FINAL
Site Inspection Report
San Juan Army Aviation Support Facility
San Juan, Puerto Rico

Site Inspections 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

August 2023

Prepared for:

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

UNCLASSIFIED

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*A Technical Project Planning Meeting was not held for San Juan Army Aviation Support Facility; regulators did not respond to the request to attend a Technical Project Planning Meeting.

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film forming foam
amsl	Above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
ASTM	ASTM International
bgs	Below ground surface
btoc	Below top of casing
CAF	Compressed Air Foam
CAPECO	Caribbean Petroleum Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	Chain-of-custody
CSM	Conceptual site model
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EDR ™	Environmental Data Resources, Inc.™
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment blank
FedEx	Federal Express
ft	Foot (feet)
gal	Gallon(s)
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
ID	Identification
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

LC/MS/MS	Liquid chromatography tandem mass spectrometry
LOQ	Limit of quantification
MIL-SPEC	Military Specification
MS	Matrix spike
MSD	Matrix spike duplicate
NAS	Naval Air Station
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
OSD	Office of the Secretary of Defense
OWS	Oil-water separator
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
PRARNG	Puerto Rico Army National Guard
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	Remedial investigation
Section	Isla Grande Airport Aviation Department Rescue and Firefighter Section
SI	Site Inspection
SIG	Isla Grande Airport
SL	Screening level
SOP	Standard Operating Procedure
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
USGS	U.S. Geological Survey

USFWS	U.S. Fish and Wildlife Services

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 from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and 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 in **Table ES-1**.

The PA identified one Area of Interest (AOI), containing several potential release areas, where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the 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 SLs for the relevant compounds. This SI was completed at Army Aviation Support Facility (AASF), in San Juan, Puerto Rico, and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1. The Army Aviation Support Facility will also be referred to as the "Facility" throughout this document.

The Facility, operated by Puerto Rico Army National Guard (PRARNG), encompasses approximately 13.02 acres in San Juan, Puerto Rico. The Facility is located adjacent to the Fernando Luis Ribas Dominicci Airport and was formerly occupied by the Naval Air Station, San Juan. The San Juan AASF is primarily used to provide aviation maintenance support and repair for aviation components.

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

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

Notes:

1. Office of the Assistant Secretary of Defense. 2022. Risk Based Screening Levels Calculated for Groundwater and Soil using U.S. Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. 6 July 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
bgs = Below ground surface
ft = Foot (feet)
ng/L = Nanogram(s) per liter

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

AOI	Potential Release Areas	Soil AOI	Groundwater AOI	Groundwater Facility Boundary	Future Action
1	Wash Rack, AASF Hangar, Flightline, Former Fire Station, Oil-Water Separator	◐	●	●	Proceed to RI

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

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense 2022). The six compounds listed in the OSD memorandum will be referred to as “relevant compounds” throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide-dimer acid (HFPO-DA)[2] at ARNG facilities nationwide. The ARNG performed this SI at Army Aviation Support Facility (AASF) in San Juan, Puerto Rico. The San Juan AASF is also referred to as the “Facility” throughout this document.

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

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Facility (AECOM Technical Services, Inc. [AECOM] 2020) that identified four potential PFAS release areas, which were grouped into one Area of Interest (AOI) where PFAS-containing materials were 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.

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

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

The AASF encompasses approximately 13.02 acres in the Isla Verde area of Puerto Rico. The Facility is directly adjacent to the Fernando Luis Ribas Dominicci Airport and is bordered by the Caño San Antonio, San Juan Bay, and the neighborhood of Miramar (**Figure 2-1**). The AASF is located within an industrial/commercial district of Isla Verde, surrounded on three sides by the waters of San Juan Bay in addition to multiple bays and inlets. The area was formerly occupied by the Naval Air Station (NAS), San Juan. Currently the primary mission of the detachment unit at the AASF is to provide aviation maintenance support and repair for aviation components (AECOM 2020).

NAS San Juan formerly served as a maintenance stationing point for U.S. Navy ships and planes in San Juan Bay. NAS San Juan included patrol squadrons of sea planes, massive dry dock maintenance and repair facilities for naval ships, a fuel supply and refinement center, a defense housing project, storehouses, and support facilities. In 1971, NAS San Juan relocated from Isla Grande to Ramey Air Force Base on the west coast of the island. Some of the areas previously occupied by NAS San Juan have been developed into neighborhoods, and other areas have been designated as industrial/commercial space. The Puerto Rico Army National Guard (PRARNG) AASF was built in 1992 in an industrial/commercial space formerly occupied by NAS San Juan (AECOM 2020).

According to PRARNG facility staff, the AASF is anticipated to relocate within the next 5 years (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The AASF lies on the low and swampy northern coast of Puerto Rico, which is indented by small bays, lagoons, and the San Juan Bay. The coast is comprised mostly by sand beaches, but it crops out in the sea cliffs of San Juan and the adjoining low hills as well as in small rock chains offshore. Topography across the AASF is very flat to accommodate the airport runway. SIG is located to the north and west of the Facility, the Puerto Rico Convention Center is located to the east of the Facility, and industrial/commercial areas are located to the south. Beyond the adjacent business and properties, the San Juan Bay is located to the south and west of the AASF, and the Caño San Antonio to the north separates Isla Grande from San Juan. The general San Juan area consists of a very gently sloping coastal plain (AECOM 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, and current and future land use. The topography at the Facility is shown on **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features and drainage basins are shown on **Figure 2-4**. Groundwater elevations, potential PFAS release areas, soil boring, and groundwater sample locations and groundwater elevation contours are presented on **Figure 2-5**.

2.2.1 Geology

The north side of the island is underlain by limestones, marls, and some noncarbonate sediments of late Oligocene to early Miocene age. These sediments overlie Cretaceous to Paleocene or early Eocene age volcanic rocks and dip at a moderate inclination northward, away from the island. These beds are locally folded and faulted but are relatively undisturbed. Rising gently southward from the coastal lagoons is a coastal plain made up of alluvial sediments. The coastal plain terminates to the south against hills of the uplands, which tend to increase in altitude southward towards the interior of the island (AECOM 2020).

Isla Verde is a fragment of a former shore isolated by beach erosion with a thin soil layer. Because much of the peninsula has been developed for industrial and commercial use, much of the area is underlain with artificial fill (**Figure 2-2**). No digital data is available for soil directly beneath the AASF via the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey tool. Soils in the low depressions and coastal lagoons within the vicinity of the AASF often include Martin Pena-Saladar-Hydraquents (AECOM 2020).

During the SI, poorly graded sand and medium-to-high plasticity fines (clays and silts) were observed as the dominant lithology of the unconsolidated sediments below the Facility. The borings were completed at depths between 5 and 15 feet (ft) below ground surface (bgs). Many of the logs also reported varying percentages of fragmented thinly layered limestone. Samples for grain size analyses were collected at two locations, AOI01-04 and SJAASF-06, via ASTM International (ASTM) Method D-422. The results indicate that the soil samples are comprised of 16.0 to 21.5 percent [%] gravel, 39.8 to 50.9% sand, 17.6 to 24.3% silt, and 10.0 to 18.7% clay. 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**.

2.2.2 Hydrogeology

San Juan is located within the north coast limestone aquifer system of Puerto Rico, which comprises three regional hydrogeologic units: an upper aquifer, a middle confining unit, and a lower aquifer. The upper aquifer mainly consists of the Aymamon and underlying Aguada limestones and is confined in coastal areas, such as San Juan, by fine-grained surficial deposits. The limestones have been extensively eroded in the San Juan area, and the freshwater zone of the upper aquifer is underlain by a basal zone of saltwater. The upper aquifer is thin, and well yields are small in San Juan. The lower aquifer in the area is composed mostly of Mucarabones Sand, which consists of sandstone and gravel of terrestrial origin. Groundwater in the lower aquifer is brackish in some areas near San Juan. The Cibao Formation is the principal rock-stratigraphic unit of the middle confining unit and is an interbedded sequence of marl, chalk, limestone, sand, and clay as much as 230 meters thick. The Cibao Formation acts either as a confining bed or as an aquifer, depending upon the lithology. In the San Juan area, an artesian aquifer capped by clays that are in turn overlain by water-bearing limestones are all part of the Cibao Formation (AECOM 2020).

There are no drinking water wells at the AASF or known to be in its vicinity; the Facility is provided municipal water by the Puerto Rico Aqueducts and Sewers Authority. The Río Grande de Loíza and the Río de la Plata watersheds are the principal sources of public water supply for the San Juan metropolitan area. Two U.S. Geological Survey (USGS) wells are located on the San Juan peninsula north of the Facility and are shown on the Environmental Data Resources, Inc.™ (EDR ™) Report. Groundwater depth at the facility is unknown but a shallow water table is assumed. Groundwater flow at the AASF is expected to be radial towards the San Juan Bay and Caño San Antonio (**Figure 2-3**).

Depths to water measured in October 2022 during the SI ranged from 2.69 to 6.16 ft bgs. Groundwater elevation contours from the SI are presented on **Figure 2-5** and indicate the groundwater flow direction at the Facility is slightly north to northwest towards the San Juan Bay.

2.2.3 Hydrology

San Juan is located in the San Juan Bay Estuary Watershed. Rainfall on inland mountain slopes drains into the Rio Piedras, which empties into the San Juan Bay. The Rio Piedras basin lies predominantly on relatively impervious volcanic rock; runoff is rapid, commonly resulting in flash flooding in the lower urbanized reaches of the streams in the area. San Juan annually receives approximately 56.35 inches of rain on the north coast. Water infiltrating the volcanic rock flows largely through the weathered zone and then into stream valleys (AECOM 2020).

The AASF is surrounded by commercial and industrial developments, primarily associated with the adjoining airport. There are no surface water bodies located within the facility boundary. Because the AASF is located on the center of the Isla Grande peninsula, it is surrounded by water on three sides (**Figure 2-4**). Surface water runoff is expected to generally flow south, away from the SIG runway, and empty into the San Juan Bay (AECOM 2020).

Surface water runoff at the AASF drains to catch basins that channel water towards an oil-water separator (OWS) located in the southeastern corner of the AASF property, adjacent to the southern corner of the Hangar. According to AASF personnel, transport of runoff beyond the OWS is unknown (AECOM 2020), however surface water must eventually discharge to the Atlantic Ocean. Surface water flow directions and features are presented on **Figure 2-4**.

2.2.4 Climate

Puerto Rico is located in the tropics, and its maritime climate experiences warm sea breezes throughout the year, preventing major fluctuations in temperature. The average temperature in San Juan in the summer is 83.5 degrees Fahrenheit (°F), while the average temperature in the winter is 78.1°F. The coastal plains endure the smallest temperature fluctuations. Seasonal variation in the temperate zone is very low; however, there is considerable variation in temperature and precipitation resulting from variable topography and prevailing winds. The east-west mountain chain intercepts the easterly trade winds and provides the north side of the island with an abundance of rain. Rainfall is distributed throughout the year, with May through November considered the raining period. January to March is drier but may have cold fronts coming in from the temperate zone to the north that can produce rain. Annual precipitation in San Juan is approximately 56.35 inches (AECOM 2020).

Puerto Rico is in the hurricane belt of the western Atlantic and Caribbean. Hurricanes are Puerto Rico's predominant weather problem because of the catastrophic high winds and waves, large volumes of rain, and the enormous structural change they can produce on natural ecosystems and on human populations and their infrastructure. Typically, 6 to 10 hurricanes develop yearly in the western North Atlantic region. Hurricanes have impacted Puerto Rico recently, most notably with Hurricane Maria in 2017 (AECOM 2020).

2.2.5 Current and Future Land Use

According to PRARNG personnel, the Facility is expected to be relocated within the next 5 years. It is unknown what the land may be used for following the relocation of the Facility; however, the land is expected to remain designated for commercial/industrial use (AECOM 2020).

2.2.6 Sensitive Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility, but 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 San Juan Municipality, Puerto Rico (U.S. Fish and Wildlife Services 2022):

- Reptiles: Puerto Rican Boa (*Epicrates inornatus)* - Federally Endangered

- Flowering Plants: Palo De Ramon (*Banara vanderbiltii*) – Federally Endangered; and Palo De Rosa (*Ottoschulzia rhodoxylon)* - Federally Endangered.

2.3 HISTORY OF PFAS USE

Four potential PFAS release areas were identified at the Facility during the PA. Interviews and records obtained during the PA indicate that annual fire training was conducted at the Wash Rack, which included the full discharge of one Tri-Max™ 30 wheeled fire extinguisher. Additionally, aqueous film forming foam (AFFF) was also released from the AASF Hangar deluge system twice, once during testing and once as an accidental release, which would have migrated through drainage features to the oil and water separator onsite. A firetruck was known to be stored within the Fire Station; however, it is unknown if the truck was capable of holding AFFF. These potential release areas comprise AOI 1. A description of the AOI is presented in **Section 3**.

Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

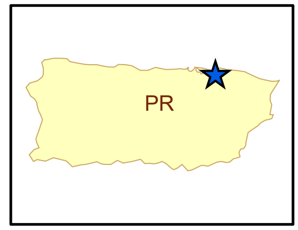

Figure 2-1
Facility Location

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Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

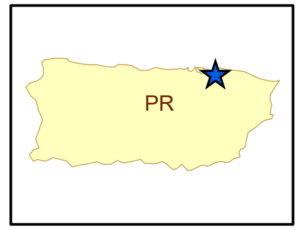

Figure 2-2
Topography

Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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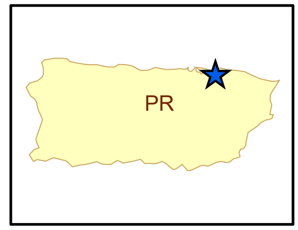
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 2-3
Groundwater Features



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Facility Data
Facility Boundary

Well Type
Unknown/Other Well

Hydrogeology
Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:..............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 2-4
Surface Water Features

Facility Data

Facility Boundary

Hydrology

Surface Water Flow Direction

Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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Army National Guard Site Inspections
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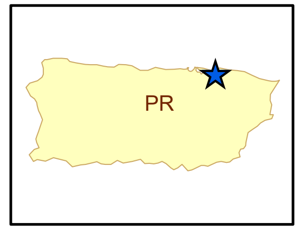
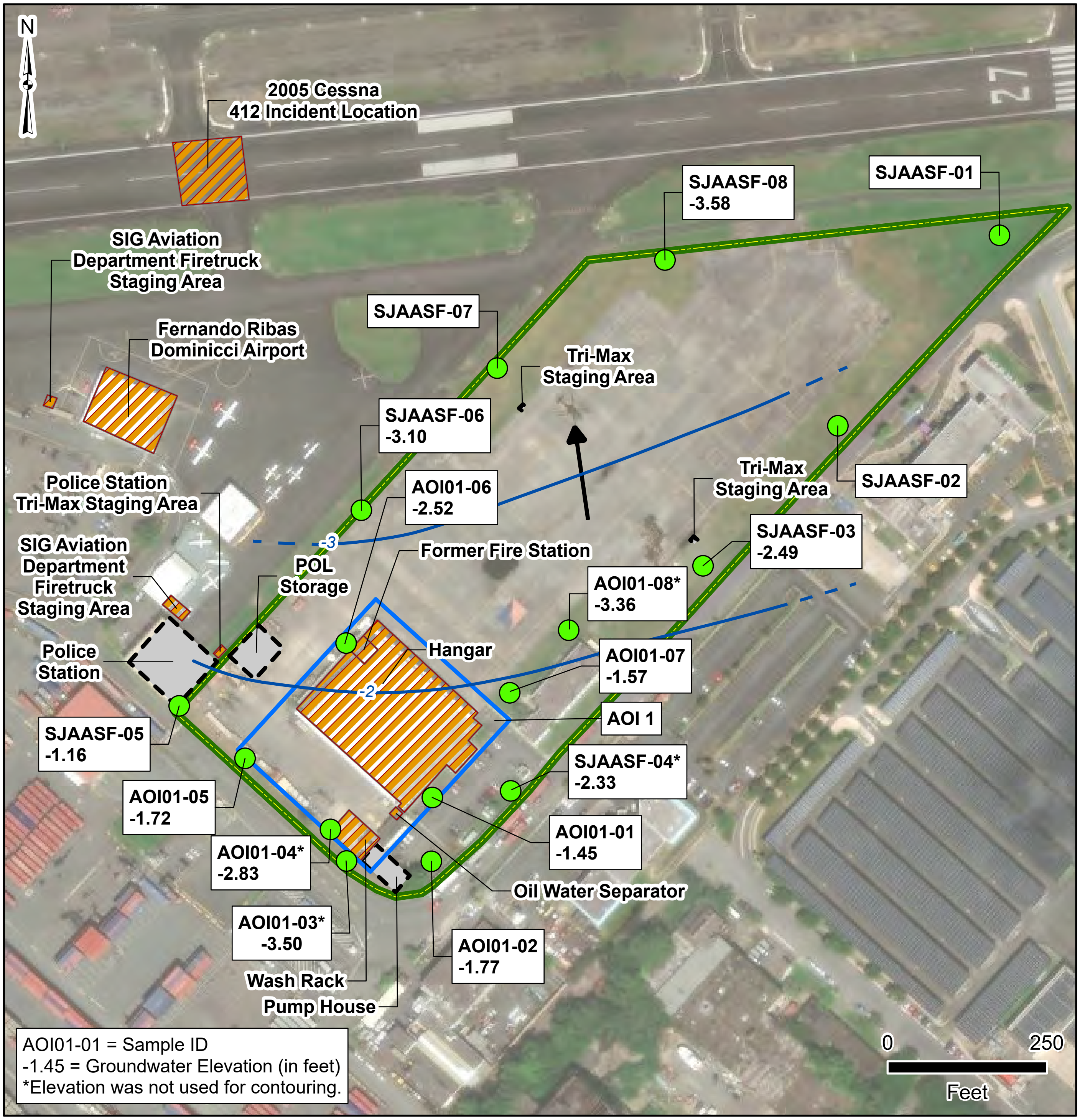


Figure 2-5
Groundwater Elevations



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Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Sample Locations
- DPT

Hydrogeology
- Groundwater Flow Direction
- Groundwater Elevation Contour (1 foot interval)
- Inferred Groundwater Elevation Contour (1 foot interval)

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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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, four potential release areas were identified and grouped into one AOI. The potential release areas are shown on **Figure 3-1**. Additionally, three adjacent potential sources have been identified (shown on **Figure 3-1**). A summary of the AOIs and the adjacent potential sources is presented below.

3.1 AOI 1 – WASH RACK, AASF HANGAR, FLIGHTLINE, FORMER FIRE STATION, AND OIL AND WATER SEPARATOR

AOI 1 consists of several potential release areas that were identified at the San Juan AASF based on preliminary data from the PA. The footprint of AOI 1 includes the Wash Rack, the AASF Hangar, the Former Fire Station, and OWS. PFAS were potentially released to soil, groundwater, surface water, and sediment within the boundary of the San Juan AASF at the Hangar and Wash Rack areas (EA Engineering, Science, and Technology, Inc., PBC [EA] 2021a).

3.1.1 Wash Rack

The AASF Wash Rack is located in the southeastern corner of the PRARNG property, south of the Hangar and adjacent to the Pump House. The Wash Rack is typically used for the controlled cleaning of heavy equipment; however, it has also been used regularly as a Fire Training Area by PRARNG personnel. According to an interviewee whose tenure at the AASF spans from 1999 to present, fire training occurred annually at the Wash Rack from 1999 to approximately 2016. It is possible that fire training occurred prior to 1999 (AECOM 2020).

During the annual fire training, one Tri-Max™ 30 Wheeled Compressed Air Foam (CAF) was typically discharged fully to the Wash Rack. Occasionally, the local fire academy assisted in training by igniting a fire in the Wash Rack for PRARNG staff to extinguish, but the fire academy never used their own materials to extinguish the flames. The Tri-Max™ 30 CAF contains 30 gallons (gal) of AFFF foam solution that produce approximately 600 gal of expanded foam. The type and concentration of AFFF discharged during training events are unknown, but safety data sheets for AFFF stored at the AASF provided by the PRARNG indicate that Chemguard 3% AFFF C-303 and Chemguard 3% AR-AFFF C-333 may have been used (AECOM 2020).

As-built drawings for the Wash Rack were not provided during the PA. PRARNG staff stated that the AASF floor drains, including the Wash Rack drain, flow in unknown directions. The fate of AFFF released during the fire training events is unknown (AECOM 2020).

3.1.2 AASF Hangar

The AASF Hangar is located in the southwest portion of the PRARNG property. The Hangar is used to provide aviation maintenance support and repair for aviation components. The fire suppression system at the Hangar includes a deluge system that is served by a 900-gal AFFF tank charged with Ansul 3% AFFF and four fixed deluge guns located in the four corners of the Hangar; however, the deluge system is not currently operational. Two Tri-Max™ 30 Wheeled

CAF extinguishers are also staged within the Hangar, as observed during the PA (AECOM 2020).

According to PRARNG AASF personnel, two AFFF releases have occurred at the Hangar. An AFFF release occurred between 2006 and 2008, when a fire marshal inspector accidentally triggered the deluge system in the AASF Hangar. During the release, the Hangar doors were open, and AFFF escaped the Hangar via the northeast and southwest doors. The majority of the escaping AFFF traveled southwest from the AASF Hangar towards the Wash Rack. AFFF may have also entered storm drains and the OWS, which is located between the Hangar and the Wash Rack. Approximately 900 gal of AFFF was released during the event. The type and concentration of AFFF released during the incident are unknown, but the deluge system tank is currently charged with Ansul 3% AFFF (AECOM 2020).

AASF staff also stated during interviews that a test of the Hangar deluge system was performed in 2009. The 2009 test also resulted in a full release of the deluge system tank (900 gal of AFFF), and the AFFF released traveled towards the Wash Rack, similarly to the accidental release between 2006 and 2008 (AECOM 2020).

AASF personnel stated that during the releases, the Hangar filled with approximately 6 ft of standing AFFF, and that the majority of AFFF flowed southwest towards the OWS, the Wash Rack, and stormwater drains (AECOM 2020).

The fate of AFFF entering drains within the Hangar as well as storm drains, the OWS, and the Wash Rack outside the Hangar is unknown (AECOM 2020).

3.1.3 Former Fire Station

The Former Fire Station at the AASF operated between 1992 and 1997. The Former Fire Station bay, where the fire station stored its firetruck, was located on the northern corner of the AASF Hangar. The firetruck remained in the fire station bay until 2004, despite the fire station’s closure in 1997. According to an interviewee whose tenure at the AASF spans from 1999 to present, the firetruck was never used between 1999 and 2004. It is unknown whether the firetruck was capable of using AFFF, and it is also unknown whether the fire department stored or trained with AFFF. Because AFFF was stored and used elsewhere at the AASF, it is possible that AFFF was stored and/or used at the Former Fire Station. The Former Fire Station is considered a potential PFAS release area (AECOM 2020).

3.1.4 Flightline

The flightline covers the majority of the AASF property. According to AASF personnel with histories that spanned from 1999 through 2020, no crashes or accidents that would have required AFFF have ever occurred on the flightline. Two mobile TRI-MAX™ units are stored on the flightline. The PA states that these units have never been discharged or maintained and that no known releases have occurred on the AASF flightline (AECOM 2020).

3.1.5 Oil-Water Separator

The OWS is located in the southeastern corner of the AASF property, adjacent to the southern corner of the Hangar. Two full deluge system tank releases in 2006–2008 and 2009, have resulted in an unknown type, volume, and concentration of AFFF entering the OWS. Due to the proximity of the OWS to the Wash Rack, it is also possible that AFFF discharged during training events could have flowed out of the Wash Rack perimeter and into the OWS (AECOM 2020).

3.2 ADJACENT SOURCES

Three potential off-facility sources of PFAS are adjacent to the Facility and are not under the control of the PRARNG. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and were not investigated as part of this SI.

3.2.1 Fernando Ribas Dominicci Airport (SIG)

SIG is located adjacent to the AASF to the north. The SIG airport runway runs from the western tip of the Isla Grande peninsula northwest towards a marina located in the Caño San Antonio. The main terminal at SIG is located approximately 0.1 mile northwest of the AASF Hangar. The airport supports general aviation as well as international and domestic commercial flights. SIG functioned as Puerto Rico's main international airport until the opening of Luis Muñoz Marín International Airport in 1954 (AECOM 2020).

Airports can represent potential adjacent sources of PFAS because airport emergency response and rescue operations often use AFFF to suppress crash flames. The SIG Aviation Department Rescue and Firefighter Section stores 6% AFFF solution in one firetruck staged approximately 100 ft northwest of the AASF Petroleum, Oils, and Lubricants Storage Area, and in one firetruck staged adjacent to the main SIG terminal building, on its northwest side. The SIG Aviation Department Rescue and Firefighter Section also stores AFFF in 5-gal buckets within its office space in the main SIG terminal (AECOM 2020). Based on the radial inferred groundwater flow direction presented in the PA, these areas are all located hydraulically downgradient of the AOI and potential PFAS contamination from these downgradient adjacent sources are not anticipated to migrate towards the facility (EA 2021a).

According to the SIG Aviation Department Rescue and Firefighter Section (Section) Supervisor, the Section performs nozzle testing on their equipment in the center of the SIG runway area using only water. The exact location of the nozzle testing is unclear. The Section also formerly performed equipment testing with water and expiring AFFF on the east and west ends of the SIG runway approximately once per month. Because there was not always expiring AFFF available to the Section, the training did not always involve AFFF. The tenure of the Section Supervisor interviewed began in 2017. Previous AFFF use and storage practices by the Section are unknown (AECOM 2020). These areas are located hydraulically downgradient of the AOI and potential PFAS contamination from these downgradient adjacent sources are not anticipated to migrate towards the facility (EA 2021).

