FINAL
Site Inspection Report
Roswell Field Maintenance Shop
Roswell, New Mexico

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

October 2023

Prepared for:

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

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
%	Percent
µg/kg	Microgram(s) per kilogram
µg/L	Microgram(s) per liter
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film-Forming Foam
amsl	Above mean sea level
ANG	Air National Guard
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	Below ground surface
blvd	Boulevard
bmsl	Below mean sea level
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
DA	Department of the Army
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DPT	Direct-push technology
DQI	Data quality indicator
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EB	Equipment Blank
EIS	Extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EPA	Environmental Protection Agency
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
ft/ft	foot per foot
FMS	Field Maintenance Shop

GPR	Ground-penetrating radar
GPS	Global positioning system
HAZMAT	Hazardous Material
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HQ	Hazard Quotient
HSA	Hollow Stem Auger
IDW	Investigation-derived waste
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
NM	New Mexico
NMARNG	New Mexico Army National Guard
NMED	New Mexico Environmental Department
No.	Number
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
PVC	polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RC	Readiness Center
Rd	Road

RI	Remedial investigation
RIAC	Roswell International Air Center
RPD	Relative percent difference
SI	Site Inspection
SL	Screening level
TCRA	Time Critical Removal Action
TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
W	West
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 the document, and the applicable screening levels (SLs) are provided below in **Table ES-1**.

The PA identified one Area of Interest (AOI) within the Roswell Field Maintenance Shop (FMS) (the Installation) where PFAS-containing materials may have been stored, disposed, or released historically (see **Table ES-2** for the AOI location). The objective of the SI is to identify whether there has been a release to the environment from the AOI 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 a comparison of SI results to SLs for the relevant compounds. This SI was completed at the Roswell FMS in Roswell, New Mexico (NM) and determined no further investigation is warranted for AOI 01: Field Maintenance Shop – Vehicle Maintenance Bay. The Roswell FMS will be referred to as the "Facility" throughout this document.

The Facility, operated by the NM ARNG (NMARNG), encompasses approximately 13.01 acres in Roswell, New Mexico. The Facility is located on the northwest corner of the Roswell International Air Center (RIAC) and is leased to the NMARNG by the City of Roswell. The land for the Facility was acquired in 1987, and the buildings were constructed in 1989. The Facility features two buildings (a readiness center and an FMS building), hazardous materials (Hazmat) storage, and several parking areas (AECOM, 2020).

The PA identified one AOI for investigation during the SI phase. SI sampling results from the AOI was compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOI.

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

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

Analyte[1,2]	Residential (Soil) (µg/kg)[1]	Industrial / Commercial Composite Worker (Soil) (µg/kg)[1]	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 CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

µg/kg = microgram(s) per kilogram
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	Groundwater – Facility Boundary	Future Action
1	Field Maintenance Shop – Vehicle Maintenance Bay	◐	◐	◐	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 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 (Assistant Secretary of Defense, 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)[1] at ARNG facilities nationwide. The ARNG performed this SI at the Roswell Field Maintenance Shop (FMS) in Roswell, New Mexico. The Roswell FMS 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) (U.S. Environmental Protection Agency [EPA] 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; EPA 1994), and in compliance with Army requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Roswell FMS (AECOM Technical Services, Inc. [AECOM] 2020) that identified one Area of Interest (AOI) 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 AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

Roswell FMS sits on 13.01 acres in Chaves County, southeastern New Mexico, along W Earl Cummings Boulevard and approximately 5 miles south of the City of Roswell (**Figure 2-1**). The Facility is located on the northwest corner of the Roswell International Air Center (RIAC) and is leased to the NMARNG by the City of Roswell. The land for the Facility was acquired in 1987, and the buildings were constructed in 1989. The Installation is comprised of a readiness center (RC), FMS building, hazardous materials (HAZMAT) storage, motor pool, and parking (AECOM, 2020). The concrete surface surrounding the FMS building has been extended since the Facility's original construction.

2.2 FACILITY ENVIRONMENTAL SETTING

Roswell FMS is located on the Mescalero Pediment, within the Lower Pecos Valley subsection of the Great Plains physiographic province. The elevation of the Facility is approximately 3,600 feet (ft) above mean sea level (msl) and is generally flat with a gentle slope towards the east (AECOM, 2020).

2.2.1 Geology

Roswell FMS is located within the Roswell Basin, which comprises a 12,000-square-mile area in southeastern New Mexico. The Facility is underlain by Permian-age bedrock from the Artesia Group that dips eastward. The Yates Formation and the underlying Seven Rivers Formation both outcrop at the Facility and are associated with the Artesia Group. The Yates Formation is composed of sandstone, siltstone, limestone, dolomite, and anhydrite. The underlying Seven Rivers Formation is composed primarily of white gypsum and orange to red mudstone, sandstone, siltstone, and shale. The Artesia Group also locally includes the Queen and Grayburg Formations, which underlie the Seven Rivers Formation. The Queen Formation consists of fine-grained sandstone and siltstone with interbedded gypsum, and the Grayburg Formation consists of dolomite and gypsum with interbedded sandstone and shale (AECOM, 2020).

The San Andres Formation underlies the Artesia Group and consists of gray, massive- to thin-bedded, cavernous limestone and dolomite. While limestone and dolomite are the principal rock types, the San Andres Formation also contains the Glorieta Sandstone near the base of the formation. The depth of the San Andres Formation ranges from 300 to 1,300 ft along the eastern margin of the Roswell Basin (AECOM, 2020).

Quaternary-aged alluvium associated with the Pecos River floodplain is located to the west of the Facility. This alluvium consists of unconsolidated gravel, sand, silt, and clay deposits, which overlie the Permian-age bedrock. During the SI, unconsolidated sediments at the Facility were dominated by medium plastic fines (silt/clay) with interbedded layers of sands and gravels. The borings were completed at depths between 15 and 144 ft below ground surface (bgs). The shallow boring lithology (0 to 15 ft bgs) was predominately silty sands and well graded gravels. The deep boring (greater than [>] 15 ft bgs) lithology was predominately medium plastic fines (clay) with layers of well graded gravels, sand, and less plastic fines (silt). Layers of well graded

gravels with fines (silt/clay) and/or sand was observed consistently in the borings with thicknesses ranging from a few inches to 34 ft. The lithology at AOI01-09 (original location and offset) consisted of significant layers of the well graded gravel with calcium carbonate present which severely limited penetration capability of the available drilling equipment as noted in the boring logs included in **Appendix E**. A sample for grain size analyses was collected at one location, AOI01-01 and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of sand (43%) and silt (38%). These results and Facility observations are consistent with the reported depositional environment of the region. Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**. The thickness of the alluvium is generally 150 to 300 ft.

2.2.2 Hydrogeology

The Roswell FMS is located in the Roswell Basin aquifer system, which underlies a portion of the Pecos River and encompasses an area of approximately 2,200 square miles from north of Roswell to northwest of Carlsbad, New Mexico. This aquifer system consists of a shallow alluvial aquifer and the Roswell Artesian aquifer. The Roswell Artesian aquifer is a leaky-confined carbonate aquifer with a saturated thickness of approximately 500 ft; it consists of water bearing zones associated with the lower Grayburg Formation and upper to middle sections of the San Andres Formation. The generally low permeability of the Queen Formation and upper Grayburg Formation serves as an upper confining unit for the aquifer. The lower confining unit of the Roswell Artesian aquifer is formed by the lower, unaltered portion of the San Andres Formation, Glorieta Sandstone, and the Yeso Formation. The direction of groundwater flow across the basin is to the east, then upward through the leaky upper confining unit, and into the Pecos River (AECOM, 2020) (**Figure 2-3**).

Recharge to the Roswell Artesian aquifer is primarily through infiltration of precipitation, a majority of which occurs west of the City of Roswell, where the San Andres Formation outcrops. Additional recharge occurs through sinkholes via solution-enlarged pathways. Principal discharge from the Roswell Artesian aquifer is by groundwater withdrawal, primarily for the purpose of irrigation. Although there is agricultural land use near the City of Roswell, agricultural activity and demand for water to irrigate crops are more intensive south of Roswell. Natural discharge also occurs and is evidenced by the presence of karst springs, lakes, and wetlands in the Roswell Basin (AECOM, 2020). Groundwater features are shown on **Figure 2-3**.

The PA Report (AECOM, 2020) included a search of wells within a 4-mile radius of the Facility. Although the PA Report indicated a potential depth to groundwater of 500 ft bgs at the Facility, a review of drillers' logs for wells installed in the vicinity between 2015 and 2020 indicates a regional depth to water in the shallow alluvial aquifer of between approximately 100 and 200 ft bgs, with an average of approximately 130 ft bgs (AECOM, 2020). The depth to groundwater in June 2022 observed during the SI ranged from approximately 117 to 132 ft bgs. Groundwater elevations from the SI are presented on **Figure 2-4**. The regional groundwater flow identified in the PA is likely pertaining to the deeper Roswell Artesian aquifer and flows generally eastward. Based on groundwater elevations calculated using depth to groundwater measurements and survey data collected during the SI, groundwater flow at the Facility during the SI generally flows to the west toward AOI01-06 with an approximate gradient of 0.017 foot per foot (ft/ft). The shallow alluvial aquifer encountered during the SI is likely influenced by local structures,

localized subsurface anomalies, and nearby groundwater usage. The SI was performed during a rain event, and while AOI01-06 is located within a paved parking lot, AOI01-07 and AOI01-08 are located in areas that do not have impervious surfacing (**Figure 2-4**). The extension of the concrete surface surrounding the FMS building is shown on **Figure 2-4**. Nearby water supply wells are completed in the Roswell artesian aquifer, with the closest well located approximately 0.45 miles to the east, between West (W) Earl Cummings Boulevard (Blvd) and W Byrne Street (St) and to the south of W Hobson Road (Rd). Private wells located to the northwest and northeast within the vicinity of the Facility tend to be completed within the alluvial aquifer (New Mexico Environment Department [NMED] Drinking Water Bureau, 2019). The closest wells are located approximately 0.22 miles to the northwest and 0.28 miles to the northeast.

The Facility receives potable water from the City of Roswell. The City of Roswell currently sources its drinking water from groundwater drawn from the San Andres water basin through a network of 20 wells completed in the artesian aquifer and having depths of over 300 feet (NMED Drinking Water Bureau, 2019). PFAS analysis was not included in the City of Roswell 2019 Water Quality Report. The United States Environmental Protection Agency (USEPA) Unregulated Contaminant Monitoring Rule 3 (UCMR3) data indicate that PFAS were not detected in a public water system above 70 parts per trillion for PFOA or PFOS individually or combined within a 20-mile radius of the facility. It is possible that low concentrations of PFAS were not detected during the UCMR3 due to the limitations of the current method detection limits but might be detected if analyzed today (AECOM, 2020).

2.2.3 Hydrology

The Pecos River Basin drains an area of approximately 19,500 square miles within New Mexico. The Pecos River flows north to south through Chaves County. A portion of the Pecos River flows approximately 10 miles west of Roswell. The Pecos River has an average flow rate of 185 cubic ft per second (ft^3/sec). Wetlands east of the City of Roswell are associated with segments of the Pecos River and the Bottomless Lakes State Park. These wetlands are specifically classified as freshwater emergent wetlands, freshwater forested/shrub wetlands, and riverine zones (**Figure 2-5**).

Stormwater at the Facility, along with the stormwater at the RIAC, generally flows to the north-northeast. The first receiving water for stormwater discharge is the Hangerman Canal, located approximately 6.7 miles from the Facility (Barron's Environmental Solutions – In Time!, Inc. [Barron's], 2021). The Hangerman Canal discharges to the Pecos River. Stormwater at the Facility flows away from the Facility and toward the outflows located on the northern edge of the property. The washrack is surrounded by a concrete berm and all water collected at the washrack flows into the drain.

2.2.4 Climate

The climate of the Roswell area is temperate and semiarid. The average annual daily temperature ranges from 41 to 77 degrees Fahrenheit (°F). Temperatures during the SI ranged from 66 to 108°F with several scattered rain and thunderstorms. Excessive heat and lighting during field activities caused intermittent delays of the SI field work. The average annual precipitation is approximately 15 inches, most of which occurs during the months of July and August, and the average annual snowfall is approximately 7.3 inches. Precipitation is exceeded by an annual

evaporation rate of 89 inches, according to a measurement taken at the Bitter Lake National Wildlife Refuge (AECOM, 2020).

