descombes - 5/1/2023 - 12:31:14 PM

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7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for each AOI, revised based on the SI findings, is presented on **Figure 7-1** through **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 remedial investigation (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 Facility 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 no identified complete 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 the relevant compounds above the SLs. Areas with an identified potentially complete pathway and a complete pathway may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in a 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) and construction workers.

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 each AOI based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Wash Rack Bay, and there are no known or documented releases of PFAS at AOI 1. The Wash Rack Bay and area to the east are paved with concrete, located outdoors, and uncovered. The surface area surrounding the Wash Rack Bay is covered with gravel. The Wash Rack Bay pavement slopes into two catch basins within the paved area. PFOA, PFOS, and PFNA were detected in soil at concentrations below SLs at boring locations completed at AOI 1. Site workers and construction workers could contact relevant compounds in surface soil via inhalation of dust or incidental ingestion of soil. Therefore, the surface soil exposure pathway for site workers and construction workers are potentially complete. PFOA was detected in shallow subsurface soil at a concentration below the SL at AOI 1. Construction workers could contact relevant compounds in subsurface soil during ground-disturbing activities via ingestion and inhalation of dust; therefore, the subsurface soil exposure pathway for 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 Wastewater Discharge Area associated with the wash rack bay (AOI 1). AOI 2 is located west of the Facility's operational area, west of the Facility fencing. There are no known or documented releases of PFAS at AOI 2. This discharge area is unpaved with a natural vegetative cover. Wastewater from the Wash Rack Bay, which consists of treated wash water and stormwater, is discharged via irrigation sprinkler into AOI 2. PFOA and PFOS were detected in surface soil at concentrations below SLs at boring locations at AOI 2. Site workers and construction workers could contact relevant compounds in surface soil via inhalation of dust or incidental ingestion of soil. Therefore, the surface soil exposure pathway for site workers and construction workers are potentially complete. PFOA and PFOS were detected in shallow subsurface soil at AOI 2 at concentrations below their respective SLs. Construction workers could contact relevant compounds in subsurface soil during ground-disturbing activities via incidental ingestion and inhalation of dust; therefore, the subsurface soil exposure pathway for 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 at each AOI based on the aforementioned criteria.

Perched groundwater was not encountered during the SI investigation. Groundwater was evaluated based on the sample collected from the Facility's potable supply well.

7.2.1 Potable Supply Well

An existing potable supply well is present at COUTES and was available for sampling during the SI investigation. The Facility water supply well was sampled for evaluation of PFAS in deep groundwater. Because the existing drinking water well is located cross-gradient to the AOIs, the results from this well are considered informational and they may not be reflective of groundwater associated with the AOIs. Based on the results of this sample, PFAS is not present at detectable concentrations in deep groundwater. The exposure pathway is incomplete for groundwater at COUTES. The CSMs are presented on **Figure 7-1** and **Figure 7-2**.