PRARNG AASF personnel also stated that AFFF was sprayed by the Section on the SIG airport runway circa 2005 to prevent a fire during the attempted landing of a malfunctioning Cessna 421 Golden Eagle. The Cessna eventually landed without fire after several touchdowns. The exact location of AFFF that was sprayed during this event is unknown (AECOM 2020). This area is located hydraulically downgradient of the AOI. However, the event may have contributed to PFAS contamination on-site if foam was released within close proximity to the Facility and it is possible the that potential PFAS contamination from this event is migrating towards the facility. (EA 2021a).

3.2.2 Police Station

A police station is located immediately adjacent to the AASF to the west. The police station operates out of a building formerly used by the Department of Natural Resources. During the PA visual SI, four wheeled fire extinguishers, similar to the Buckeye A-150-SP ABC Dry Chemical Wheeled Stored Pressure Fire Extinguishers observed at Camp Santiago, were observed outside the police station. The type of fire extinguisher at the police station is unclear, and it is unknown whether the extinguishers contain AFFF. The police station practices regarding fire suppression are unknown (AECOM 2020). While the police station is hydraulically downgradient of the AOI, it is located directly adjacent to the western corner of the AASF facility boundary. If a AFFF release occurred, the foam may have migrated on-site via surface flow (EA 2021a).

3.2.3 2009 Caribbean Petroleum Fire

In 2009, a massive fire and explosion occurred at the Caribbean Petroleum Corporation (CAPECO) facility located in Bayamon, Puerto Rico, approximately 3.4 miles southwest of the AASF. A fuel vapor cloud, created when a 5-million-gallon aboveground storage tank overflowed, reached an ignition source elsewhere in the CAPECO facility and erupted, causing multiple fires and secondary explosions. The fires burned for approximately 60 hours, and petroleum products leaked into the soil, nearby wetlands, and navigable waterways in the surrounding area (AECOM 2020).

The emergency response by the local fire departments and CAPECO was not sufficient to control the fire. According to PRARNG firefighters at Camp Santiago and Fort Allen, PRARNG aided in fire suppression efforts using AFFF (AECOM 2020).

The incident resulted in the release of thousands of gallons of oil, fire suppression foam of unknown types and concentrations, and contaminated runoff to the wetlands surrounding the CAPECO facility. These wetlands include Las Lajas Creek, Lago del Caño de San Fernando, and Malaria Creek, which empties into the San Juan Bay. The volume of AFFF that reached the San Juan Bay is unclear (AECOM 2020). This area is located across the San Juan Bay from the facility and is not expected to impact groundwater underlying the AOI (EA 2021a).

Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

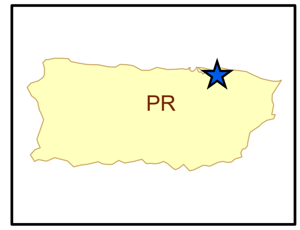

Figure 3-1
Areas of Interest

Facility Data

- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

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4. PROJECT DATA QUALITY OBJECTIVES

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

4.1 PROBLEM STATEMENT

ARNG may recommend an AOI for remedial investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above 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 San Juan AASF (AECOM 2020)
- Groundwater and soil sample data collected as part of this SI in accordance with the site-specific UFP-QAPP Addendum (EA 2021a)
- Field data collected 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 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights-of-entry will be obtained by ARNG with property owner(s). The vertical boundaries of the subsurface investigation were based on the depth of target samples and advancement to achieve temporary well construction. 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 Lancaster Laboratories Environmental LLC, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP); Accreditation No. 101 and the National Environmental Laboratory Accreditation Program (NELAP); Certificate No. 6408. Data were compared to applicable SLs and decision rules as defined in the UFP-QAPP Addendum (EA 2021a).

4.5 DATA USABILITY ASSESSMENT

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

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

5. SITE INSPECTION ACTIVITIES

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

- *Final Preliminary Assessment Report, San Juan Army Aviation Support Facility, San Juan, Puerto Rico,* dated March 2020 (AECOM 2020)

- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA 2020a)

- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, San Juan Army Aviation Support Facility, San Juan, Puerto Rico,* dated August 2021 (EA 2021a)

- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA 2020b)

- *Final Site Safety and Health Plan, San Juan Army Aviation, San Juan, Puerto Rico,* dated August 2021 (EA 2021b).

The SI field activities were conducted from 11 to 14 October 2022 and consisted of direct-push technology (DPT) borings and soil sample collection, temporary monitoring well installation, and grab groundwater sample collection. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 24 PFAS via liquid chromatography/tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) Version 5.3 Table B-15, as well as three samples for total organic compound (TOC), pH, and grain size to fulfill the project DQOs:

- Thirty-two (32) soil samples from 16 soil boring locations
- Sixteen (16) grab groundwater samples from 16 temporary well locations
- Nineteen (19) quality assurance/quality control samples.

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

5.1 PRE-INVESTIGATION ACTIVITIES

In preparation for the SI field activities, project team members performed utility clearance and sampled decontamination source water. The project team also attempted to identify regulatory personnel to participate in technical project planning meetings (TPP) during the scoping of the SI; however, ARNG personnel could not identify regulatory personnel to participate in the process. 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 2016) defines four phases to project planning: (1) defining the project phase; (2) determining data needs; (3) developing data collection strategies; and (4) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

The stakeholders for this SI include ARNG, USACE, Puerto Rico Department of Natural and Environmental Resources (PRDNER), and PRARNG representatives familiar with the Facility, the regulations, and the community. There was no PRDNER regulatory involvement in the planning process; therefore, the initial meetings included ARNG, PRARNG, USACE, and representatives familiar with the Facility. ARNG attempted to engage PRDNER, however, PRDNER did not provide a response. A future TPP meeting, if needed, will provide an opportunity to discuss results, findings, and future actions where warranted.

5.1.2 Utility Clearance

EA contacted the Puerto Rico 811 Miss Utility to notify them of intrusive work at the Facility, as well as Jaca and Sierra Engineering to perform a utility clearance at each of the proposed boring locations on 11 October 2022 with input from PRARNG and the EA field team. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by EA's drilling subcontractor, Jaca and Sierra Engineering, using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

Prior to mobilization for drilling, water samples were collected from on-site potable water sources to determine if source water could be used for drilling equipment decontamination. On 18 January 2022, samples were collected from a spigot located on the outside of the operation building near the entrance to the site. The City of San Juan provides potable water service. Each sample was collected in laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard CoC procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (EA 2021a). PFAS concentrations were reported to be below the limit of quantitation (LOQ), which met acceptance criteria presented in the UFP-QAPP Addendum for the source water to be used for decontamination of drilling equipment (EA 2021a). Further, decontamination water was pumped through a 5-gal granular activated carbon pail prior to use with equipment decontamination. These results can be found in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used for the sampling 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 (SOPs) as an appendix to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

The first 2 ft of each boring were pre-cleared by EA's drilling subcontractor, Jaca and Sierra Engineering, using a hand auger to verify utility clearance in the shallow subsurface where utilities would typically be encountered.[3] No borings were advanced exclusively by hand auger based on terminal depth. Soil samples collected from depths shallower than 2 ft bgs were collected using the hand auger. All soil sample locations are shown on **Figure 5-1** and described in the subsequent section. Non-dedicated sampling equipment (e.g., hand auger) was decontaminated between sampling locations.

Subsurface soil samples were collected via DPT drilling methods in accordance with SOP 047 Direct-Push Technology Sampling (EA 2021a). A Geoprobe® 7822DT dual-tube sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from only the top 2 ft

Two discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and one subsurface soil sample. One subsurface soil sample was collected approximately 1 ft above the groundwater table. Groundwater was encountered at depths ranging from 4 to 8 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 8 to 15 ft bgs.

All soil sample locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-1**. The soil boring locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2021a).

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

[3] The UFP QAPP indicated the first 5 ft would be advanced using a hand auger in addition to conducting a utility clearance; however, EA encountered refusal around 2 ft bgs due to large cobles and contacted USACE to advise on the situation. USACE confirmed hand augering could be stopped less than 5 ft if refusal was encountered. An explanation of this SI UFP-QAPP deviation is provided in **Section 5.8**.

moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

The hand auger, post-hole digger, throw bar (where applicable), and a cutting shoe were decontaminated between locations use using a six-step, PFAS-free decontamination procedure with Liquinox, PFAS-free deionization water, and methyl alcohol (methanol). The drill casing was also rinsed with PFAS-free deionization water between locations, though the casing did not come in contact with soil samples due to the use of the acetate core liner.

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 chain-of-custody (CoC) procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), TOC (USEPA Method 9060A), and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2021a).

Field duplicate samples 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. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

DPT borings were converted to temporary wells, which were subsequently abandoned after sampling and surveying in accordance with the UFP-QAPP Addendum (EA 2021a). After removal of the casings, boreholes were abandoned using bentonite chips. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

5.3 TEMPORARY WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Temporary wells were installed using a Geoprobe® 7822DT dual-tube DPT system as described in Section 5.3. Once the borehole was advanced to the desired depth, a temporary well was constructed of a 5-ft section of 1-inch Schedule 40 polyvinyl 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 screen intervals. After the recharge period, groundwater samples were collected using PFAS-free HDPE tubing and a peristaltic pump. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. However, due to the tightness of the formation, some wells experienced poor groundwater recharge. In these cases, temporary wells were purged until dry and then sampled immediately upon recharge. 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**) during purging at 5-minute intervals. After parameters adequately stabilized as listed in the UFP-QAPP Addendum (EA 2021a) or 1 hour of purging, each groundwater grab sample was collected in a separate container. No foaming was observed in any of the groundwater samples. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. Foaming was observed in the samples for AOI01-04 as well as SJAASF-07.

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

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as their accompanying parent samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters. One field reagent blank was collected per day in accordance with the UFP-QAPP Addendum (EA 2021a).

A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment. Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA 2021a).

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were measured across the AOI in order to the determine groundwater flow direction and develop a potentiometric surface. Synoptic water level elevation measurements were collected from the newly installed temporary monitoring wells; the northern side of the well casing was used as the measurement reference elevation point. Due to the on-site water level probe not being PFAS-free, water level measurements were taken after all wells had been sampled and prior to the wells being pulled and abandoned. Groundwater elevation data is provided in **Table 5-3**.

5.5 SURVEYING

A well survey was performed by EA's subcontractor MForce, a Puerto Rico licensed surveyor, on 14 October 2022 prior to well abandonment. When surveying the newly installed temporary wells, the SOP is to survey the northern side of each new temporary well casing. Due to the temporary nature of the wells (lack of supporting material in the annular space) and the flexibility of the casing materials the temporary wells were not stable and were determined to be unsuitable for direct measurement. Instead, the ground elevation at each well location was surveyed and the length of the casing sticking out of the ground was measured (top of casing). Positions were collected in Universal Transverse Mercator Zone 19Q projection with World Geodetic System 1984 datum (horizontal) and Puerto Rico Vertical Datum 2002 (vertical). Surveying data were collected on 14 October 2022 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA 2021a).

Solid IDW (i.e., soil cuttings) generated during SI activities were left in place at the point of the source. The soil cuttings were replaced in the borehole and distributed on the downgradient side of the borehole in accordance with the UFP QAPP. Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were discharged directly to the ground surface slightly downgradient of the source of generation (downgradient of each well location).

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other consumables generated during the field activities were properly disposed of as municipal solid waste.

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Environmental, LLC, in Lancaster, Pennsylvania, a DoD ELAP- and NELAP-certified laboratory. Due to the turbidity, many of the water samples were centrifuged and decanted prior to analysis.

One soil sample from AOI 1 in a location close to the source area (AOI01-01-SB-2-3) was analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D. Additionally, this sample was submitted for grain size analysis (ASTM D-422) (i.e., clay content). The grain size analysis was collected from one location where clays were identified by the field geologist.

Due to the turbidity groundwater samples AOI01-05-GW, AOI01-05-GW-DUP, AOI01-08-GW, SJAASF-01-GW, SJAASF-02-GW, SJAASF-05-GW, SJAASF-06-GW, and SJAASF-07-GW were centrifuged and decanted in the laboratory prior to analysis. The leftover solid residues were not analyzed.

5.8 DEVIATIONS FROM SITE INVESTIGATION UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on conditions encountered during the field investigation activities. These deviations were discussed between EA and USACE. Deviations from the UFP-QAPP Addendum are noted below:

- The approved SI UFP-QAPP Addendum (EA 2021a) states that each borehole will be cleared to 5 ft bgs using a hand auger prior to the advancement of the DPT. Due to the nature of the shallow subsurface consisting of large gravel and small boulders, hand clearing to 5 ft bgs was unachievable. Upon verbal approval from USACE, the field crew hand cleared until refusal with the hand auger and then began with DPT.