2.2.5 Current and Future Land Use

Presently, the Roswell RC and FMS reside on land owned by the City of Roswell and are part of the RIAC, and are used to support personnel readiness and organizational maintenance of military equipment, respectively. The current land use is listed as L-2 Heavy Industrial. Future land use is not anticipated to change (AECOM, 2020). The facility is within a fenced boundary with limited access. Each area within the Facility boundary requires an escort and approved Facility access including site-specific badging.

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 in Chaves County, New Mexico (U.S. Fish and Wildlife Services, 2021):

Birds:

Northern Aplomado Falcon, *Falco Femoralis Septentrionalis* (experimental population)

Piping Plover, *Charadrius Melodus* (threatened)

Fishes:

Pecos Bluntnose Shiner, *Notropis Simus Pecosensis* (threatened)

Pecos Gambusia, *Gambusia Nobilis* (endangered)

Flowering Plants:

Pecos Sunflower, *Helianthus Paradoxus* (threatened)

Insects:

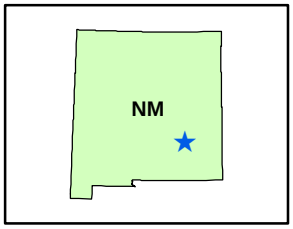
Monarch Butterfly, *Danaus Plexippus* (candidate)

2.3 HISTORY OF PFAS USE

One AOI where aqueous film-forming foam (AFFF) may have been stored, disposed, or released historically at the Roswell RC and FMS was identified in the PA (AECOM, 2020). The one AOI is located within the property boundary of the Facility. The FMS building vehicle maintenance bay of the Roswell FMS is located on the southeastern portion of the Facility. According to personnel interviews, one Tri-Max™ hand truck (a mobile AFFF fire extinguisher) was stored within this bay until 2016, when it was turned in to the Defense Reutilization Marketing Office. It was reported that the Tri-Max™ unit was never used or leaked and was regularly serviced by a contractor. There are no records or recollection of any leaks or incidents.

Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 2-1
Facility Location



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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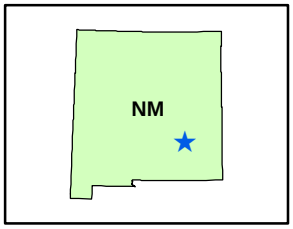
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 2-2
Facility Topography



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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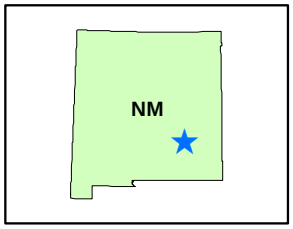
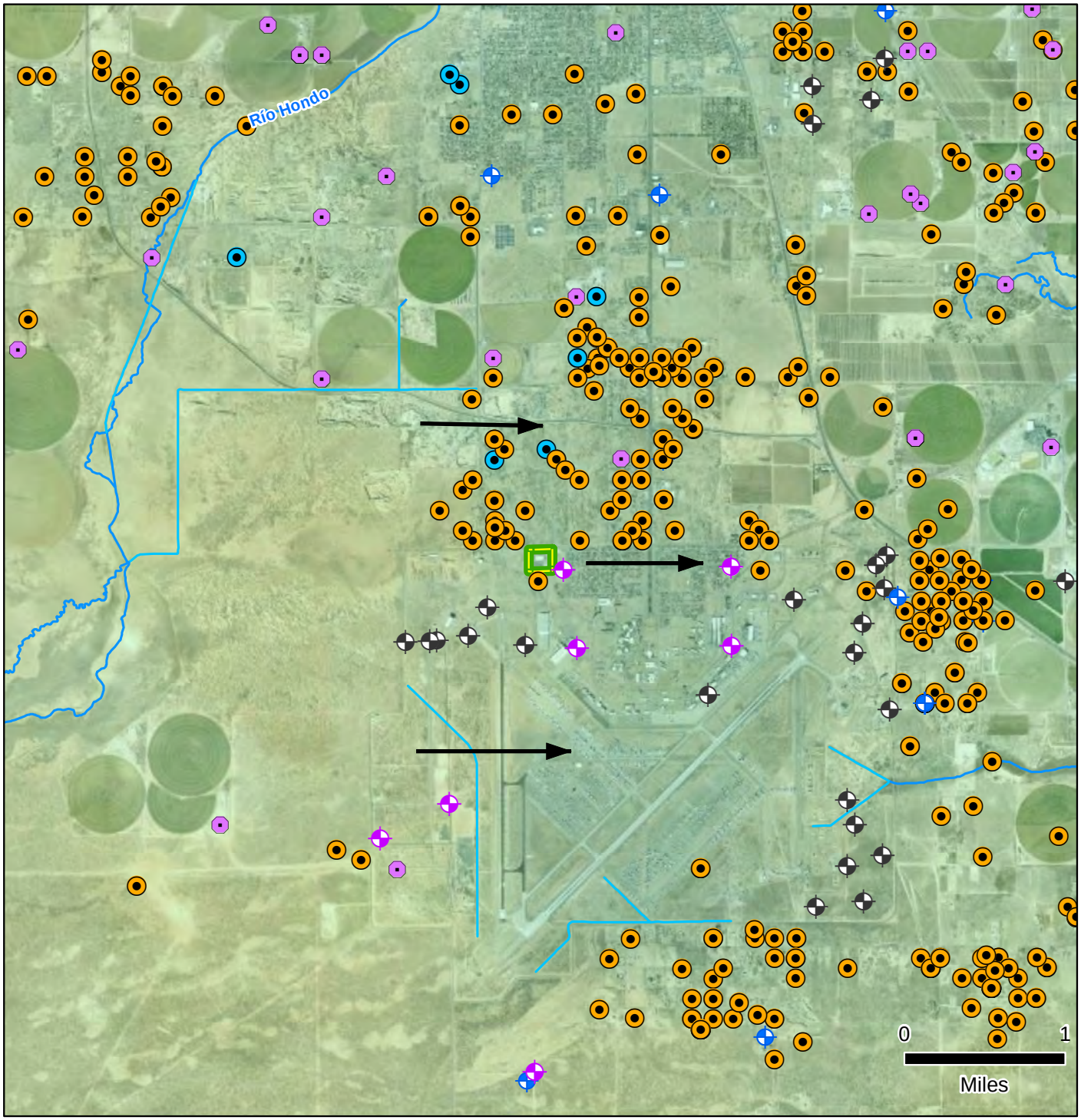
Figure 2-3
Groundwater Features





Facility Data
- Facility Boundary

Wells
- Drinking/Sanitary
- City
- Monitoring/Observation
- Commercial
- Domestic
- Irrigation

Hydrology/Hydrogeology
- Inferred Groundwater Flow Direction
- Canal/Ditch
- Stream/River
- Alluvium

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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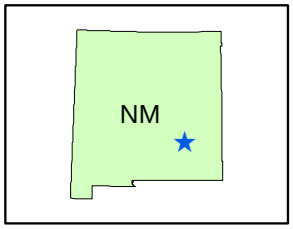
Figure 2-4
Groundwater Elevations



Facility Data
- Area of Interest (AOI)
- Facility Boundary

Sample Type
- Soil Boring/Temporary Monitoring Well
- Temporary Monitoring Well

Hydrology/Hydrogeology
- Approximate Shallow Groundwater Flow Direction
- Groundwater Elevation Contour (3-foot interval, ft. amsl)

Data Sources:
ESRI 2020
AECOM 2019

Notes:
FMS = Field Maintenance Shop
Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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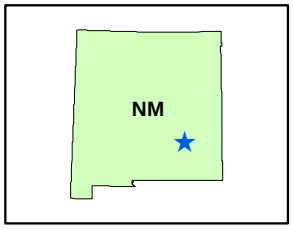
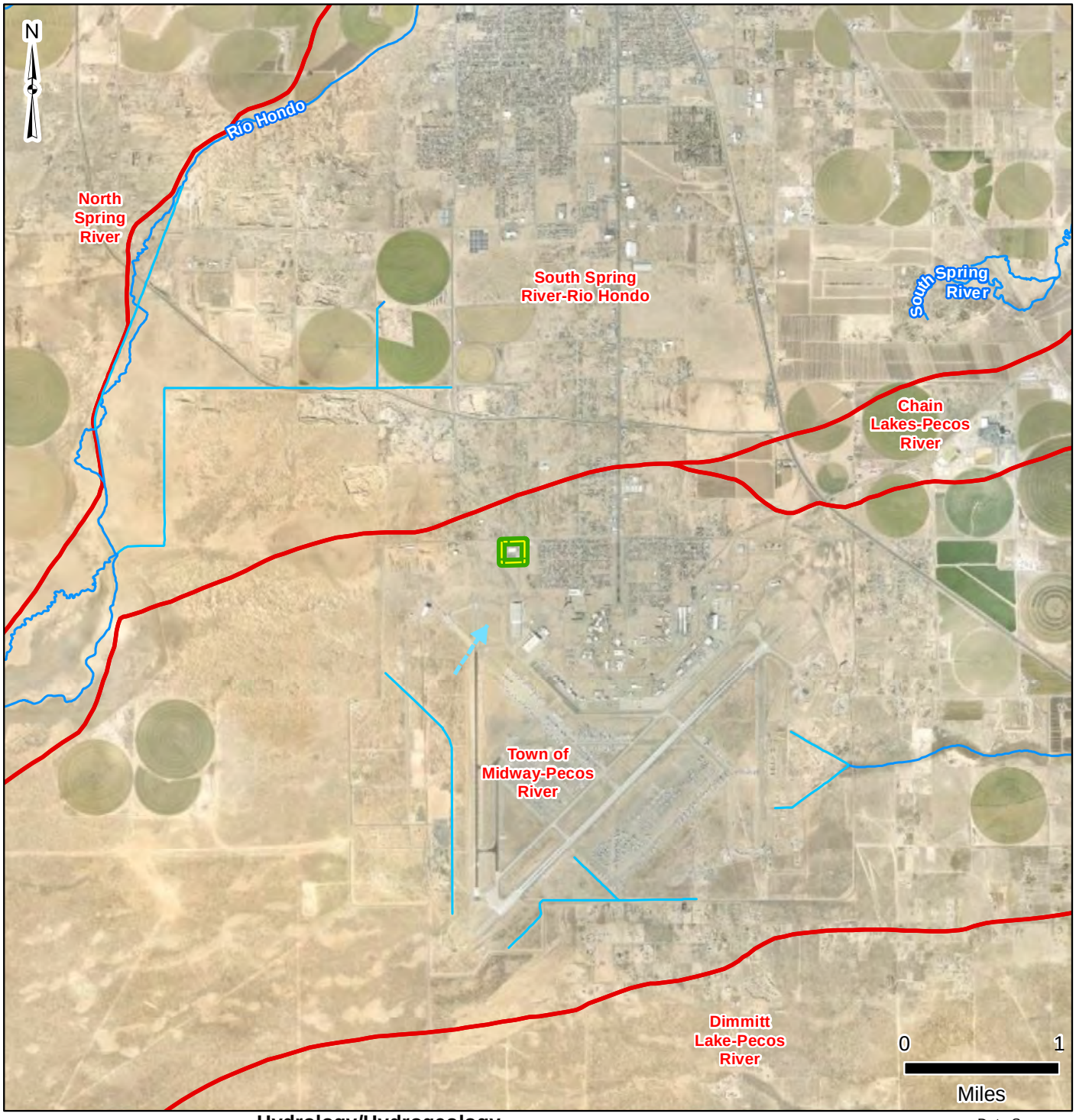
Figure 2-5
Surface Water Features





Facility Data

Facility Boundary

Hydrology/Hydrogeology

Inferred Local Surface Water Flow Direction

Canal/Ditch

Stream/River

Watershed

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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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, one potential release area was identified at the Roswell FMS and identified as: AOI 1 - FMS Truck Bay/Vehicle Maintenance Bay. The AOI is shown on **Figure 3-1**.