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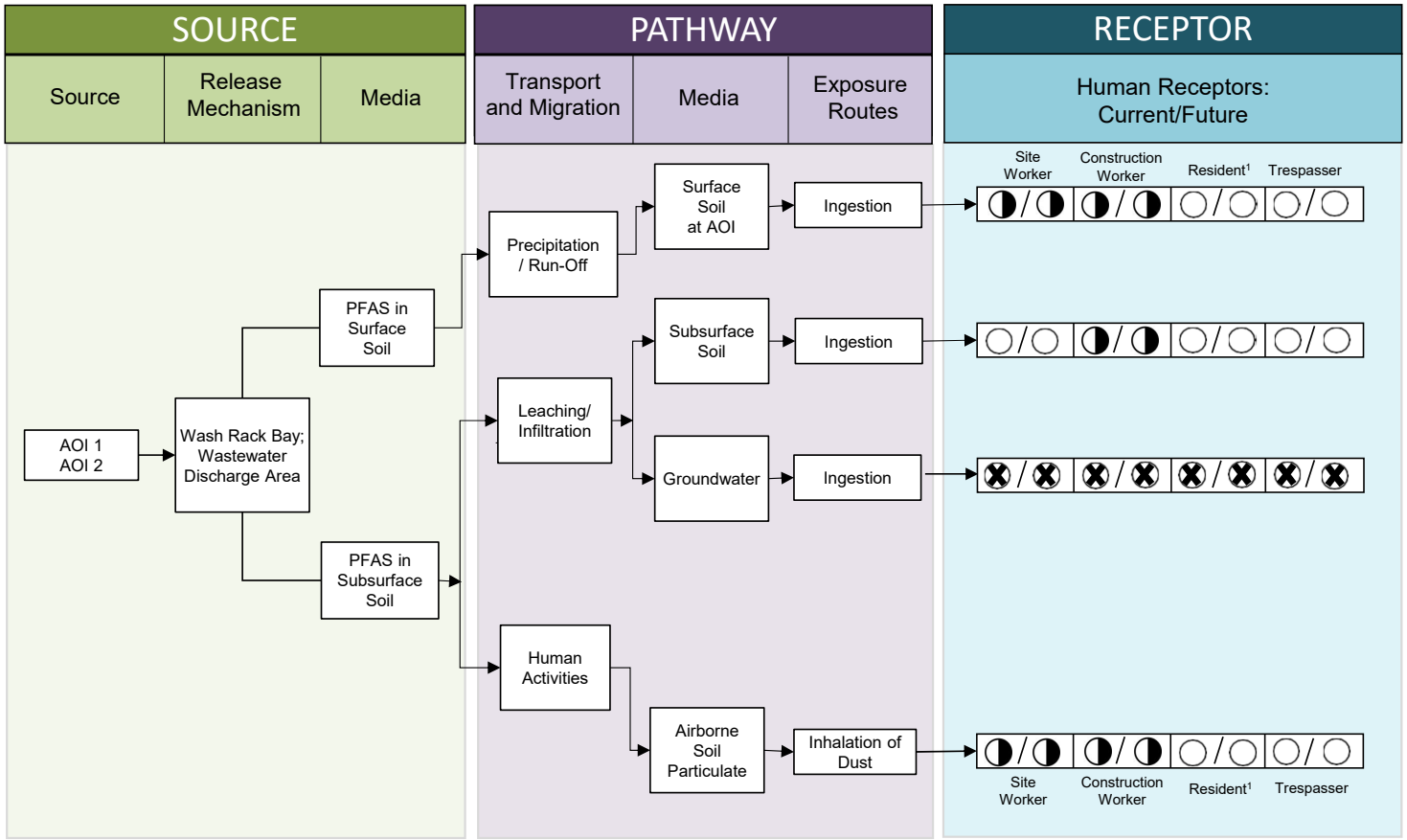

LEGEND

- Flow-Chart Continues
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL
- Groundwater analyzed was cross-gradient of AOIs with no detections

NOTES

1. The resident users refer to off-site receptors.
2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model
COUTES

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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 at the Facility were conducted from 23 to 24 September 2021. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood 2021a), except as previously noted in **Section 5.7**.

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

- 20 soil grab samples from 10 boring locations
- One grab groundwater sample from the potable supply well
- 5 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 multimedia 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, no further evaluation under CERCLA in the form of a RI is warranted for AOI 1 or AOI 2 at this time. 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.

Relevant compound concentrations in media collected during the SI were compared against the project SLs in soil and groundwater, as listed in **Table 6-1**. A summary of the results of the SI data relative to SLs is as follows:

At AOI 1:

PFOA, PFOS, and PFNA were detected in soil at AOI 1 below SLs. PFBS and PFHxS were not detected in soil at AOI 1.

Based on the results of the SI, no further evaluation of AOI 1 is warranted.

At AOI 2:

PFOA and PFOS were detected in soil at AOI 2 below SLs. PFBS, PFHxS, and PFNA were not detected in soil at AOI 2.

Based on the results of the SI, no further evaluation of AOI 2 is warranted.

Groundwater:

PFOA, PFOS, PFBS, PFNA, and PFHxS were not detected in the groundwater sample collected from the Facility potable water supply well.

Based on the results of the SI, no further evaluation of groundwater at the Facility is warranted.

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 military specification (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
COUTES, Oregon
Site Inspection Report

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Future Action
1	Wash Rack Bay	◐	Not Sampled	No further action
2	Wastewater Discharge Area	◐	Not Sampled	No further action
NA	Groundwater Supply Well	Not Sampled	○	No further action

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected

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