Table 5-1. Samples by Medium
San Juan Army Aviation Support Facility, San Juan, Puerto Rico
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	10/12/2022	0-2	X				MS/MSD
AOI01-01-SB-3-4	10/13/2022	3-4	X				
AOI01-02-SB-0-2	10/12/2022	0-2	X				
AOI01-02-SB-3-4	10/13/2022	3-4	X				
AOI01-03-SB-0-2	10/12/2022	0-2	X				
AOI01-03-SB-3-4	10/13/2022	3-4	X				
AOI01-04-SB-0-2	10/12/2022	0-2	X				
AOI01-04-SB-4-5	10/13/2022	4-5	X	X	X	X	
AOI01-05-SB-0-2	10/12/2022	0-2	X				
AOI01-05-SB-4-5	10/12/2022	4-5	X				
AOI01-06-SB-0-2	10/13/2022	0-2	X				MS/MSD
AOI01-06-SB-3-4	10/13/2022	3-4	X				
AOI01-07-SB-0-2	10/12/2022	0-2	X				
AOI01-07-SB-4-5	10/12/2022	4-5	X				
AOI01-08-SB-0-2	10/13/2022	0-2	X				
AOI01-08-SB-3-4	10/13/2022	3-4	X				
SJAASF-01-SB-0-2	10/11/2022	0-2	X				
SJAASF-01-SB-4-5	10/12/2022	4-5	X				
SJAASF-02-SB-0-2	10/12/2022	0-2	X				
SJAASF-02-SB-8-9	10/12/2022	8-9	X				
SJAASF-03-SB-0-2	10/13/2022	0-2	X				
SJAASF-03-SB-4-5	10/13/2022	4-5	X				
SJAASF-04-SB-0-2	10/12/2022	0-2	X				
SJAASF-04-SB-4-5	10/13/2022	4-5	X				
SJAASF-05-SB-0-2	10/12/2022	0-2	X				
SJAASF-05-SB-3-4	10/12/2022	3-4	X				
SJAASF-06-SB-0-2	10/11/2022	0-2	X				
SJAASF-06-SB-2-3	10/11/2022	2-3	X	X	X	X	
SJAASF-07-SB-0-2	10/11/2022	0-2	X				
SJAASF-07-SB-13-14	10/12/2022	13-14	X				
SJAASF-08-SB-0-2	10/11/2022	0-2	X				
SJAASF-08-SB-6-7	10/12/2022	6-7	X				
SJAASF-01-SB-0-2-DUP	10/11/2022	0-2	X				Field Duplicate for SJAASF-01-SB-0-2
SJAASF-04-SB-0-2-DUP	10/12/2022	0-2	X				Field Duplicate for SJAASF-04-SB-0-2
AOI01-05-SB-4-5-DUP	10/12/2022	0-2	X				Field Duplicate for AOI01-05-SB-4-5
AOI01-04-SB-4-5-DUP	10/13/2022	4-5				X	Field Duplicate for AOI01-04-SB-4-5
Groundwater Samples							
AOI01-01-GW	10/14/2022	—	X				
AOI01-02-GW	10/13/2022	—	X				
AOI01-03-GW	10/13/2022	—	X				
AOI01-04-GW	10/14/2022	—	X				
AOI01-05-GW	10/13/2022	—	X				
AOI01-06-GW	10/13/2022	—	X				
AOI01-07-GW	10/13/2022	—	X				MS/MSD
AOI01-08-GW	10/14/2022	—	X				

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
SJAASF-01-GW	10/13/2022	—	X				
SJAASF-02-GW	10/14/2022	—	X				
SJAASF-03-GW	10/13/2022	—	X				
SJAASF-04-GW	10/14/2022	—	X				
SJAASF-05-GW	10/14/2022	—	X				
SJAASF-06-GW	10/12/2022	—	X				
SJAASF-07-GW	10/13/2022	—	X				
SJAASF-08-GW	10/12/2022	—	X				
AOI01-05-GW-DUP	10/13/2022	—	X				Field Duplicate for AOI01-05-GW
AOI01-07-GW-DUP	10/13/2022	—	X				Field Duplicate for AOI01-07-GW
Blank Samples							
SJAASF-FB-01	10/12/2022	—	X				Field Blank
SJAASF-FB-02	10/13/2022	—	X				Field Blank
SJAASF-FB-03	10/14/2022	—	X				Field Blank
SJAASF-EB-01-SB	10/11/2022	—	X				Rinse Blank
SJAASF-EB-01-GW	10/12/2022	—	X				Rinse Blank
SJAASF-EB-02-SB	10/12/2022	—	X				Rinse Blank
SJAASF-EB-02-GW	10/13/2022	—	X				Rinse Blank
SJAASF-EB-03-SB	10/13/2022	—	X				Rinse Blank
SJAASF-EB-03-GW	10/14/2022	—	X				Rinse Blank
SJAASF-EB-04-SB	10/14/2022	—	X				Rinse Blank

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
San Juan Army Aviation Support Facility, San Juan, Puerto Rico
Site Inspection Report

AOI	Temporary Monitoring Well / Soil Boring Identification	Soil Boring Depth (ft bgs)	Temporary Monitoring Well Screen Interval (ft bgs)
1	AOI01-01	10	5-10
	AOI01-02	10	5-10
	AOI01-03	10	5-10
	AOI01-04	10	5-10
	AOI01-05	11.5	6.5-11.5
	AOI01-06	10	5-10
	AOI01-07	14	9-14
	AOI01-08	15	10-15
	SJAASF-01	15	10-15
	SJAASF-02	12	7-12
	SJAASF-03	10	5-10
	SJAASF-04	10	5-10
	SJAASF-05	10	5-10
	SJAASF-06	8	3-8
	SJAASF-07	14	9-14
	SJAASF-08	11	6-11

**Table 5-3. Groundwater Elevations
San Juan Army Aviation Support Facility, San Juan, Puerto Rico
Site Inspection Report**

Temporary Monitoring Well Identification	Top of Casing Elevation (ft NAVD 88)	Ground Surface Elevation (ft NAVD 88)	Depth to Water (ft btoc)	Depth to Water (ft bgs)	Groundwater Elevation (ft NAVD 88)[1]
AOI01-01	4.11	2.09	5.56	3.54	-1.45
AOI01-02	6.82	2.45	8.59	4.21	-1.77
AOI01-03	2.53	2.47	6.03	5.97	-3.50
AOI01-04	2.29	2.14	5.12	5.67	-2.83
AOI01-05	2.15	1.76	3.87	3.48	-1.72
AOI01-06	2.17	2.09	4.69	4.61	-2.52
AOI01-07	3.57	2.01	5.14	3.58	-1.57
AOI01-08	2.80	2.80	6.16	6.16	-3.36
SJAASF-01	-	1.90	8.82[2]	-	-
SJAASF-02	-	2.43	-	--	-
SJAASF-03	2.17	2.02	4.65	4.5	-2.49
SJAASF-04	2.75	2.67	5.08	5	-2.33
SJAASF-05	2.93	1.53	4.09	2.69	-1.16
SJAASF-06	1.47	1.31	4.56	4.4	-3.10
SJAASF-07	-	1.62	-	-	-
SJAASF-08	2.14	2.08	5.72	5.66	-3.58

Notes:
1. Elevation measurements were collected relative to the Puerto Rico Vertical Datum of 2002.
2. Depth to water measurement pulled from sampling purge log and not synoptic gauging event

btoc = below top of casing
bgs = below ground surface
ft = feet
NAVD 88 = North American Vertical Datum 1988
ID = Identification

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Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

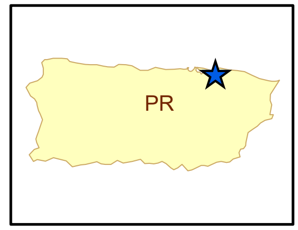

Figure 5-1
Site Inspection Sample Locations

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Sample Locations
- DPT

Hydrogeology
- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:..............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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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** in **Table 6-1**. A discussion of the results for the AOI is provided in **Section 6.3** and a discussion of the results for the boundary samples is provided in **Section 6.4**. **Tables 6-2 through 6-4** present results for the relevant compounds in soil and groundwater. Tables containing all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

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

Notes:
1. Assistant Secretary of Defense. July 2022. Risk Based SLs Calculated for Groundwater and Soil using USEPA's Regional Screening Level Calculator. Hazard Quotient=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.

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 all 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). Soil sampling results indicate that the soil samples are comprised of roughly 16.0 to 21.5% gravel, 39.8 to 50.9% sand, 17.6 to 24.3% silt, and 10.0 to 18.7% clay. These results and facility observations are consistent with the reported depositional environment of the region and are indicative of a sandy clay loam.

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Wash Rack, AASF Hangar, Flightline, Former Fire Station, and OWS. The soil and groundwater results are summarized in **Tables 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

Figures 6-1 through 6-5 present the ranges of detections in soil. **Tables 6-2 and 6-3** summarize the soil results.

Soil was sampled at eight boring locations associated with the potential release area at AOI01. Soil was sampled from two intervals at each of the boring locations, surface (0–2 ft bgs) and subsurface soil (3–5 ft bgs).

Soil was sampled from surface soil (0–2 ft bgs) from boring locations AOI01-01 through AOI01-08. PFBS and PFHxS were not detected in any of the surface soil samples. PFOA, PFOS, and PFNA were detected below SLs in one or more of the surface soil samples. PFNA was detected below the SL at five of the eight locations (AOI01-02, AOI01-03, AOI01-04, AOI01-06 and AOI01-06) and ranged from 0.21 J to 7.4 µg/kg in AOI01-02 and AOI01-03, respectively. PFOS was detected below the SL at seven of the eight locations (AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, AOI01-07 and AOI01-08) and ranged from 0.51 J to 3.1 µg/kg in samples collected from AOI01-08 and AOI01-04, respectively. PFOA was detected below the SL in seven of the eight locations (AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06, and AOI01-07) and ranged from 0.34 to 2.7 µg/kg in samples collected from AOI01-01 and AOI01-03, respectively.

Subsurface soil samples were collected from soil boring locations AOI01-01 through AOI01-08 at depths ranging from 3 to 5 ft bgs. PFBS and PFHxS were not detected in any of the eight subsurface soil samples. PFOA, PFOS, and PFNA were detected below SLs in one or more of the surface soil samples. PFNA was detected below the SL in one of the eight locations, boring

AOI01-03 at a concentration of 4.7 J µg/kg. PFOS was detected below the SL in four of the eight locations (AOI01-02, AOI01-03, AOI01-07, and AOI01-08) and ranged from 0.30 J to 0.60 J µg/kg in samples collected from AOI01-07 and AOI01-03, respectively. PFOA was detected below the SL in two of the eight locations, borings AOI01-05 and AOI01-03, and ranged from 0.24 J and 2.3 µg/kg, respectively.

6.3.2 AOI 1 – Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater samples were collected from eight temporary wells associated within the potential release area of AOI01. All five relevant compounds, PFOA, PFOS, PFBS, PFHxS, and PFNA, were detected in groundwater at AOI01. Each temporary well had at least four compounds detected, with seven of the eight wells (AOI1-01, AOI1-02, AOI01-03, AOI01-05, AOI01-06, AOI01-07, and AOI1-08) having reported detections of all five relevant compounds.

PFBS was detected below the SL (601 ng/L) in all eight wells with values ranging from 1 J to 11 ng/L, associated with well locations AOI01-06 and AOI01-08, respectively. PFHxS was detected above the SL (39 ng/L) at one location AOI01-08 (46 ng/L), and below the SL at six of the seven remaining locations (AOI01-01, AOI01-02, AOI01-03, AOI01-05, AOI01-06, and AOI01-07), which ranged from 1.2 J (AOI01-06) to 18 ng/L (AOI01-07). PFNA was detected in all eight wells. PFNA exceeded the SL (6 ng/L) at six of the eight locations (AOI1-01, AOI1-02, AOI01-03, AOI01-05, AOI01-07, and AOI1-08) ranging from 7.4 (AOI01-08) to 120 ng/L (AOI01-03). The remaining detections of PFNA ranged from 2.5 (AOI01-04) to 4.7 ng/L (AOI01-06). PFOS was detected in all eight wells. PFOS exceeded the SL (4 ng/L) at six of the eight locations ranging from 31 (AOI01-03 and AOI01-05) to 83 ng/L (AOI01-07). The remaining detections of PFOS ranged from 1.8 J (AOI01-04) to 2.2 ng/L (AOI01-06). PFOA was detected at all eight wells. PFOA exceeded the SL (6 ng/L) at seven of the eight locations, (AOI1-01, AOI1-02, AOI01-03, AOI01-05, AOI01-06, AOI01-07, and AOI1-08) ranging from 38 (AOI01-06) to 980 ng/L (AOI01-03). The remaining detection of PFOS was 2.4 from AOI01-04.