3.1 AOI 1 –FIELD MAINTENANCE SHOP – VEHICLE MAINTENANCE BAY

AOI 01 consists of the FMS building vehicle maintenance bay, which is located on the southeastern portion of the Facility. This maintenance bay is used to service organizational military vehicles and is adjacent to the Facility's motor pool. Interviews and records obtained during the PA indicate that maintenance bay is used to service various vehicles on and around the Facility. According to personnel interviews, one Tri-Max™ hand truck (a mobile AFFF fire extinguisher) was stored within this bay until 2016, when it was turned in to the Defense Reutilization Marketing Office. It was reported that the Tri-Max™ unit was never used or leaked and was regularly serviced by a contractor. There are no records or recollection of any leaks or incidents. If the Tri-Max™ hand truck was used or leaked during the time it was stored in the vehicle maintenance bay, it was likely left to dry before being cleaned up or drained to the center-line floor drain within the vehicle maintenance bay (AECOM, 2020). The vehicle maintenance bay had a center-line floor drain that, prior to June 2021, discharged to a sand/grit trap and then to the Roswell sanitary sewer. The center-line floor drain was filled with concrete, the lines leading to and from the sand trap were grouted, and the sand trap structure was filled with sand and capped with concrete. The abandonment work was completed 09 June 2021. There are vehicle wash racks outside of the FMS to the southeast and east. The vehicle wash racks drain through a 550-gallon oil water separator to the Roswell sanitary sewer.

3.2 ADJACENT SOURCES

One potential off-facility source of PFAS was identified adjacent to the Facility in the PA (AECOM, 2020) and is not under the control of the New Mexico ARNG (NMARNG). A description of the off-facility source is presented below and shown on **Figure 3-1**.

3.2.1 Roswell International Air Center

RIAC occupies the former Roswell Army International Airfield and Walker Air Force Base (1941-1967). Historic Military AFFF usage at the RIAC property is unknown but may have occurred with potential wide distribution from fire training, nozzle checks, and other uses or releases. The PA Report identified two emergency incidents at the Air Center on 02 April 2011 and 05 June 2019.

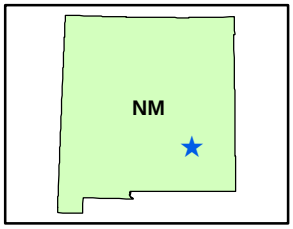
- 02 April 2011: a Gulfstream G650 jet impacted a concrete structure and an airport weather station at the end of the runway during takeoff, resulting in extensive structural damage and a post-crash fire. It is unknown if AFFF containing PFAS was used to extinguish the fire.
- 05 June 2019: an ignition event occurred in a storage building onsite leading to the explosion/consumption of Class C fireworks (3- 6 inch shells) and the explosion of the

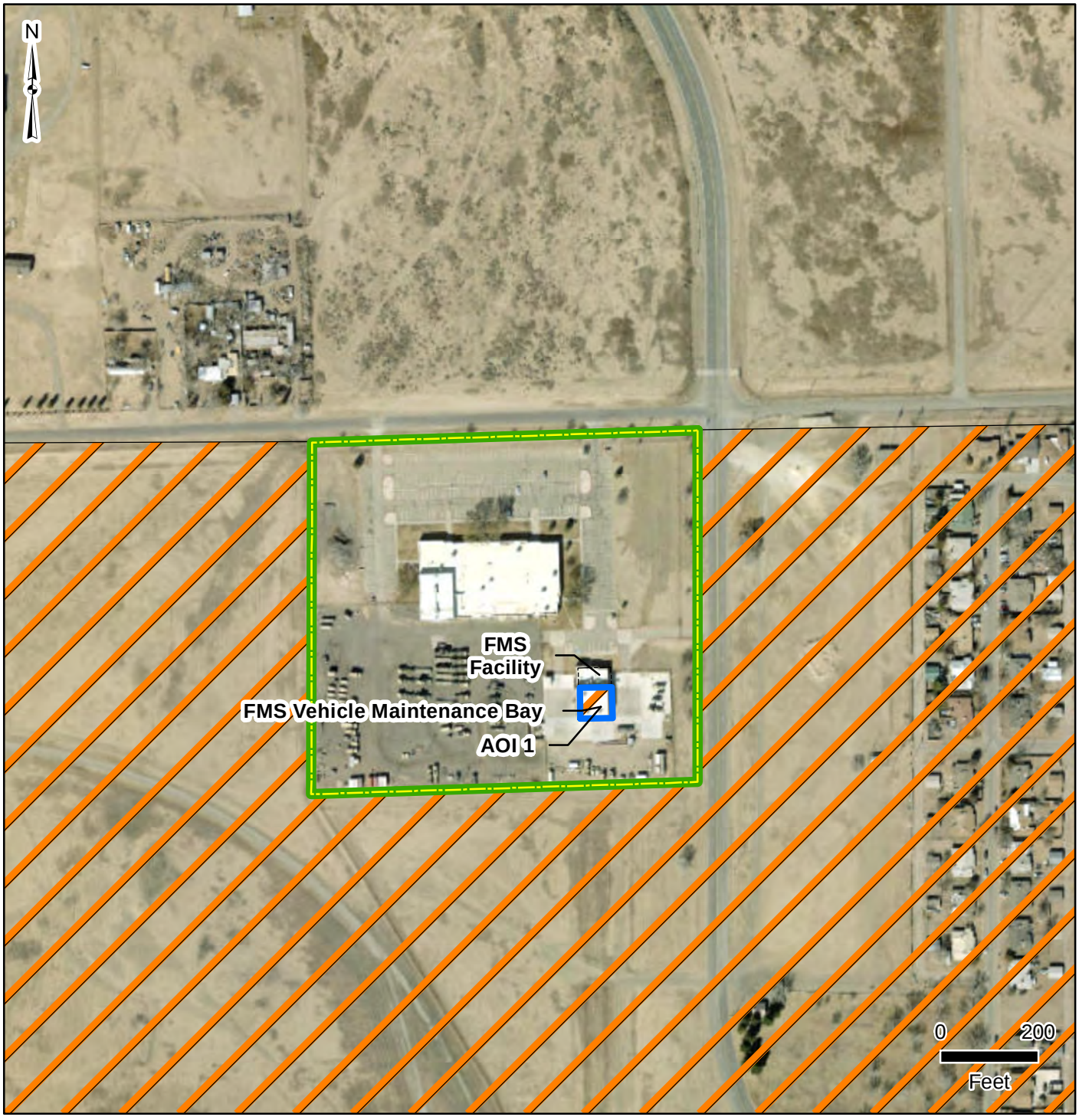
structure. The storage building is located approximately 1.5 miles to the east of the FMS. It is unknown if AFFF containing PFAS was used to extinguish the fire.

No other off-facility source areas were identified in the PA Report. Although the RIAC, formerly Walker Air Force Base, is an area of concern for PFAS, the Roswell FMS is likely cross gradient/upgradient of any releases at the Air Center (AECOM, 2020).

Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 3-1
Areas of Interest





Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release

Note: FMS = Field Maintenance Shop

Data Sources:
ESRI 2020
AECOM 2019

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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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) - QAPP Addendum (EA/Wood, 2022a), the objective of the SI is to identify whether there has been a release to the environment at the AOI 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 the sampled AOI.

4.1 PROBLEM STATEMENT

ARNG will recommend an AOI for remedial investigation (RI) if site-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 Roswell RC and FMS (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 2022a)
- 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 **3-1**). The scope of the SI was bounded vertically by the depth of temporary monitoring wells installed within groundwater, where encountered (maximum depth of 144 ft 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 Department of Defense (DoD) Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 1.01) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 021). PFAS data underwent 100 percent (%) Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019a) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual (QSM) Table B-15 (2020). PFAS data were compared to applicable SLs within this document and decision rules as defined in the UFP-QAPP Addendum (EA/Wood 2022a).

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. Groundwater quality downgradient of AOI 1 is a data gap. The SI data are of sufficient quality to meet the objectives and requirements of the UFP-QAPP (EA/Wood, 2022a).

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, Roswell Readiness Center and Field Maintenance Shop, Roswell, New Mexico,* 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 2020)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Roswell Readiness Center and Field Maintenance Shop, New Mexico,* dated May 2022 (EA/Wood, 2022a)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated June 2022 (EA 2022b)
- *Final Site Safety and Health Plan, Roswell Readiness Center and Field Maintenance Shop, STATE,* dated June 2022 (EA/Wood 2022b).

The SI field activities were conducted in two sampling events: the first event was on 28 and 29 April 2022, and the second event was from 06 to 23 June 2022. The SI field activities consisted of utility clearance, hand augering to clear utilities and collect surface soil samples, hollow stem auger (HSA) boring advancement and soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2022a), except as noted in **Section 5.9**.

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

- Eighteen (18) soil samples from 6 locations (soil borings locations)
- Three (3) grab groundwater samples from temporary well locations AOI01-06, AOI01-07, and AOI01-08
- 18 quality assurance (QA)/QC samples.

Figure 5-1 provides the sample locations for all media (soil and groundwater) 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 is provided in **Appendix B3,** a corrective action report is provided in **Appendix B4**, and the investigation-derived

waste (IDW) placement location is provided in **Appendix B5**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

The U.S. Army Corps of Engineers (USACE) TPP Process, Engineers 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 16 February 2022 followed by a Facility walk, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include, ARNG, NMARNG, USACE, New Mexico Environmental Department (NMED), 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, 2022a).

A TPP Meeting 3 was held after the field event to discuss the results of the SI on 17 August 2023. Meeting minutes for TPP 3 are included in **Appendix D** of this report. The TPP3 meeting provided an opportunity to discuss results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

WSP USA Environment & Infrastructure, Inc. (WSP), previously doing business as Wood Environment & Infrastructure Solutions, Inc., contacted the Utility Notification Center to notify them of intrusive work at the Facility. WSP contracted MYC Environmental & Construction, LLC (MYC), a private utility location service and construction company, to perform utility clearance and concrete cutting at the Facility. Utility clearance was performed at each of the proposed boring locations on 28 April 2022 with input from the WSP field team. General locating services and ground-penetrating radar (GPR) were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by WSP or WSP's drilling subcontractor, Cascade Drilling and Technical Services (Cascade), using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

During the first sampling event, surface soil samples were collected at the soil boring locations using a hand auger. A buried irrigation line was encountered during the hand auger advancement. The line had minimal damage and was repaired by MYC with a poly-vinyl chloride (PVC)

coupler on 29 April 2022. A corrective action report was prepared following the incident (**Appendix B4**). Photos of the ground disturbance and associated repair are included in **Appendix C**.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to meet acceptability criteria, as defined in the UFP-QAPP Addendum, prior to the start of field activities. A sample from a potable water source at the Facility wash rack, was collected on 16 February 2022, prior to mobilization and during the initial Facility walk and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the sample of the potable water source used for decontamination of drilling equipment during the SI are provided in **Appendix F**. A discussion of the results is presented in the Data Usability Assessment (**Appendix A**).

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 (PQAPP) (EA, 2020).

5.2 HAND AUGER SOIL SAMPLING

Hand auger soil sampling was conducted during the first sampling event from 28 to 29 April 2022 to collect surface soil samples (0 to 2 feet bgs) at 6 locations (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, and AOI01-06). All soil sample locations are shown on **Figure 5-1**. The hand auger locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and site walk, and review of the UFP-QAPP Addendum (EA/Wood, 2022a). Several boring locations were adjusted within a 50-ft offset for reasons including drill rig access, utility avoidance and bias toward sampling within observed drainage features. Non-dedicated sampling equipment (i.e., hand auger) was decontaminated between sampling locations. Additionally, an equipment blank sample was collected from all non-dedicated sampling equipment (EA/Wood, 2022a).

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 (COC) 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), grain size (ASTM Method D-422), and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA/Wood, 2022a). QC samples and analysis were performed as described in the UFP-QAPP Addendum (EA/Wood, 2022a).

5.3 SOIL BORINGS AND SOIL SAMPLING

Subsurface soil samples were collected in June 2022 via HSA drilling methods in accordance with Standard Operating Procedure 025 and 047 *HSA Drilling and Sampling* (EA/Wood, 2022a). A split spoon sampler was used to collect continuous soil cores to the target depth. A hand auger was used to clear the top 5 ft of the boring in compliance with utility clearance procedures. 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 50-ft offset for reasons including drill rig access, utility avoidance and bias toward sampling within observed drainage features.

Three (3) discrete soil samples were collected from each of the six (6) specified soil borings (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, and AOI01-06): one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. The surface soil samples were collected during the first sampling event as described in **Section 5.2**. Subsurface samples were collected during the second sampling event in June 2022 and were defined as intermediate and deep samples (EA/Wood, 2022a). Intermediate samples were collected at 6 to 7 ft bgs at AOI01-01, AOI01-02, AOI01-03, AOI01-04, and AOI01-05 (shallow borings) and at 14 to 15 ft bgs at AOI01-06 (deep boring and temporary well location). Deep samples were collected approximately 1 ft above the groundwater table at AOI01-06, and for the remaining borings, were collected at 14 to 15 ft bgs. Groundwater during drilling was encountered at depths ranging from approximately 128 to 130 ft bgs. Total boring completion depths, to accommodate temporary well installation, ranged from approximately 135 to 144 ft bgs, and the shallow total boring completion depths ranged from approximately 15 to 18 ft bgs.