6.3.3 AOI 1 – Conclusions

Based on the results of the SI, PFOA, PFOS, PFNA, and PFHxS were detected in soil below their respective SLs. All five relevant compounds (PFOA, PFOS, PFHxS, PFNA, and PFBS) were detected in groundwater, with four of the five relevant compounds (PFOA, PFOS, PFNA, and PFHxS) detected at concentrations above their respective SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 1 is warranted.

6.4 Facility Boundary

This section presents the analytical results for soil and groundwater in comparison to SLs for the Facility Boundary of the Facility. The soil and groundwater results are summarized in **Tables 6-2 through 6-4**. Soil and groundwater results are presented on **Figures 6-1 through 6-7**.

6.4.1 Facility Boundary – Soil Analytical Results

Figures 6-1 through 6-5 present the ranges of detections in soil. **Tables 6-2** and 6-3 summarize the soil results.

Soil was sampled at eight boring locations associated with the potential release area in the Facility Boundary. Soil was sampled from two intervals at each of the boring locations. Samples were collected from surface (0–2 ft bgs) and subsurface soil (2–14 ft bgs).

Soil was sampled from surface soil (0 to 2 ft bgs) from boring locations SJAASF-01 through SJAASF-08. PFBS was not detected in any of the surface soil samples. PFHxS, PFOA, PFOS, and PFNA were detected below SLs in one or more of the surface soil samples. PFHxS was detected below the SL at one of the eight locations, boring SFAASF-03 with a concentration of 0.27 J µg/kg. PFNA was detected below the SL at three of the eight locations (SJAASF-05, SJAASF-06, and SJAASF-08) and ranged from 0.25 J to 3.9 µg/kg in SJAASF-08 and SJAASF-06, respectively. PFOS was detected below the SL at all eight locations and ranged from 0.49 J to 1.5 µg/kg in samples collected from SJAASF-05 and SJAASF-03, respectively. PFOA was detected below the SL in three of the eight locations (SJAASF-04, SJAASF-05, and SJAASF-06) and ranged from 0.23 J to 1.4 J+ µg/kg in samples collected from SJAASF-04 and SJAASF-06, respectively.

Subsurface soil samples were collected from soil boring locations SJAASF-01 through SJAASF-08 at depths ranging from 2 to 14 ft bgs. PFBS and PFHxS were not detected in any of the eight subsurface soil samples. PFOA, PFOS, and PFNA were detected below SLs in one or more of the surface soil samples. PFNA was detected below the SL in one of the eight locations, boring SJAASF-06 at a concentration of 1.9 µg/kg. PFOS was detected below the SL in two of the eight locations, SJAASF-03 and SJAASF-06 with concentrations of 0.36 J and 0.45 J µg/kg, respectively. PFOA was detected below the SL in one of the eight locations, borings SJAASF-06 with a concentration of 0.84 J+ µg/kg.

6.4.2 Facility Boundary – Groundwater Analytical Results

Figure 6-6 and **Figure 6-7** present the ranges of detections in groundwater. **Table 6-4** summarizes the groundwater results.

Groundwater samples were collected from eight temporary wells associated within the potential release area in the Facility Boundary. All five relevant compounds, PFOA, PFOS, PFBS, PFHxS, and PFNA, were detected in groundwater at seven of the eight locations with SJAASF-02 being the exception with four detected compounds.

PFBS was detected below the SL (601 ng/L) in all eight wells with values ranging from 1.3 J to 5.9 ng/L, associated with well locations SJAASF-06 and SJAASF-02, respectively. PFHxS was detected above the SL (39 ng/L) at one of the eight locations, SJAASF-08 (87 ng/L), and below the SL at the seven remaining locations, which ranged from 1 J (SJAASF-07) to 10 ng/L (SJAASF-03). PFNA was detected in seven of the eight wells. PFNA exceeded the SL (6 ng/L) at three of the eight locations (SJAASF-05, SJAASF-06, and SJAASF-08) ranging from 7.1 (SJAASF-08) to 45 ng/L (SJAASF-05). The remaining detections of PFNA ranged from 1 J

(SJAASF-04) to 1.9 ng/L (SJAASF-03). PFOS was detected in all eight wells. PFOS exceeded the SL (4 ng/L) at seven of the eight locations (SJAASF-01, SJAASF-03, SJAASF-04, SJAASF-05, SJAASF-06, SJAASF-07, and SJAASF-08) ranging from 4.2 (SJAASF-01) to 120 ng/L (SJAASF-08). The remaining detection of PFOS was 3 J ng/L at SFAASF-02. PFOA was detected at all eight wells. PFOA exceeded the SL (6 ng/L) at five of the eight locations, (SJAASF-01, SJAASF-05, SJAASF-06, SJAASF-07, and SJAASF-08) ranging from 6.3 (SJAASF-07) to 83 ng/L (SJAASF-06). The remaining detections of PFOS ranged from 4.2 (SJAASF-02) to 5.9 ng/L (SFAASF-03).

6.4.3 Facility Boundary – Conclusions

Based on the results of the SI, PFOA, PFOS, PFNA, and PFHxS were detected in soil below their respective SLs. All five relevant compounds (PFOA, PFOS, PFHxS, PFNA, and PFBS) were detected in groundwater, with four of the five relevant compounds (PFOA, PFOS, PFNA, and PFHxS) detected at concentrations above their respective SLs. Based on the exceedances of the SLs in groundwater, further evaluation of the Facility Boundary is warranted.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06	
	Sample Name	AOI01-01-SB-0-2		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												
	Sample Date	10/12/2022		10/12/2022		10/12/2022		10/12/2022		10/12/2022		10/13/2022	
	Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	ND	U	0.21	J	7.4		1.5		0.51	J	0.5	J
Perfluorooctanesulfonic acid (PFOS)	13	ND	U	0.75		0.85		3.1		0.64		0.83	
Perfluorooctanoic acid (PFOA)	19	0.34	J	0.44	J	2.7		1		0.34	J	0.57	J

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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

	Location ID	AOI01-07		AOI01-08		SJAASF-01		SJAASF-01		SJAASF-02		SJAASF-03	
	Sample Name	AOI01-07-SB-0-2		AOI01-08-SB-0-2		SJAASF-01-SB-0-2		SJAASF-01-SB-0-2-DUP		SJAASF-02-SB-0-2		SJAASF-03-SB-0-2	
	Parent Sample ID							SJAASF-01-SB-0-2					
	Sample Date	10/12/2022		10/13/2022		10/11/2022		10/11/2022		10/12/2022		10/13/2022	
	Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	U	ND	U	ND	U	ND	U	ND	U	0.27	J
Perfluorononanoic acid (PFNA)	19	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	13	1		0.51	J	1		1		0.96		1.5	
Perfluorooctanoic acid (PFOA)	19	0.42	J	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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

	Location ID	SJAASF-04		SJAASF-04		SJAASF-05		SJAASF-06		SJAASF-07		SJAASF-08	
	Sample Name	SJAASF-04-SB-0-2		SJAASF-04-SB-0-2-DUP		SJAASF-05-SB-0-2		SJAASF-06-SB-0-2		SJAASF-07-SB-0-2		SJAASF-08-SB-0-2	
	Parent Sample ID			SJAASF-04-SB-0-2									
	Sample Date	10/12/2022		10/12/2022		10/12/2022		10/11/2022		10/11/2022		10/11/2022	
	Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	ND	U	ND	U	0.38	J	3.9		ND	U	0.25	J
Perfluorooctanesulfonic acid (PFOS)	13	0.69		0.71		0.49	J	0.71		0.73		0.8	
Perfluorooctanoic acid (PFOA)	19	0.35	J	0.23	J	0.28	J	1.4	J+	ND	U	ND	U

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-05	
	Sample Name	AOI01-01-SB-3-4		AOI01-02-SB-3-4		AOI01-03-SB-3-4		AOI01-04-SB-4-5		AOI01-05-SB-4-5		AOI01-05-SB-4-5-DUP	
	Parent Sample ID											AOI01-05-SB-4-5	
	Sample Date	10/13/2022		10/13/2022		10/13/2022		10/13/2022		10/12/2022		10/12/2022	
	Depth (ft bgs)	3-4		3-4		3-4		4-5		4-5		4-5	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	ND	U	ND	U	4.7		ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	U	0.36	J	0.6	J	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	ND	U	ND	U	2.3		ND	U	0.24	J	0.37	J

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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

	Location ID	AOI01-06		AOI01-07		AOI01-08		SJAASF-01		SJAASF-02		SJAASF-03	
	Sample Name	AOI01-06-SB-3-4		AOI01-07-SB-4-5		AOI01-08-SB-3-4		SJAASF-01-SB-4-5		SJAASF-02-SB-8-9		SJAASF-03-SB-4-5	
	Parent Sample ID												
	Sample Date	10/13/2022		10/12/2022		10/13/2022		10/12/2022		10/12/2022		10/13/2022	
	Depth (ft bgs)	3-4		4-5		3-4		4-5		8-9		4-5	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	U	0.3	J	0.53	J	ND	U	ND	U	0.45	J
Perfluorooctanoic acid (PFOA)	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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

	Location ID	SJAASF-04		SJAASF-05		SJAASF-06		SJAASF-07		SJAASF-08	
	Sample Name	SJAASF-04-SB-4-5		SJAASF-05-SB-3-4		SJAASF-06-SB-2-3		SJAASF-07-SB-13-14		SJAASF-08-SB-6-7	
	Parent Sample ID										
	Sample Date	10/14/2022		10/12/2022		10/11/2022		10/12/2022		10/12/2022	
	Depth (ft bgs)	4-5		3-4		2-3		13-14		6-7	
Analyte	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)											
Perfluorobutanesulfonic acid (PFBS)	25000	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	ND	U	ND	U	1.9		ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	U	ND	U	0.36	J	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	ND	U	ND	U	0.84	J+	ND	U	ND	U

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
Values exceeding the Screening Level are shaded gray.
µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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**Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, SJAASF**

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-05	
	Sample Name	AOI01-01-GW		AOI01-02-GW		AOI01-03-GW		AOI01-04-GW		AOI01-05-GW		AOI01-05-GW-DUP	
	Parent Sample ID											AOI01-05-GW	
	Sample Date	10/14/2022		10/13/2022		10/13/2022		10/14/2022		10/13/2022		10/13/2022	
Analyte	**Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	601	6.6		7.3		2.8		1.1	J	5.7		5.5	
Perfluorohexanesulfonic acid (PFHxS)	39	16		12		7.6		ND	U	8.6		8.5	
Perfluorononanoic acid (PFNA)	6	54		8.4		120		2.5		45		43	
Perfluorooctanesulfonic acid (PFOS)	4	50		47		31		1.8	J	31		30	
Perfluorooctanoic acid (PFOA)	6	830		110		980		2.4		170		170	

Notes:

U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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.

Values exceeding the Screening Level are shaded gray.

ng/L = Nanogram(s) per liter.

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

Qual = Qualifier.

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, SJAASF

	Location ID	AOI01-06		AOI01-07		AOI01-07		AOI01-08		SJAASF-01		SJAASF-02	
	Sample Name	AOI01-06-GW		AOI01-07-GW		AOI01-07-GW-DUP		AOI01-08-GW		SJAASF-01-GW		SJAASF-02-GW	
	Parent Sample ID					AOI01-07-GW							
	Sample Date	10/13/2022		10/13/2022		10/13/2022		10/14/2022		10/13/2022		10/14/2022	
Analyte	Screening Level[1]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	601	1	J	5.4		5.1		11		5.4		5.9	
Perfluorohexanesulfonic acid (PFHxS)	39	1.2	J	18		18		46		1.2	J	5.3	
Perfluorononanoic acid (PFNA)	6	4.7		9		8.3		7.4		1.5	J	ND	U
Perfluorooctanesulfonic acid (PFOS)	4	2.2		83		80		81		4.2		3	J
Perfluorooctanoic acid (PFOA)	6	38		49		48		39		6.8		4.2	

Notes:

U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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.

Values exceeding the Screening Level are shaded gray.

ng/L = Nanogram(s) per liter.

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

Qual = Qualifier.

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, SJAASF

	Location ID	SJAASF-03		SJAASF-04		SJAASF-05		SJAASF-06		SJAASF-07		SJAASF-08	
	Sample Name	SJAASF-03-GW		SJAASF-04-GW		SJAASF-05-GW		SJAASF-06-GW		SJAASF-07-GW		SJAASF-08-GW	
	Parent Sample ID												
	Sample Date	10/13/2022		10/14/2022		10/14/2022		10/12/2022		10/13/2022		10/12/2022	
Analyte	**Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	601	4.9		5.1		3.2		1.3	J	1.6	J	3.4	
Perfluorohexanesulfonic acid (PFHxS)	39	10		9.9		6.1		2		1	J	87	
Perfluorononanoic acid (PFNA)	6	1.9		1	J	17		45		1.6	J	7.1	
Perfluorooctanesulfonic acid (PFOS)	4	39		17		11		6.2		7.9		120	
Perfluorooctanoic acid (PFOA)	6	5.9		5.3		32		83		6.3		46	

Notes:
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
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.
Values exceeding the Screening Level are shaded gray.
ng/L = Nanogram(s) per liter.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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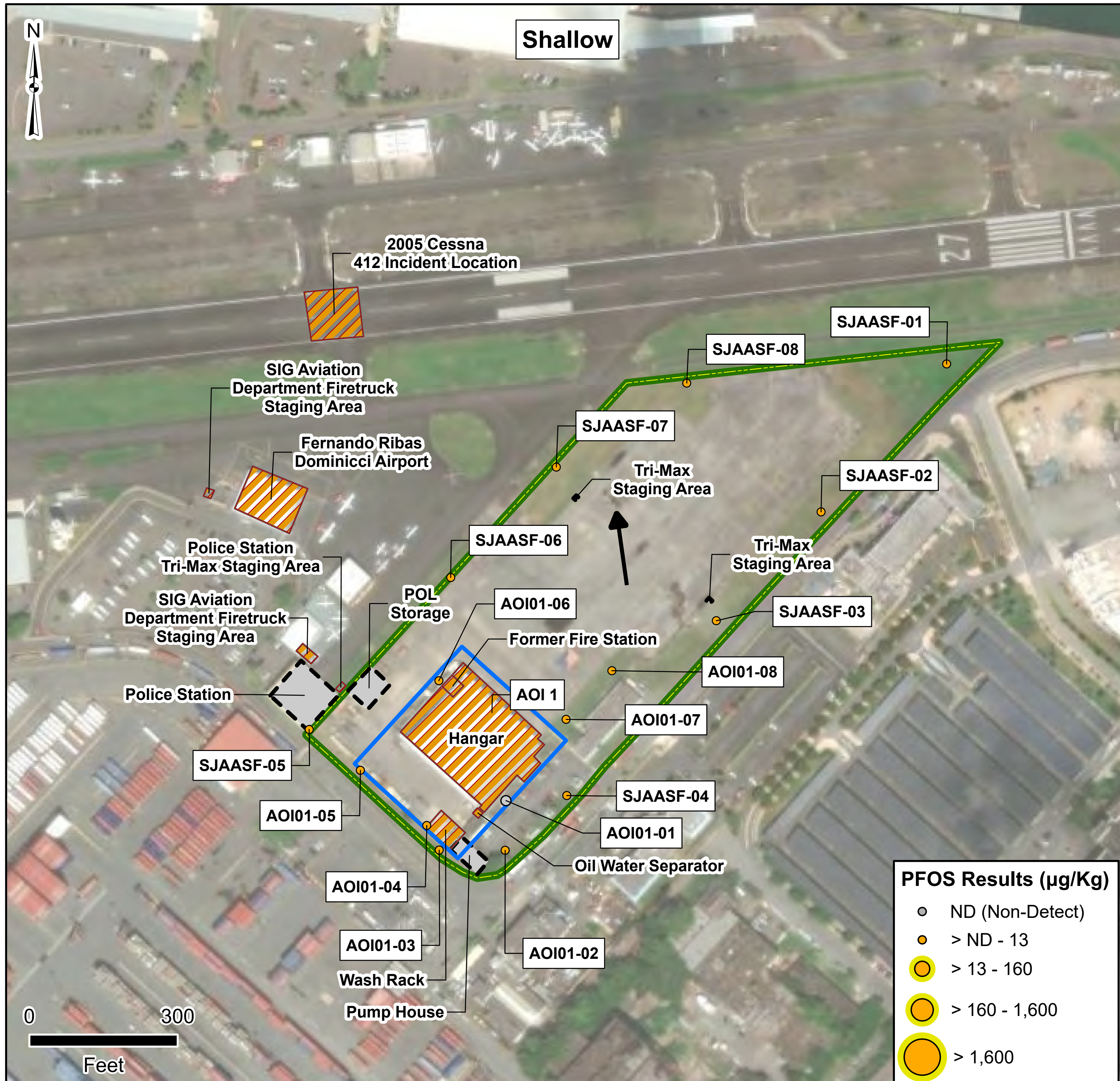
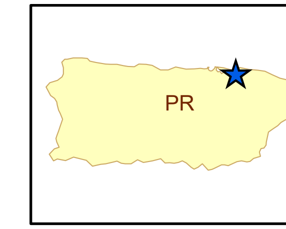
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 6-1
PFOS Detections in Soil





Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

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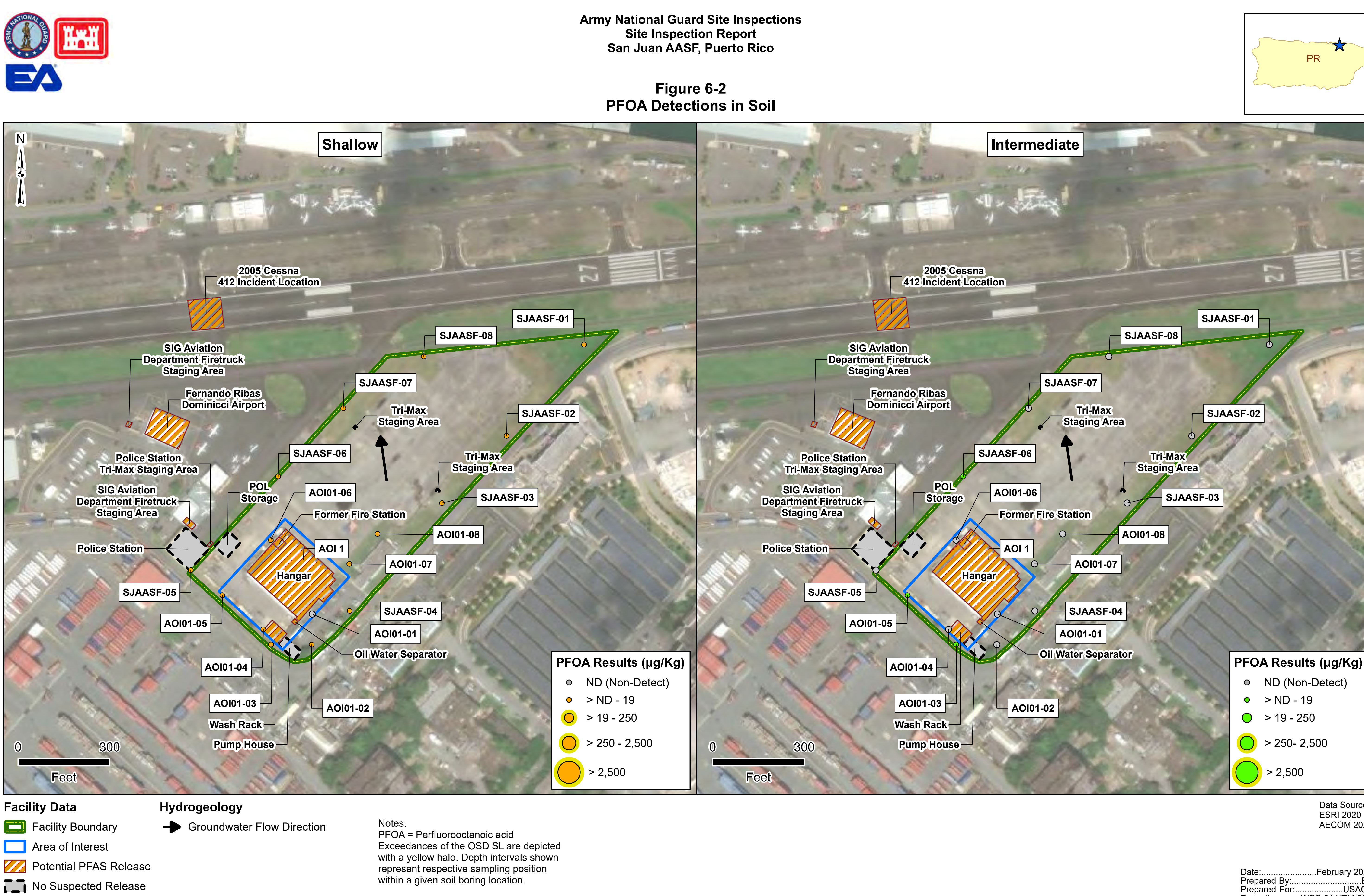
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 6-2
PFOA Detections in Soil



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

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

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Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

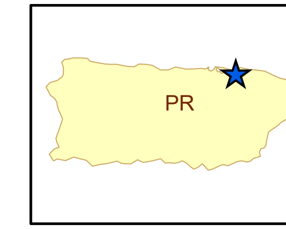
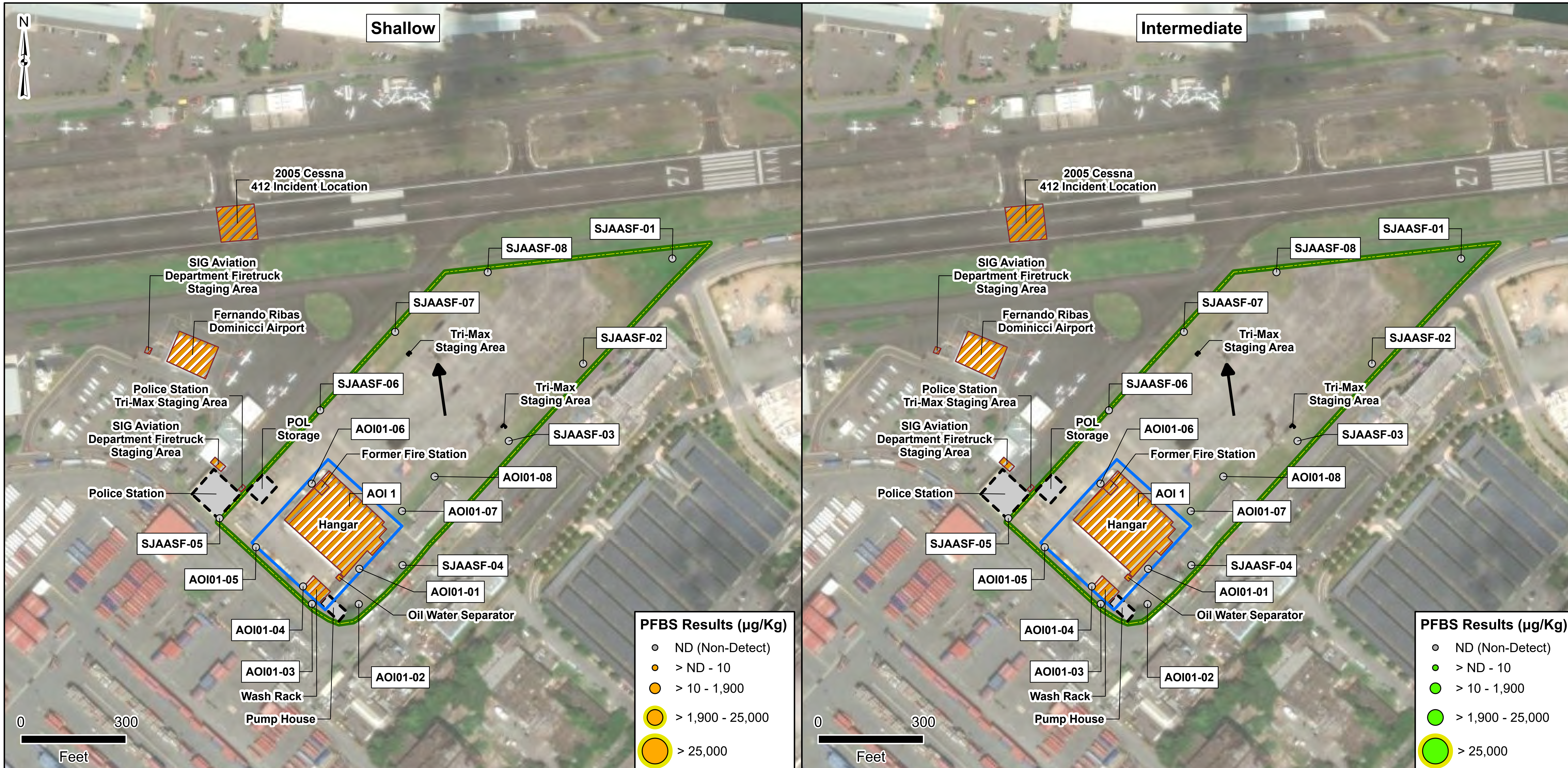