During drilling, 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**.

Soil borings completed during the SI found predominately medium plastic fines (silt/clay) with interbedded layers of sands and gravels below the Facility. The borings were completed at depths between 15 and 144 feet bgs. The Facility lithology was predominately silty sands and well graded gravels in the shallow subsurface and predominately medium plastic fines (clay) with layers of well graded gravels, sand, and less plastic fines (silt) in the deeper subsurface. Layers of well graded gravels with fines (silt/clay) and/or sand was observed consistently in the borings with thicknesses ranging from a few inches to 34 ft. These observations are consistent with the understood depositional environment of the region.

Each sample was collected into a laboratory-supplied PFAS-free HDPE bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory (Eurofins) and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), TOC (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the UFP-QAPP Addendum (EA/Wood, 2022a).

Field duplicate samples (**Table 5-1**) were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix Spike (MS)/ matrix spike duplicates (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. The specific equipment is noted in **Table 5-1**. 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.

5.4 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed at locations AOI01-06, AOI01-07, and AOI01-08 using an HSA CME 75 system. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 10-ft section of 2-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

Groundwater samples were collected, after a period of time following well installation to allow groundwater to infiltrate and recharge the temporary well intervals, using a monsoon pump at AOI01-06 with PFAS-free HDPE tubing and a PFAS-free bailer at AOI01-07 and AOI01-08. Different sampling methods were required due to the accumulated fines within the screened interval and the limited infiltration and groundwater recharge within the temporary wells. The temporary well, AOI01-06 was purged at a low flow rate but purged nearly dry following removal of 3.2 gallons of water. The AOI01-06 sample was collected once the well had recharged sufficient for sampling. At AOI01-07, approximately one gallon of water was purged by pumping before the water column in the well dropped to the point that there was insufficient head pressure to continue pumping, at which time a PFAS-free bailer was deployed to collect the water sample at AOI01-07. AOI01-08 was purged with a PFAS-free bailer to remove accumulated fines and then sampled. 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**) before each grab sample was collected in a separate container.

Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard COC procedures to the laboratory (Eurofins) 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, 2022a).

Field duplicate samples (**Table 5-1**) 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. Three (3) field blanks (FBs) were collected in accordance with the UFP-QAPP Addendum (EA/Wood, 2022a). In instances when non-dedicated sampling equipment was used, such as a bladder or monsoon pump, one EB was collected per day and analyzed for the same parameters as the groundwater samples. A temperature blank was placed in each cooler for use in confirming that samples were preserved at or below 6°C during shipment.

Following well surveying (described below in **Section 5.6**), temporary wells were abandoned in accordance with the SI UFP-QAPP Addendum (EA/Wood, 2022a) by removing the PVC and backfilling the hole with bentonite chips.

For deep HSA borings (AOI01-06, AOI01-07, and AOI01-08), Portland cement was used for abandonment pursuant to NM requirements. Borings were installed in grass/dirt, asphalt, and concrete areas and all boring locations were restored to originally condition at the best of the ability of Cascade.

5.5 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor Facility-wide groundwater elevations and assess groundwater flow. A synoptic groundwater gauging event was performed on 19 June 2022. Groundwater elevation measurements were collected from the 3 newly installed temporary monitoring wells, taken from the survey mark on the northern side of the well casing. Groundwater elevation data is provided in **Table 5-3**. A groundwater flow contour map is provided as **Figure 2-4**.

5.6 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R10 real-time kinematic differential global positioning system. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected by Atkins Engineering Associates, Inc. (Atkins) on 21 June 2021 and are provided in **Appendix B3**.

5.7 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS 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, 2022a) and subsequent discussions with NMED and Facility personnel.

Surface soil IDW from the first sampling event was containerized pending analysis. Following review of the surface soil sample results with all stakeholders and with verbal approval by NMED, the surface soil IDW was returned to the ground surface at each sampling location and non-saturated soil IDW from subsurface sampling and temporary well installation was consolidated and placed on the ground in a location within the motor pool at the Facility. Water saturated soil IDW (i.e., saturated soil cuttings) were placed into Department of Transportation (DOT)-approved steel drums, labeled, and stored on-Facility on plastic sheeting on an asphalt-paved surface pending analytical results. The subsurface IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were contained in labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and left on plastic sheeting on an asphalt-paved surface. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples

collected from that source location. The liquid IDW will be disposed of via a Resource Conservation and Recovery Act Subtitle C landfill. The disposal contract is being managed under a separate contract (EA Engineering, Science, and Technology, Inc., 2021). Specifics on the disposal of liquid IDW will be addressed in an IDW Treatment Memorandum.

Geographic coordinates were collected using a Global positioning system (GPS) around each location where IDW was placed (i.e., an IDW polygon). The IDW polygons are displayed on the figure in **Appendix B5**.

The IDW disposal is being managed separately under a contract with EA Engineering, Science, and Technology, Inc. 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.

5.8 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.

Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D, and grain size using ASTM Method D-422.

5.9 DEVIATIONS FROM SI UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum (EA/Wood, 2022a) occurred based on field conditions. These deviations were discussed between EA, WSP, ARNG, USACE, and NMARNG. Deviations from the UFP-QAPP Addendum are noted below:

- AOI01-05: This location was moved slightly southeast to allow for a sufficient distance from the wash rack drain and the associated underground utilities. The location was placed as close as was deemed safe by Cascade and WSP.
- AOI01-09: No temporary well was installed at this location and subsequently no groundwater sample or groundwater elevation were collected. Gravels with calcium carbonate were encountered in significant volumes during borehole advancement at this location. The lithology at this location placed excessive amounts of stress onto the drilling equipment and refusal was encountered during the first and second attempt at 97 and 70 ft bgs, respectively. Following refusal during the first attempt, a step out was agreed upon which was placed 10 ft to the east. Cascade noted concerns of the equipment not being able to reach the proposed total depth at this location and a verbal agreement on 20 June 2022 between WSP and ARNG was reached to not proceed with this location based on the location's lithology and the limited capability of the available equipment. This was documented on the Daily Field Record included in **Appendix B-1**.
- During drilling of the deep boreholes for temporary wells, approximately three to five gallons of potable water was intermittently sprayed on the augers to cool frictional heat

that was generated by the drill bit while cutting through the subsurface lithology. The intermittent intervals at which water was introduced are denoted on the boring logs in **Appendix E**. With the minimal volume added, potable water that was not converted to vapor by the heat and frictional forces is expected to have been adsorbed by the borehole soil. No potable water was added to the saturated interval.

- Due to limited recharge conditions, the temporary wells were not able to be purged until water quality indicator parameters stabilized. Groundwater purging with a submersible pump at AOI01-06 removed approximately 3.2 gallons of groundwater before the well was purged nearly dry. The groundwater sample was collected from AOI01-06 once the well had recharged to a sufficient level. Approximately 1 gallon of groundwater was purged at AOI01-07 before the water column dropped to where there was insufficient head pressure for pumping. The groundwater was then sampled at AOI01-07 with a PFAS-free bailer as stated in Section 5.4. Approximately 2 gallons of groundwater was purged and sampled with a PFAS-free bailer from AOI01-08 and no submersible pump purging was performed due to sediment, minimal water volume present, and conditions observed at AOI01-06 and AOI01-07.
- No shaker tests were performed on the groundwater samples due to limited water recovered at AOI01-06 and a field omission at AOI01-07 and AOI08.
- Temporary monitoring wells were abandoned with a mixture of water, Quikrete Portland Cement (Type I/II), and a Quick Gel. This grout mixture is in compliance with the NM abandonment requirements.

Table 5-1. Site Inspection Samples by Medium
Roswell FMS, Roswell, NM
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (USEPA Method	pH (USEPA Method 9045D)	Grain Size (ASTM Method D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	4/28/2022 8:50	0-2	X	X	X	X	Parent Sample – AOI01-01-SB-01-02-DUP
AOI01-01-SB-01-02-DUP	4/28/2022 8:50	0-2	X				FD
AOI01-01-SB-06-07	6/7/2022 16:40	6-7	X				MS/MSD
AOI01-01-SB-14-15	6/7/2022 16:50	14-15	X				
ROS-FD-01	6/7/2022 16:50	14-15	X				FD
AOI01-02-SB-0-2	4/28/2022 9:55	0-2	X				
AOI01-02-SB-06-07	6/13/2022 13:42	6-7	X				
AOI01-02-SB-14-15	6/13/2022 13:46	14-15	X				
AOI01-03-SB-0-2	4/28/2022 15:20	0-2	X				
AOI01-03-SB-06-07	6/13/2022 10:57	6-7	X				
AOI01-03-SB-14-15	6/13/2022 11:09	14-15	X				
AOI01-04-SB-0-2	4/28/2022 10:50	0-2	X				
AOI01-04-SB-06-07	6/13/2022 15:10	6-7	X				
AOI01-04-SB-14-15	6/13/2022 15:15	14-15	X				
AOI01-05-SB-0-2	4/28/2022 16:00	0-2	X				
AOI01-05-SB-06-07	6/13/2022 9:05	6-7	X				
AOI01-05-SB-14-15	6/13/2022 9:35	14-15	X				
AOI01-06-SB-0-2	4/28/2022 16:25	0-2	X				
AOI01-06-SB-14-15	6/10/2022 9:35	14-15	X				
AOI01-06-SB-139-140	6/12/2022 12:02	139-140	X				
ROS-FD-02	6/12/2022 12:00	139-140	X				FD
Groundwater Samples							
AOI01-06-GW	6/21/2022 14:55	NA	X				
AOI01-07-GW	6/22/2022 12:15	NA	X				
ROS-FD-03	6/22/2022 12:15	NA	X				FD
AOI01-08-GW	6/22/2022 13:45	NA	X				MS/MSD
Blank Samples							
ROS-ERB-01	4/28/2022 4:50	NA	X				Hand Auger
ROS-ERB-01	6/7/2022 15:50	NA	X				Split Spoon Sampler
ROS-ERB-02	6/10/2022 8:16	NA	X				Split Spoon Sampler
ROS-ERB-03	6/13/2022 15:28	NA	X				Split Spoon Sampler
ROS-ERB-04	6/13/2022 8:46	NA	X				Split Spoon Sampler
ROS-ERB-05	6/16/2022 11:00	NA	X				Auger Bolts with Lubricant
ROS-ERB-06	6/21/2022 7:15	NA	X				GeoTech Pump
ROS-ERB-07	6/21/2022 12:00	NA	X				PVC Pump – Monsoon

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	TOC (USEPA Method	pH (USEPA Method 9045D)	Grain Size (ASTM Method D-422)	Comments
ROS-ERB-08	6/22/2022 11:15	NA	X				Stainless Steel Bailer
ROS-FB-01	4/28/2022 11:15	NA	X				
ROS-FB-01	6/21/2022 7:30	NA	X				

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

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Roswell FMS, Roswell, NM
Site Inspection Report

Area of Interest	Boring Location	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval [1] (ft bgs)
1	AOI01-01	15	NA
	AOI01-02	15	NA
	AOI01-03	15	NA
	AOI01-04	15	NA
	AOI01-05	15	NA
	AOI01-06	144	131.8-141.8
	AOI01-07	135	126.3-136.3
	AOI01-08	135	125.3-135.3
	AOI01-09 (original)	97	NA[2]
	AOI01-09 (step out)	70	NA[2]

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
[2] Refusal was encountered and could not be advanced to groundwater table
AASF = Army Aviation Support Facility
amsl = Above mean sea level
bgs = below ground surface
btoc = below top of casing
ft = feet
FMS = Field Maintenance Shop
NA = not applicable
NAVD88 = North American Vertical Datum 1988

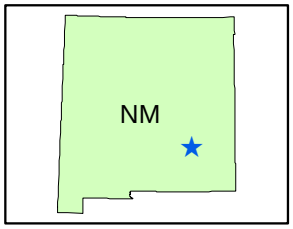
Table 5-3. Groundwater Elevation
Roswell FMS, Roswell, NM
Site Inspection Report

Monitoring Well ID	Top of Casing Elevation[1] (ft NAVD88)	Depth to Water (ft btoc)	Groundwater Elevation (ft NAVD 88)
AOI01-06	3652.81	132.25	3520.62
AOI01-07	3650.95	118.43	3532.67
AOI01-08	3650.58	117.37	3533.22

Notes:
[1] Temporary well screen set above total depth to capture groundwater interface
amsl = Above mean sea level
bgs = below ground surface
btoc = below top of casing
FMS = Field Maintenance Shop
Ft = feet
NA = not applicable
NAVD88 = North American Vertical Datum 1988

Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 5-1
Site Inspection Sample Locations



Facility Data
- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

Sample Type
- Soil Boring
- Monitoring Well

Hydrology/Hydrogeology
- Inferred Local Surface Water Flow Direction
- Shallow Aquifer Approximate Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2019

FMS = Field Maintenance Shop
Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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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 the AOI is provided in **Sections 6.3**. SLs for relevant compounds, for both soil and groundwater, are presented in **Table 6-1**. **Tables 6-2** through **6-6** present results in soil or 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 dated 6 July 2022 (Assistant Secretary of Defense 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum Facility concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1**.

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

Analyte	Residential 0-2 ft bgs (Soil) (µg/kg)[1]	Industrial / Commercial Composite Worker 2-15 ft bgs (Soil) (µg /kg)[1]	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. 2022. Risk-Based Screening Levels in Groundwater and Soil using U.S. Environmental Protection Agency's (EPA'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 CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 ft bgs). The SLs are not applied to deep subsurface soil results (greater than 15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

To provide basic soil parameter information, soil samples were analyzed for TOC, pH, and grain size, which are important for evaluating transport through the soil medium. **Appendix F** 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 – Field Maintenance Shop – Vehicle Maintenance Bay

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: FMS – Vehicle Maintenance Bay. The soil and groundwater results are summarized in **Table 6-2** through **6-4**. Soil and groundwater results are presented on **Figures 6-1** through **6-7**.

6.3.1 AOI 1 Soil Analytical Results

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

Surface soil (0 to 2 ft bgs) was sampled from boring locations AOI01-01 through AOI01-06. Soil was sampled from the shallow subsurface soils (6 to 7 ft bgs) and deep subsurface soil intervals (14 to 15 ft bgs) from boring locations AOI01-01 through AOI01-05. Soil was also sampled from the shallow subsurface soil interval of 14 to 15 ft bgs and a very deep subsurface soil interval of 139 to 140 ft bgs at boring location, AOI01-06.

PFOS and PFOA were detected in surface soil at concentrations below their respective SLs. PFOA was detected at AOI01-01 at a concentration of 0.2 J µg/kg. PFOS was detected at AOI01-04 at a concentration of 1.6 J+ µg/kg. PFBS, PFHxS, and PFNA were not detected in the surface soil samples.

No relevant compounds (PFBS, PFHxS, PFNA, PFOS, and PFOA) were detected in shallow and deep subsurface soils.

6.3.2 AOI 1 Groundwater Analytical Results

Groundwater samples were collected from 3 temporary wells associated with AOI 1 during the SI as discussed in Section 5.0. **Figure 6-6** and **6-7** presents the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater was sampled from temporary monitoring well locations AOI01-06 through AOI01-08. PFBS and PFOA were detected at concentrations below their respective SLs. Two of the three locations (AOI01-06 and AOI01-07) had detections of PFBS, at concentrations of 1.0 J and 1.2 J ng/L, respectively. Two of the three locations (AOI01-06 and AOI01-07) had detections of PFOA, at concentration of 1.2 J and 0.75 J ng/L (0.78 J ng/L in the duplicate), respectively. PFHxS, PFNA, and PFOS were not detected in the groundwater samples.

6.3.3 Conclusions

Based on the results of the SI, PFOS and PFOA were detected in soil below their respective SLs. PFBS and PFOA were detected in groundwater at concentrations below their respective SLs. There were no exceedances of the SLs in soil or groundwater, and no further evaluation at AOI 1 is warranted.

Table 6-2. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report
Roswell Field Maintenance Shop, New Mexico

Area of Interest		AOI 1													
Location ID		AOI01-01		AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06	
Sample Name		AOI01-01-SB-0-2		AOI01-01-SB-0-2-DUP		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-05-SB-0-2		AOI01-06-SB-0-2	
Parent Sample ID				AOI01-01-SB-0-2											
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Sample Date		4/28/2022		4/28/2022		4/28/2022		4/28/2022		4/28/2022		4/28/2022		4/28/2022	
Analyte	**OSD Screening Level 0-2 ft bgs[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS (PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15) (µg/kg)															
PFBS	1,900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	19	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	13	ND	U	ND	U	ND	U	ND	U	1.6	J+	ND	U	ND	U
PFOA	19	0.2	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

Chemical Abbreviations:

PFBS Perfluorobutanesulfonic acid
PFHxS Perfluorohexanesulfonic acid
PFNA Perfluorononanoic acid
PFOS Perfluorooctanesulfonic acid
PFOA Perfluorooctanoic acid

References

1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022. Soil screening levels based on residential scenario for incidental ingestions of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated quantity but may be biased high

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

Acronyms and Abbreviations

µg/kg = micrograms per kilogram

AOI = Area of Interest

ft = Feet

LOD = Limit of Detection

LOQ = Limit of Quantitation

ND = Analyte not detected above the LOD.

Qual = Qualifier

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report
Roswell Field Maintenance Shop, New Mexico

Area of Interest		AOI 1													
Location ID		AOI01-01		AOI01-01		AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-03	
Sample Name		AOI-01-SB-06-07		AOI-01-SB-14-15		ROS-FD-01		AOI01-02-SB-06-07		AOI01-02-SB-14-15		AOI01-03-SB-06-07		AOI01-03-SB-14-15	
Parent Sample ID						AOI-01-SB-14-15									
Depth		6-7 ft		14-15 ft		14-15 ft		6-7 ft		14-15 ft		6-7 ft		14-15 ft	
Sample Date		6/7/2022		6/7/2022		6/7/2022		6/13/2022		6/13/2022		6/13/2022		6/13/2022	
Analyte	**OSD Screening Level >2 ft bgs[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS (PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15) (µg/kg)															
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1,600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	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. The screening levels for soil based on are based on Industrial/Commercial Composite Worker scenario for incidental ingestion of contaminated soil.

Chemical Abbreviations:

PFBS Perfluorobutanesulfonic acid
PFHxS Perfluorohexanesulfonic acid
PFNA Perfluorononanoic acid
PFOS Perfluorooctanesulfonic acid
PFOA Perfluorooctanoic acid

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated quantity but may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection level.

Acronyms and Abbreviations

µg/kg = micrograms per kilogram
AOI = Area of Interest
ft = Feet
LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Analyte not detected above the LOD.
Qual = Qualifier

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report
Roswell Field Maintenance Shop, New Mexico

Area of Interest		AOI 1											
Location ID		AOI01-04		AOI01-04		AOI01-05		AOI01-05		AOI01-06		AOI01-06	
Sample Name		AOI01-04-SB-06-07		AOI01-04-SB-14-15		AOI01-05-SB-06-07		AOI01-05-SB-14-15		AOI01-06-SB-06-07		AOI01-06-SB-14-15	
Parent Sample ID													
Depth		6-7 ft		14-15 ft		6-7 ft		14-15 ft		6-7 ft		14-15 ft	
Sample Date		6/13/2022		6/13/2022		6/13/2022		6/13/2022		6/10/2022		6/10/2022	
Analyte	**OSD Screening Level >2 ft bgs[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS (PFAS by LC/MS/MS compliant with QSM													
PFBS	25,000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1,600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense. July 2022. Risk Based Sc
Regional Screening Level Calculator. HQ=0.1. May 2022.
incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated quantity but may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection level.

Acronyms and Abbreviations

µg/kg = micrograms per kilogram
AOI = Area of Interest
ft = Feet
LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Analyte not detected above the LOD.
Qual = Qualifier

Chemical Abbreviations:

PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report
Roswell Field Maintenance Shop, New Mexico

Area of Interest	AOI 1			
Location ID	AOI01-06		AOI01-06	
Sample Name	AOI01-06-SB-139-140		ROS-FD-02	
Parent Sample ID			AOI01-06-SB-139-140	
Depth	139-140 ft		139-140 ft	
Sample Date	6/12/2022		6/12/2022	
Analyte	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS (PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15) (µg/kg)				
PFBS	ND	U	ND	U
PFHxS	ND	U	ND	U
PFNA	ND	U	ND	U
PFOS	ND	U	ND	U
PFOA	ND	U	ND	U

Interpreted Qualifiers

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

Acronyms and Abbreviations

µg/kg = micrograms per kilogram

AOI = Area of Interest

ft = Feet

LOD = Limit of Detection

LOQ = Limit of Quantitation

ND = Analyte not detected above the LOD.

Qual = Qualifier

Chemical Abbreviations:

PFBS Perfluorobutanesulfonic acid

PFHxS Perfluorohexanesulfonic acid

PFNA Perfluorononanoic acid

PFOS Perfluorooctanesulfonic acid

PFOA Perfluorooctanoic acid

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Table 6-5. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report
Roswell Field Maintenance Shop, New Mexico

Location ID		AOI01-06		AOI01-07		AOI01-07		AOI01-08	
Sample Name		AOI01-06-GW		AOI01-07-GW		ROS-FD-03		AOI01-08-GW	
Parent Sample ID						AOI01-07-GW			
Sample Date		6/21/2022		6/22/2022		6/22/2022		6/22/2022	
Analyte	**OSD Screening Level [1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS (ng/L)									
PFBS	601	1.0	J	1.2	J	1.2	J	ND	U
PFHxS	39	ND	U	ND	U	ND	U	ND	U
PFNA	6	ND	U	ND	U	ND	U	ND	U
PFOS	4	ND	U	ND	U	ND	U	ND	U
PFOA	6	1.2	J	0.75	J	0.78	J	ND	U

Grey Fill Detected concentration exceeded OSD Screening Levels

References

1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Chemical Abbreviations:

PFBS Perfluorobutanesulfonic acid
PFHxS Perfluorohexanesulfonic acid
PFNA Perfluorononanoic acid
PFOS Perfluorooctanesulfonic acid
PFOA Perfluorooctanoic acid

Interpreted Qualifiers

J = Estimated concentration
J+ = Estimated quantity but may be biased high
U = The analyte was not detected at a level greater than or equal to the adjusted detection level.

Acronyms and Abbreviations

AOI = Area of Interest
ft = Feet
LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Analyte not detected above the LOD.
ng/L = nanograms per liter
Qual = Qualifier

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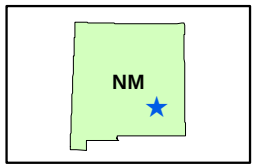
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 6-1
PFOS Detections in Soil (AOI 1)



Facility Data

- Facility Boundary
- Area of Interest (AOI)
- Potential PFAS Release
- Original Paved Area

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....Wood
Prepared For:.....USACE

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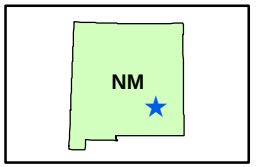
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico

Figure 6-2
PFOA Detections in Soil (AOI 1)



Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

PFOA Results (µg/kg)