Figure 6-3
PFBS Detections in Soil



Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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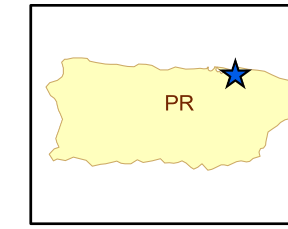
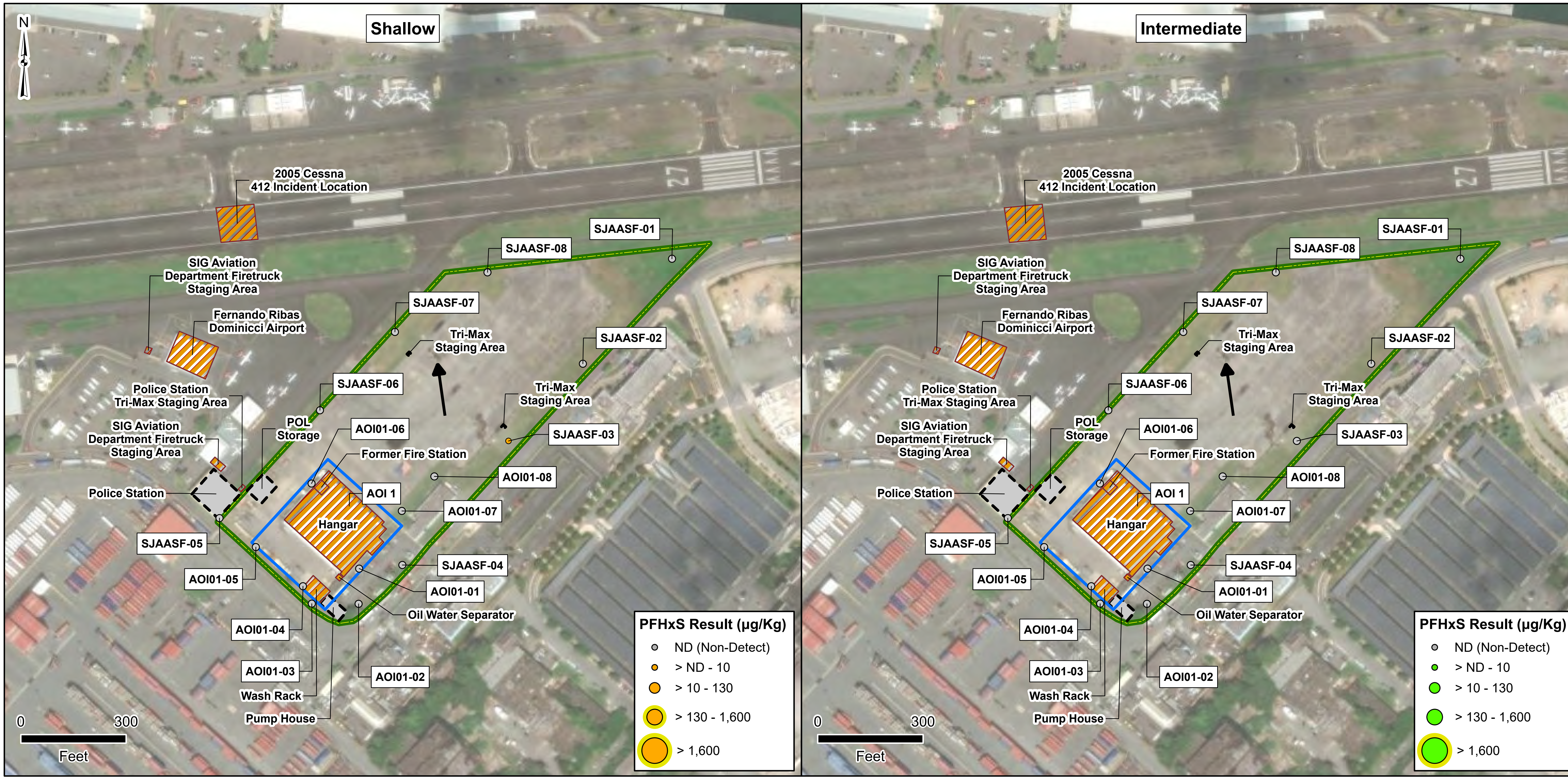
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 6-4
PFHxS Detections in Soil





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Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

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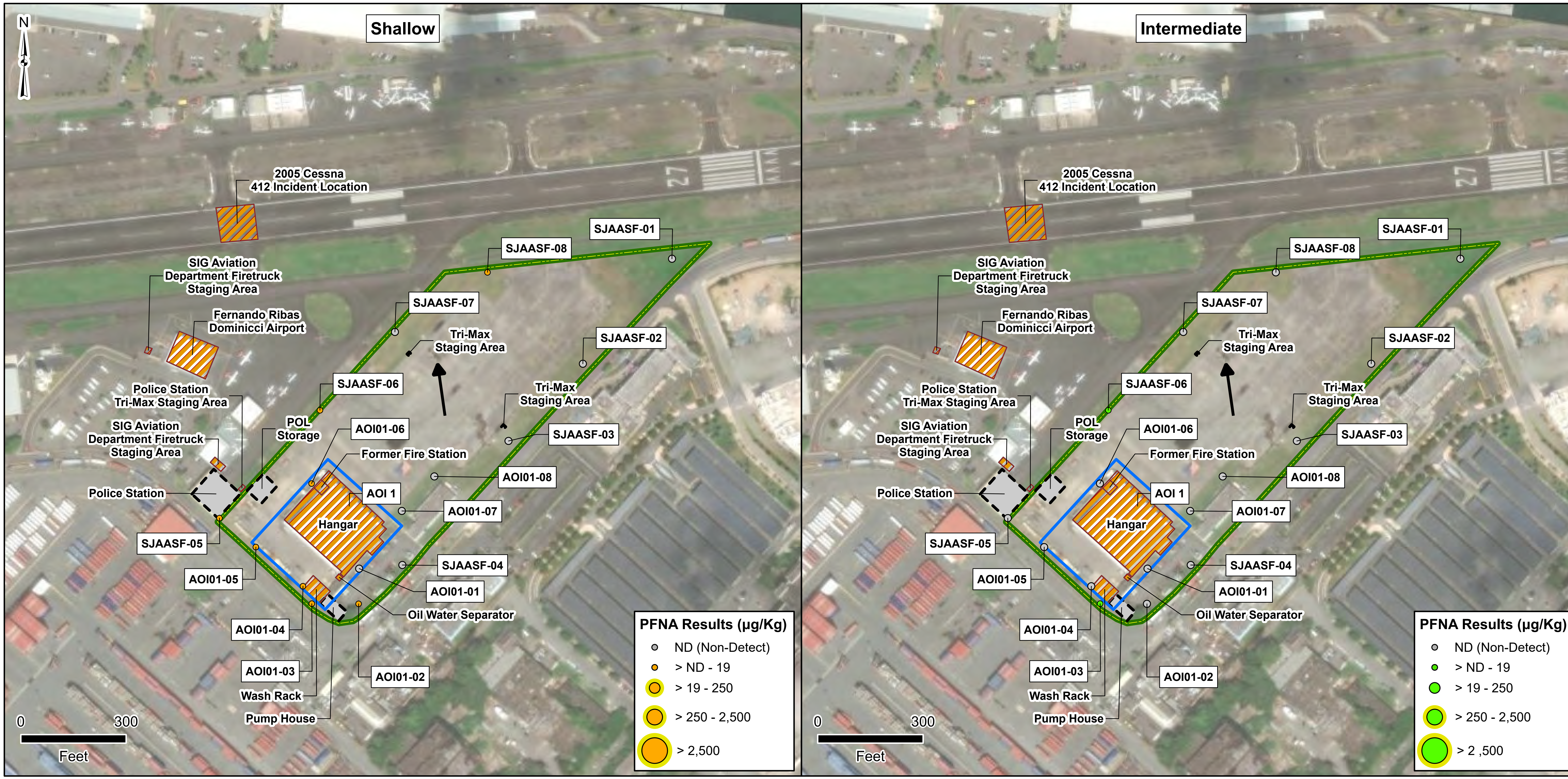
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

Figure 6-5
PFNA Detections in Soil



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

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

Data Sources:
ESRI 2020
AECOM 2020

Date:.......................February 2023
Prepared By:...........................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 20N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

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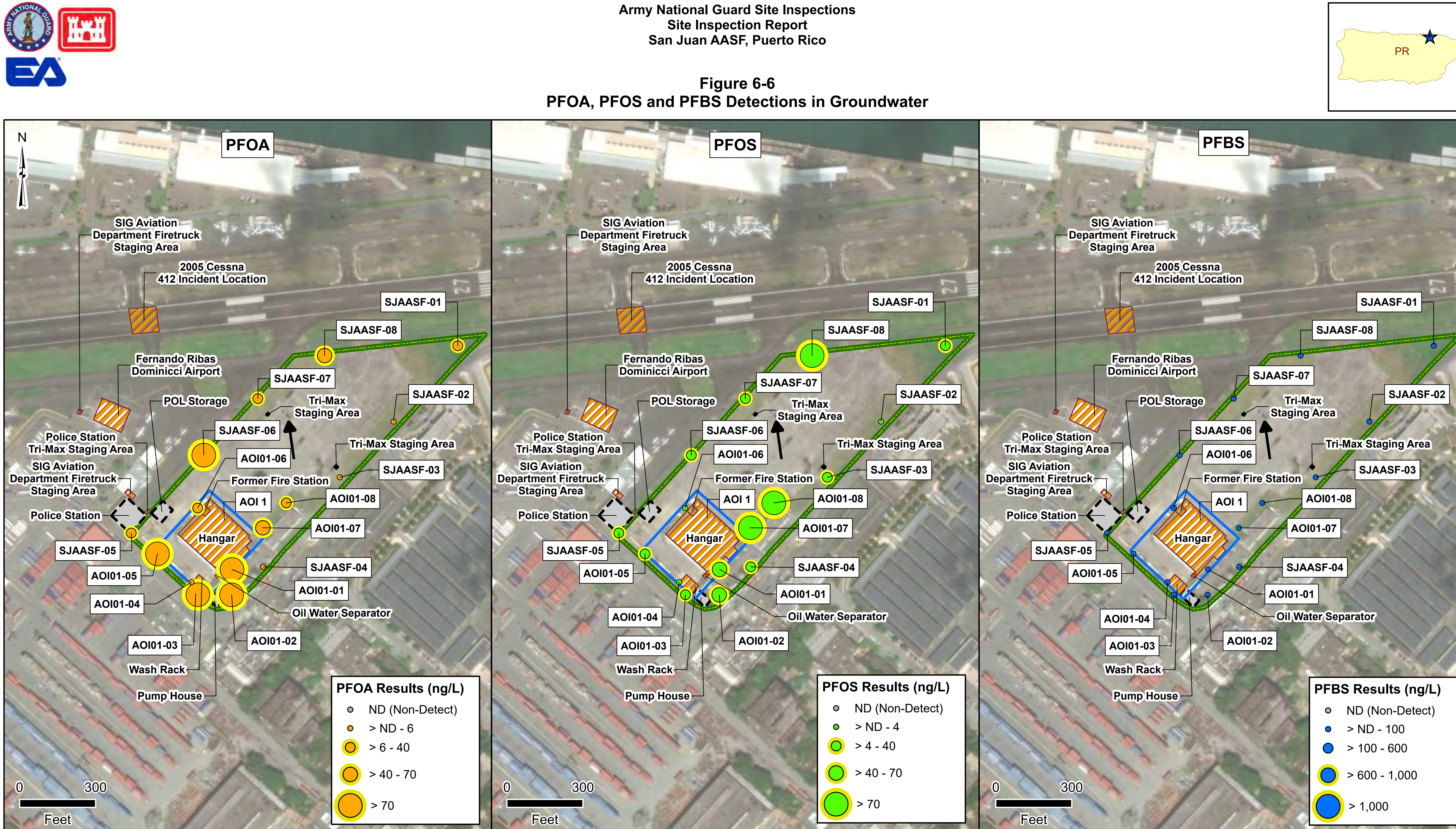
Army National Guard Site Inspections
Site Inspection Report
San Juan AASF, Puerto Rico

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



Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

Note:
PFOA = Perfluorooctanesulfonic acid
PFOS = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo

Data Sources:
ESRI 2022
AECOM 2019

Date:........................February 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 20N