- ND (Non-Detect)
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFOA = perfluorooctanoic acid
ND = Non-Detect
(µg /Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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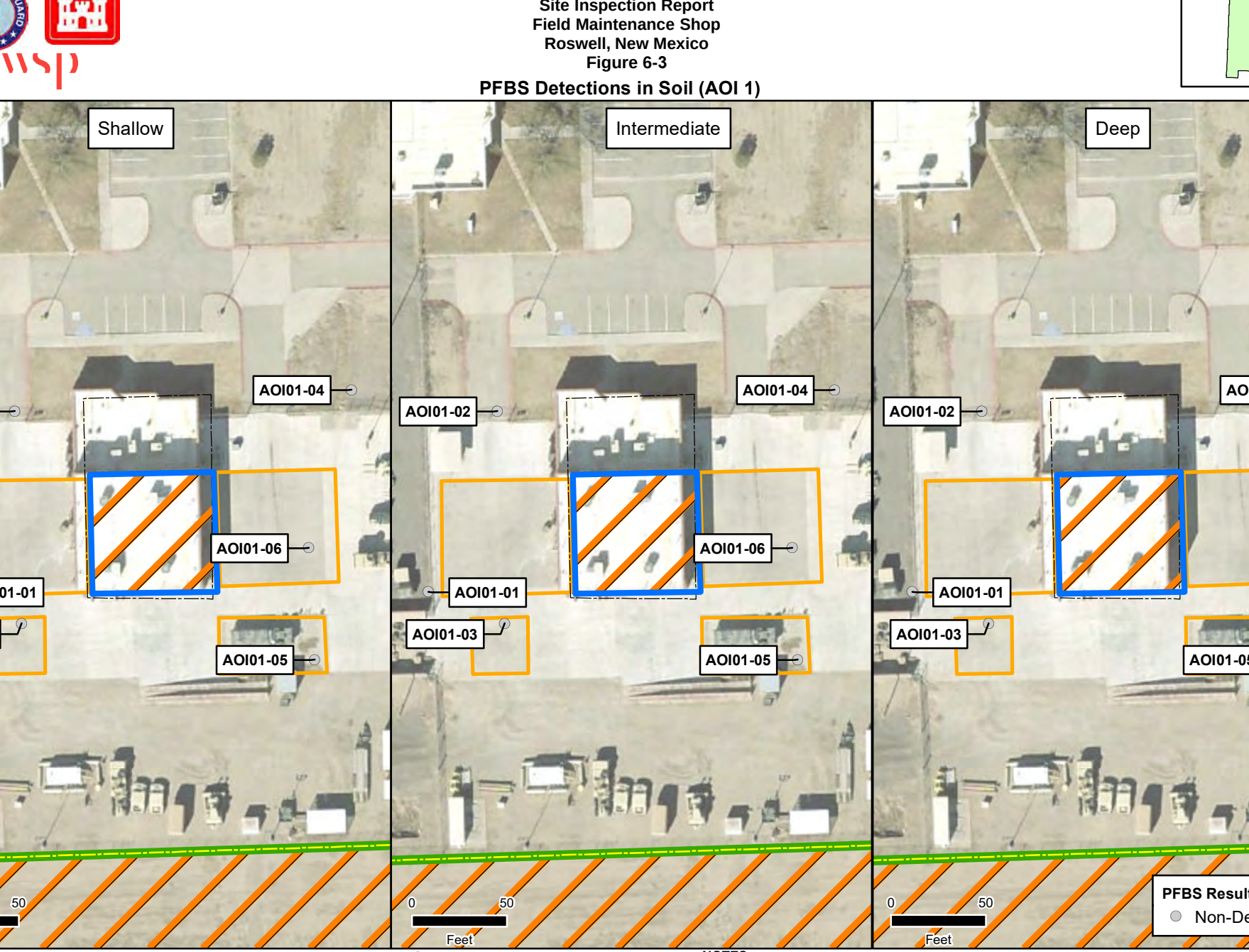
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico
Figure 6-3

PFBS Detections in Soil (AOI 1)



Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

PFBS Results (µg/kg)

- ND (Non-Detect)
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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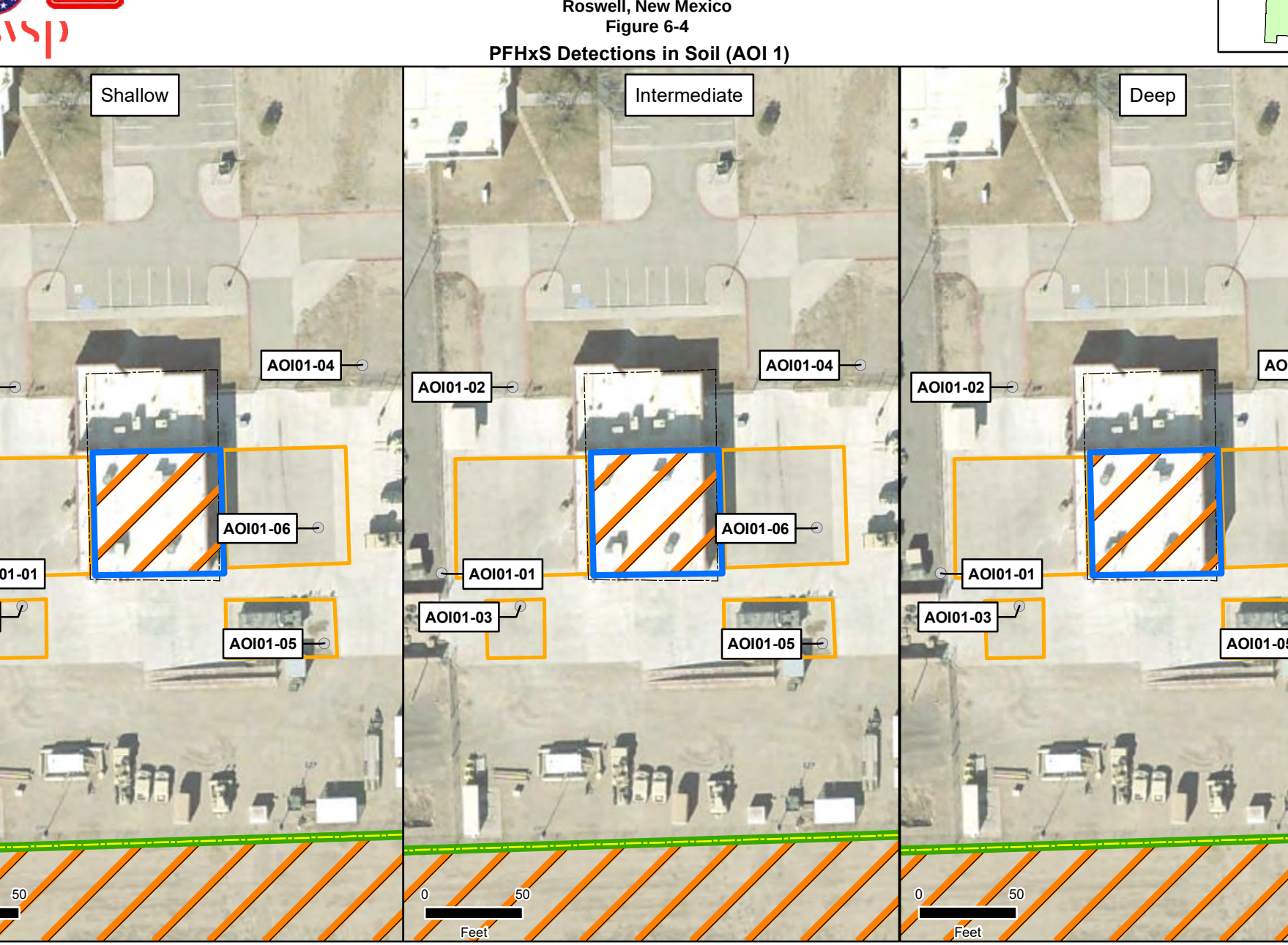
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico
Figure 6-4

PFHxS Detections in Soil (AOI 1)



Facility Data
- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

PFHxS Results (µg/kg)
- ND (Non-Detect)
- >ND - 13
- >13 -130
- >130 - 1,600
- >1,600

NOTES:
PFAS - Per- and Polyfluoroalkyl Substances
PFHxS = perfluorohexanesulfonic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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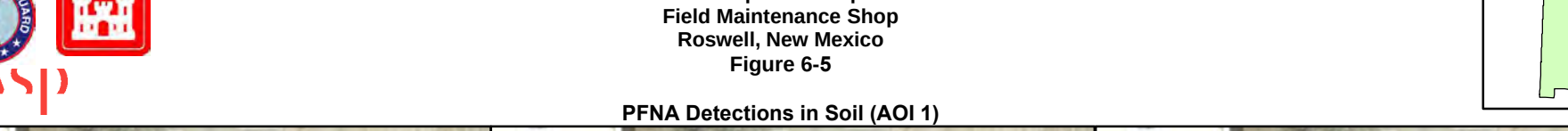
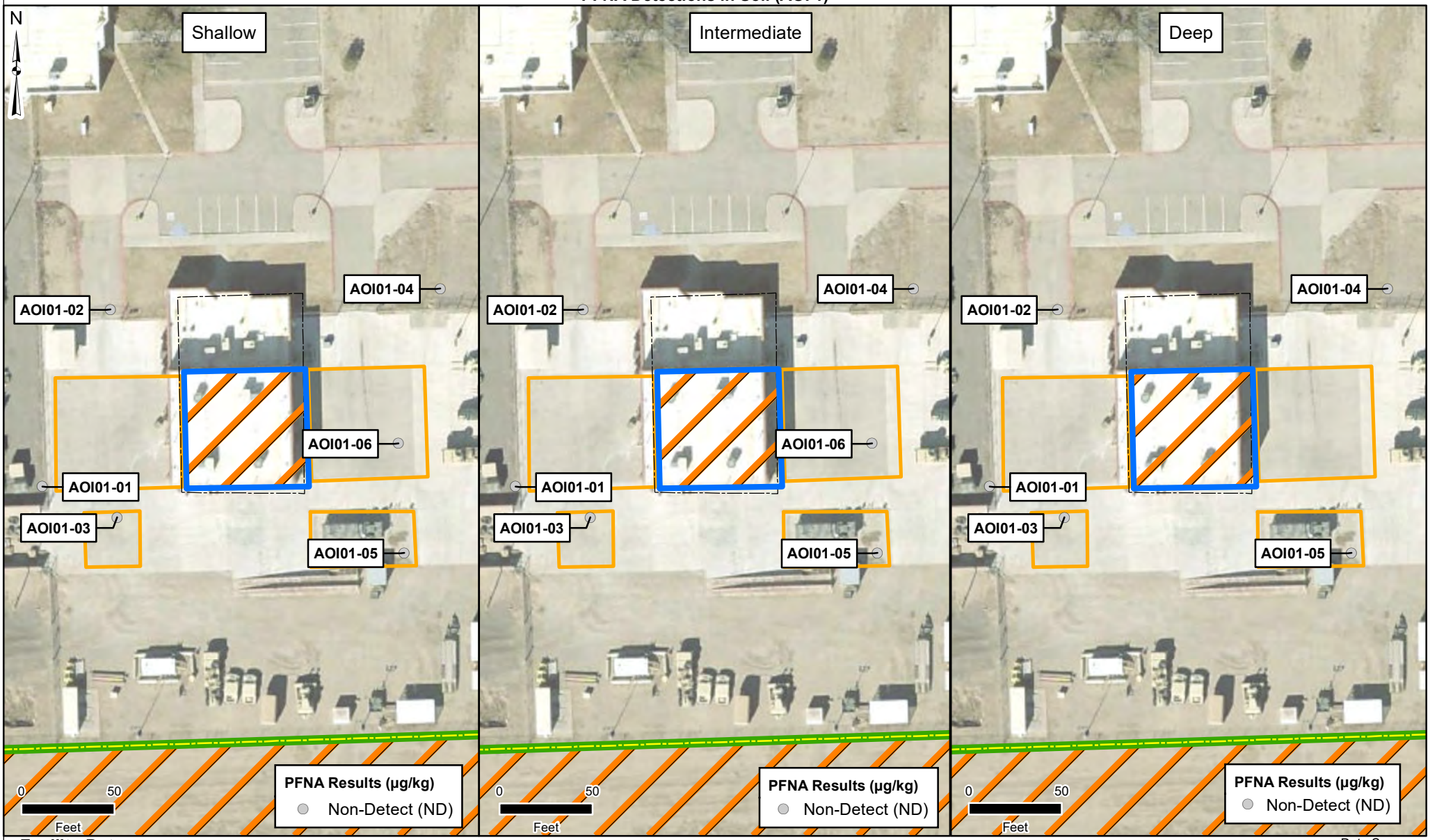
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico
Figure 6-5

PFNA Detections in Soil (AOI 1)





Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

PFNA Results (µg/kg)