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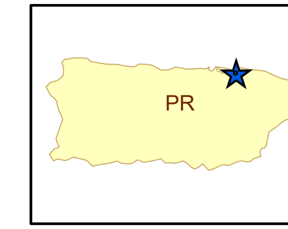
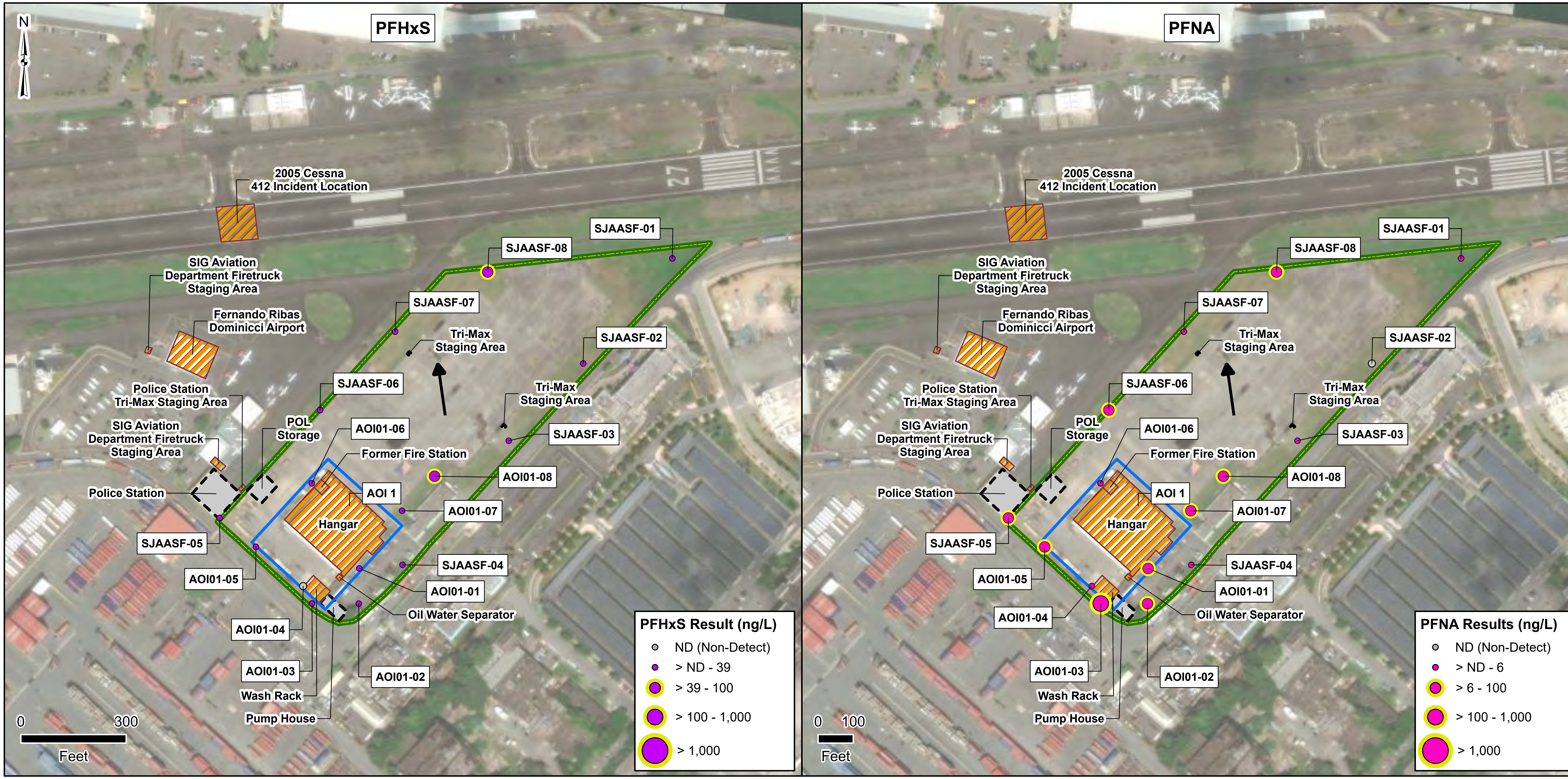


Figure 6-7
PFHxS and PFNA Detections in Groundwater



Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SanJuan\SanJuanSI.aprx

Facility Data
- Facility Boundary
- Area of Interest
- Potential PFAS Release
- No Suspected Release

Hydrogeology
- Groundwater Flow Direction

Notes:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:........................February 2023
Prepared By:..............................EA
Prepared For:......................USACE
Projection:........WGS 84 UTM 20N

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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 an SI to an RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

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

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

7.1 SOIL EXPOSURE PATHWAY

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

7.1.1 AOI 1

AOI 1 encompasses the potential AFFF releases at the Wash Rack, AASF Hangar, Flightline, Former Fire Station, and the OWS located in the southwestern portion of the Facility. There are multiple documented releases of AFFF at the Wash Rack and the AASF Hangar. The Wash Rack was regularly used as a Fire Training Area from 1999 to 2016 for annual training exercises where 30 gal of AFFF solution was release during each exercise. It is possible that training also occurred prior to 1999. The AASF Hangar has three confirmed releases of AFFF (2006, 2008, and 2009) in which 900 gal of AFFF was released during each event. Although no evidence indicates that AFFF has ever been released at the Former Fire Station, the corrosive nature of AFFF potentially stored at this location may have led to unknown releases of AFFF.

PFOA, PFOS, PFNA, and PFHxS were detected in surface soil at AOI 1 below the applicable SLs. Site workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and construction workers are potentially complete. Further, PFHxS, PFNA, PFOS, and PFOA were detected in subsurface soil at AOI 1 below the SLs. Ground-disturbing activities to subsurface soil could result in construction worker exposure to detected constituents via incidental ingestion. Therefore, the exposure pathways for subsurface soil are potentially complete for the construction worker. The CSM is presented in **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 based on the aforementioned criteria.

7.2.1 AOI 1

PFOA, PFNA, PFOS, and PFHxS were detected in groundwater above their respective SLs. PFBS was detected in groundwater at concentrations below the associated SL.

There are no drinking water wells at the AASF or known to be in its vicinity; the Facility is provided municipal water by the Puerto Rico Aqueducts and Sewers Authority. The Río Grande de Loíza and the Río de la Plata watersheds are the principal sources of public water supply for the San Juan metropolitan area. Two USGS wells are located on the San Juan peninsula north of the Facility. Groundwater flow at the AASF is expected to be radial towards the San Juan Bay and Caño San Antonio.

Additionally, the depth to groundwater is shallow, so trenching and excavation activities could result in construction worker exposure via accidental ingestion; therefore, this pathway is considered potentially complete. Based on the information presented in the PA regarding surrounding communities being on municipal drinking water, and the lack of migration pathways for water, the groundwater pathways for the resident and trespasser/recreational user are considered incomplete.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

The site features were used to determine whether a potentially complete pathway exists between the source and potential receptors based on the aforementioned criteria.

7.3.1 AOI 1

Surface water runoff at the AASF drains into a stormwater management system that eventually discharges into the Atlantic Ocean. The preliminary assessment states that stormwater drains into catch basins that divert water into an oil-water separator (OWS) located in the southeastern corner of the AASF property, adjacent to the southern corner of the Hangar. It is unclear whether all or only some of the stormwater is diverted through the OWS. Regardless stormwater is diverted through stormwater piping and into the Atlantic Ocean. The site coverage includes previous (grassy areas) and impervious (asphalt and concrete) areas. Sediment carried by stormwater runoff enters the stormwater management system and is diverted the Atlantic Ocean. Due to this lack of surface water features, the pathway for surface water and sediment is considered incomplete for all receptors. The CSM is presented in **Figure 7-1**.

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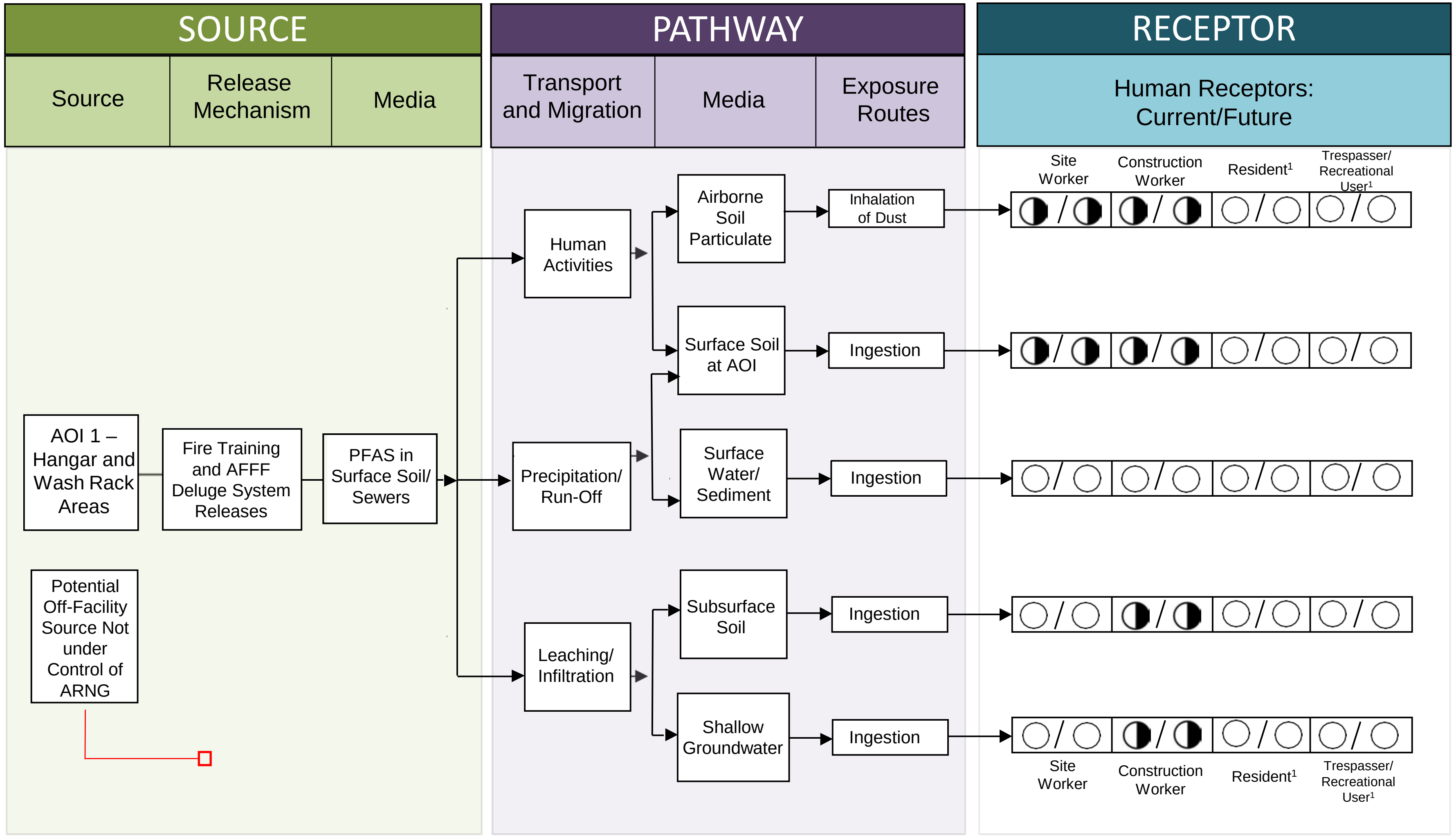

LEGEND

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

Notes:

1. The resident and recreational users refer to off-site receptors.

Figure 7-1
Conceptual Site Model
AOI 1 – Hangar and Wash Rack Areas

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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 SITE INSPECTION ACTIVITIES

The SI field activities at the facility were conducted from 11 to 14 October 2022. The SI field activities included utility clearance, soil sample collection, temporary monitoring well installation and grab groundwater sample collection, sampling of facility wells, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as previously noted in **Section 5.8**.

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

- Thirty-two (32) soil samples from 16 locations (soil borings locations)
- Sixteen (16) grab groundwater samples from 6 temporary well locations
- Nine (9) quality assurance/quality control 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 is described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA in the form of an RI is warranted for AOI01 and the Facility Boundary (**Table 8-1**). Based on the CSM developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from releases during historical DoD activities at the Facility. Sample chemical analytical concentrations collected during this SI were compared with the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to SLs is as follows:

- AOI 1:
    - — PFOA, PFOS, and PFNA were detected in soil at AOI 1 at concentrations below the SLs. PFBS and PFHxS were not detected in soil at any location at AOI 1.

— All five relevant compounds were detected in the groundwater at AOI 1. PFHxS concentrations exceeded the SL in groundwater in one temporary well. PFNA and PFOS exceeded the SL in six of the eight temporary well locations. PFOA exceeding the SL in seven of the eight locations. PFBS did not exceed the SL at any of the eight locations. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.

- Facility Boundary:

— PFOA, PFOS, PFNA, and PFHxS were detected in soil at the Facility Boundary at concentrations below the SLs. PFBS was not detected in soil at any location at the Facility Boundary.

— All five relevant compounds were detected in the groundwater at the Facility Boundary. PFHxS concentrations exceeded the SL in groundwater in one temporary well. PFNA exceeded the SL in three of the eight temporary well locations. PFOS exceeded the SL in seven of the eight temporary well locations. PFOA exceeding the SL in five of the eight locations. PFBS did not exceed the SL at any of the eight locations. Based on the results of the SI, further evaluation of the Facility Boundary is 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 CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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

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

AOI	Potential Release Area	Soil AOI	Groundwater AOI	Groundwater Facility Boundary	Future Action
1	Wash Rack, AASF Hangar, Flightline, Former Fire Station, and OWS	◐	●	●	Proceed to RI

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

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