- ND (Non-Detect)
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

NOTES:
PFAS = Per- and Polyfluoroalkyl Substances
PFNA = perfluorononanoic acid
ND = Non-Detect
(µg/Kg) = Microgram(s) per Kilogram
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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Army National Guard Site Inspections
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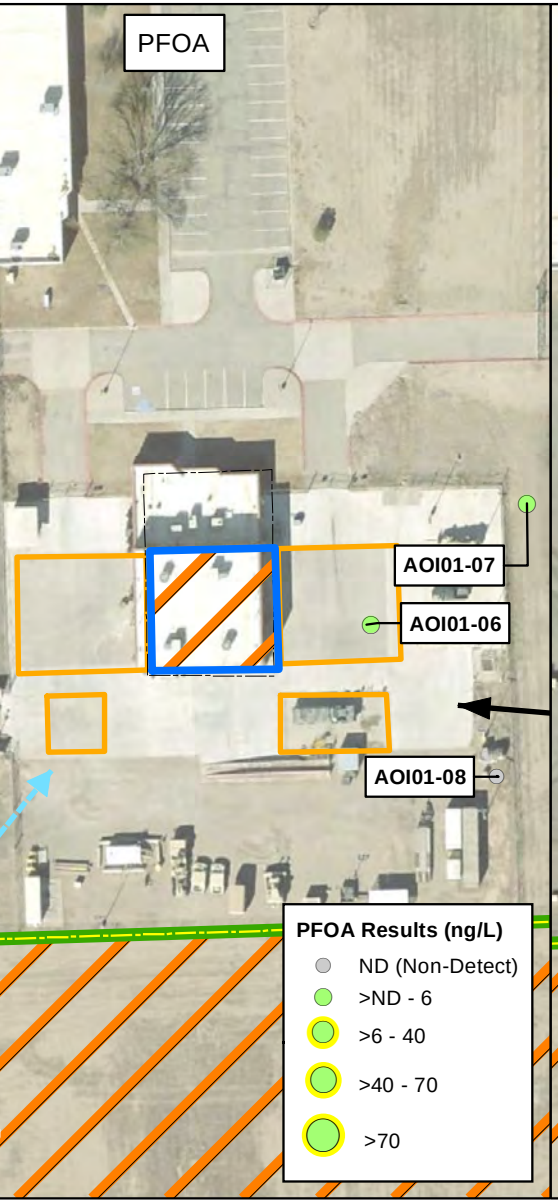
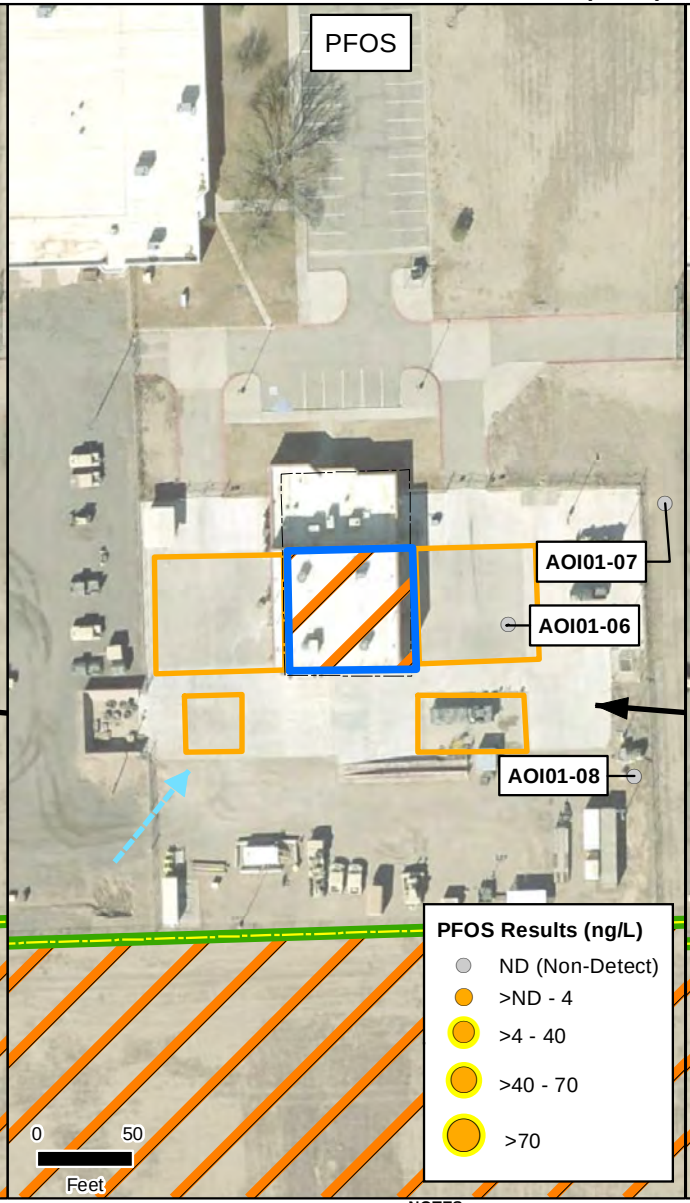
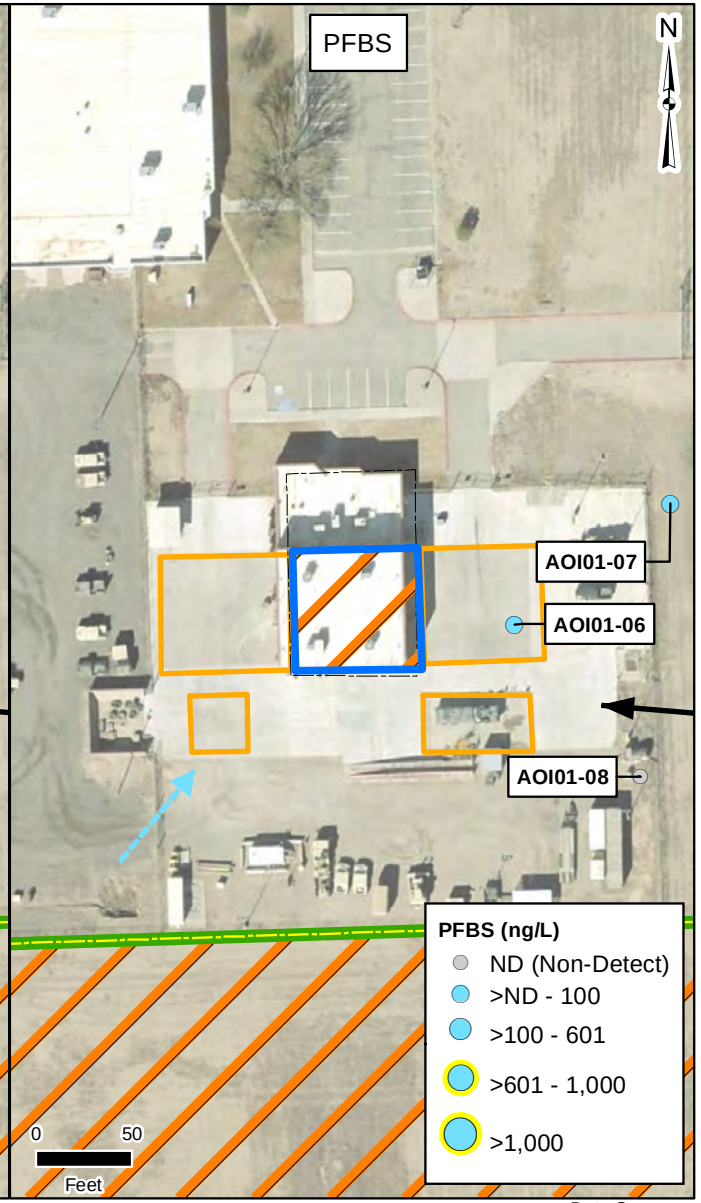
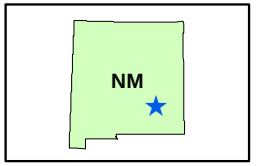
Figure 6-6

PFOA,PFOS, and PFBS Detections in Groundwater (AOI 1)









Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

Hydrology/Hydrogeology

- Inferred Local Surface Water Flow Direction
- Shallow Aquifer Approximate Groundwater Flow Direction

NOTES:

PFAS = Per- and Polyfluoroalkyl Substances
PFOS = perfluorooctanesulfonic acid
PFOA = perfluorooctanoic acid
PFBS = perfluorobutanesulfonic acid
ND = Non-Detect
ng/L = nanogram(s) per liter
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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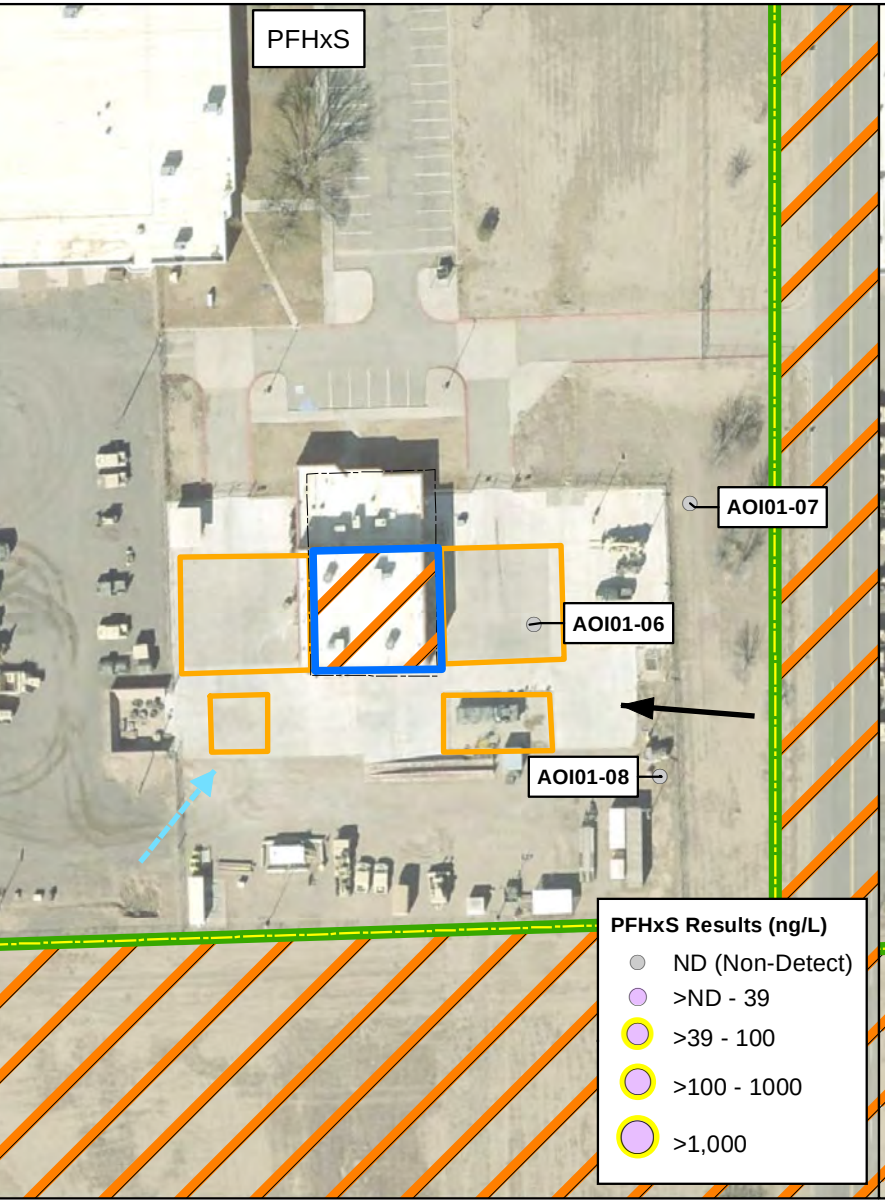
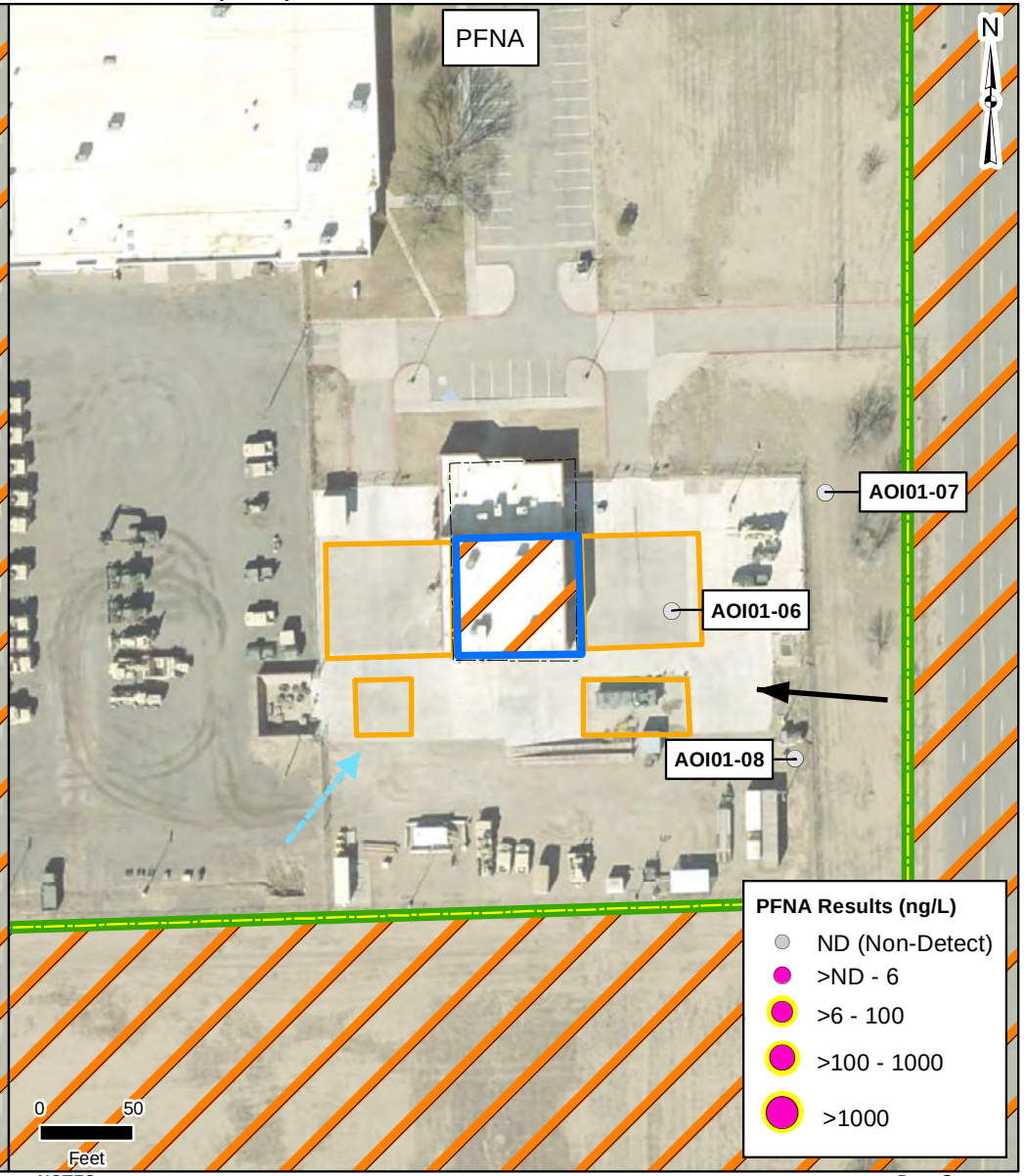
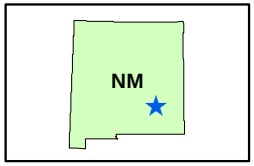
Army National Guard Site Inspections
Site Inspection Report
Field Maintenance Shop
Roswell, New Mexico
Figure 6-7

PFHxS and PFNA Detections in Groundwater (AOI 1)







Facility Data

- Area of Interest (AOI)
- Facility Boundary
- No Suspected PFAS Release
- Potential PFAS Release
- Original Paved Area

Hydrology/Hydrogeology

- Inferred Local Surface Water Flow Direction
- Shallow Aquifer Approximate Groundwater Flow Direction

NOTES:
PFAS - Per-and Polyfluoroalkyl Substances
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
ND = Non-Detect
ng/L = nanogram(s) per liter
Exceedances of The Office of the Secretary of Defense (OSD) Screening Level (SL) are depicted with a yellow halo.

AOI01-06 was advanced to groundwater. Intermediate soil sample at AOI01-06 taken at 14-15 ft bgs. Deep soil sample at AOI01-06 taken at 139-140 ft bgs.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....October 2022
Prepared By:.....WSP
Prepared For:.....USACE

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7. EXPOSURE PATHWAYS

The Conceptual Site Model (CSM) for the AOI, revised based on the SI findings, is presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the 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. SLs are presented in Section 6.1 of this report.

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

If any of these elements are missing, the pathway is incomplete. The CSM figure uses 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 CSM indicates 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 EPA guidance for risk screening (EPA 2001). Receptors at the Facility include Facility workers (e.g., facility staff and visiting soldiers), construction workers, trespassers, residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1 – FIELD MAINTENANCE SHOP – VEHICLE MAINTENANCE BAY

AOI 1 is the FMS – Vehicle Maintenance Bay, where a Tri-Max™ mobile fire extinguisher containing AFFF was historically stored. No potential releases or AFFF usage was noted during the PA at AOI01 (AECOM, 2020).

PFOA and PFOS were detected in the surface soil at AOI 1 at concentrations below their respective SLs. Facility workers, construction workers, and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for Facility workers, construction workers, and trespassers are potentially complete. No relevant compounds were detected in the subsurface soil at AOI01 therefore, the subsurface soil exposure pathway for Facility workers and construction workers is incomplete. The CSM for AOI 1 is presented on Figure 7-1.

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 the AOI based on the aforementioned criteria.

7.2.1 AOI 1 – AOI FIELD MAINTENANCE SHOP – VEHICLE MAINTENANCE BAY

PFBS and PFOA were detected below their respective SLs in groundwater samples collected from the groundwater at AOI 1 (shallow aquifer). No potable wells are located within the Facility boundary, and the Facility receives water from a municipal source that extracts water from the deep aquifer. Depths to water measured at AOI 1 in June 2022 during the SI ranged from approximately 117 to 132 ft bgs. Therefore, the ingestion exposure pathway for Facility workers, construction workers, and trespassers is considered incomplete. Domestic wells surround the Facility and are located primarily to the northeast and east within a 4-mile radius of the Facility (Figure 2-3). The closest domestic wells are located approximately 0.22 miles to the northwest and 0.28 miles to the northeast. One drinking well was identified during the PA (AECOM, 2020), located to the south of the Facility. Six production wells completed in the Roswell Artesian aquifer are located within the RIAC boundary and four to the south of the RIAC boundary (NMED Drinking Water Bureau, 2019). Three commercial water and 18 irrigation wells are located within a 4-mile radius of the Facility. The wells identified may be completed in either the shallow aquifer or the deep Roswell Artesian aquifer. Thus, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

Surface water and sediment were not sampled as part of the SI. The facility has natural drainage flow paths and stormwater swales that flow outside the Facility boundary to the north-northeast. All stormwater for the RIAC flows northeast toward the Hangerman Canal (Barron's, 2021). There are two outfalls within the RIAC property located to the east of the Facility. SI results in soil and groundwater from AOI 1, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because PFOA and PFOS were detected in soil and PFOA and PFBS were detected in groundwater at AOI 1, it is possible that these compounds may have migrated from soil and/or groundwater to the north of the Facility via groundwater discharge or overland flow. Therefore, the surface water and sediment ingestion exposure pathway for site workers, construction workers, trespassers, and off-site residents is considered potentially complete.

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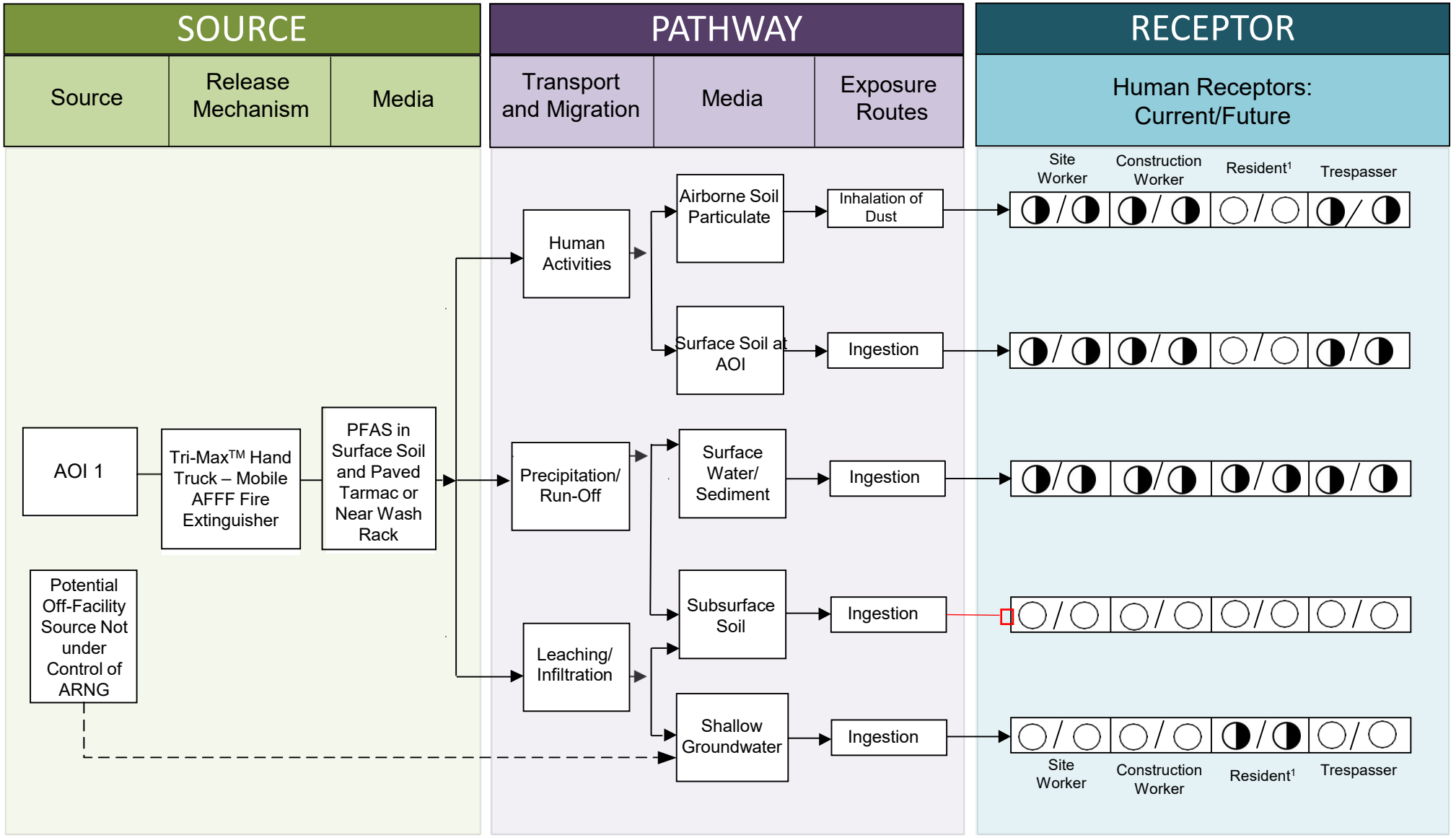

LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Complete Pathway

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
AOI 1 Roswell FMS

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8. SUMMARY AND OUTCOME

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

8.1 SI ACTIVITIES

The SI field activities were conducted during two sampling events, between 28 to 28 April 2022 and 06 to 23 June 2022. The SI field activities included soil and groundwater sampling. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA/Wood, 2022a), except as previously noted in **Section 5.9**.

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

- 18 soil grab samples from 6 boring locations
- 3 grab groundwater samples from 3 temporary well locations
- 18 QA/QC samples.

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at the AOI 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 CSM was refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOI, which are described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation is not warranted for AOI 1. Based on the CSM developed and revised based on the SI findings, there are potentially complete pathways for exposure to receptors from AOI 1 from sources on the Facility resulting from historical DoD activities.

Sample analytical concentrations collected during the SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. The following bullets summarize the SI results relative to the SLs:

At AOI 1:

- In the surface soils, PFOS was detected at AOI01-04 and PFOA was detected at AOI01-01, both below their respective SLs. PFOS and PFOA were detected in soil at concentrations less than the respective SLs. The maximum PFOS concentration in soil was 1.6 J+ µg/kg. The maximum PFOA concentration in soil was 0.2 J µg/kg. There were no detections of relevant compounds in the subsurface soils.

- PFOA and PFBS were detected in groundwater at AOI 1 at concentrations that did not exceed SLs. The maximum concentration of PFOA and PFBS were 1.2 J ng/L for both constituents.
- Based on the results of the SI, further evaluation of AOI 1 is not warranted in the RI.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film-forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS. **Table 8.1** summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	Field Maintenance Shop – Vehicle Maintenance Bay	◐	◐	◐	No further action

Legend:

● = Detected; exceedance of screening levels

◐ = Detected; no exceedance of screening levels

○ = Not detected

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