FINAL
Site Inspection Report
Army Aviation Support Facility #2
Grand Island, Nebraska

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

October 2023

Prepared for

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

UNCLASSIFIED

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°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
bgs	Below ground surface
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data quality objective
DUA	Data usability assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EB	Equipment blank
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
HDPE	High-density polyethylene
HEF	High-expansion foam
HFPO-DA	Hexafluoropropylene oxide dimer acid
ID	Identification
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council
K_{oc}	Organic carbon normalized distribution coefficient
LC/MS/MS	Liquid chromatography with tandem mass spectrometry

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

MIL-SPEC	Military Specification
MS	Matrix spike
MSD	Matrix spike duplicate
NEARNG	Nebraska Army National Guard
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PID	Photoionization detector
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
SI	Site Inspection
SL	Screening level
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

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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) (Assistant Secretary of Defense) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) [1]. These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable screening levels (SLs) are provided below in **Table ES-1**.

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for the relevant compounds. This SI was completed at the Grand Island Army Aviation Support Facility (AASF) #2 located in Grand Island, Nebraska, and it was determined that further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 2 and no further evaluation is warranted for AOI 1 at this time. The Grand Island AASF #2 will be referred to as the "Facility" throughout this document.

The Grand Island AASF #2, is adjacent to the Central Nebraska Regional Airport and accessible from East Airport Road. The Facility is operated by the Nebraska ARNG (NEARNG) and encompasses approximately 49.5 acres in Hall County, approximately 3 miles northeast of Grand Island. The AASF #2 was constructed in 2009 as a NEARNG maintenance support facility, and the Readiness Center was added in 2014. The Facility is located in the Platt River Lowlands of Nebraska, with the Platte River flowing nearby within 5 miles of the AASF #2 (AECOM Technical Services, Inc. [AECOM] 2020).

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the AOIs were compared to OSD SLs for the relevant compounds. **Table ES-2** summarizes the SI results for the AOIs. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for AOI 2; however, no further evaluation is warranted for AOI 1 at this time.

[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. Assistant Secretary of Defense. July 2022. Risk Based Screening Levels Calculated for Groundwater and Soil using U.S. Environmental Protection Agency's Regional SL Calculator. Hazard Quotient (HQ) = 0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

bgs = Below ground surface
µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

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

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Groundwater Facility Boundary	Future Action
1	Hangar Fire Suppression System	○	◐	●	No Further Action
2	Tri-Max ™ 30 Fire Extinguishers	○	●	●	Proceed to RI

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

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on 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 components 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 the Grand Island Army Aviation Support Facility (AASF) #2 located in Grand Island, Nebraska. The Grand Island AASF #2 will be 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 (DA) requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Grand Island AASF #2 (AECOM Technical Services, Inc. [AECOM] 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, or historically released. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

Grand Island AASF #2 is in Hall County, approximately 3 miles northeast of Grand Island and adjacent to the Central Nebraska Regional Airport (**Figure 2-1**). The AASF #2 is accessible from East Airport Road from the south. The AASF #2 is constructed on a parcel of land that is approximately 49.5 acres and has been owned and operated by the State of Nebraska Military Department since 2005. Before 2005, the Hall County Airport Authority owned and operated the land. In 2009, the AASF #2 was constructed to house the Nebraska ARNG (NEARNG) maintenance support facility. In 2014, the Grand Island Readiness Center was added to the campus. The Readiness Center is used to train part- and full-time soldiers in aviation and skill development. Currently, no other new structures have been added to the AASF #2 Facility (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The AASF #2 is in the Platte River Lowlands of Nebraska. The Platte River flows within 5 miles of the AASF #2, which is surrounded by agricultural land, and there are three lakes located within 3 miles of the Facility. Lake Davis, Crystal Lake, and Eagles Lake are located to the south of the Facility. The elevation of the AASF #2 is approximately 1,860 feet (ft) above mean sea level (amsl) (AECOM 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, and current and future land use. The topography at AASF #2 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 and contours are presented on **Figure 2-5**.

2.2.1 Geology

The AASF #2 lies within the High Plains section of the Great Plains Province. The underlying geological features at the Facility can be defined by four categories. The first 10 ft below the surface is alluvial silty clay and topsoil. There is also alluvial sands and gravel from the Grand Island Formation, which have been reported to be approximately 50 to 60 ft thick. A thinner layer of low-permeability alluvial silty clay, which is approximately 5 to 15 ft thick, from the Fullerton Formation is also located in the area. This clay can also be referred to as “blue clay.” The last layer underneath the Facility is the deepest layer and can be found up to 200 ft thick. It is an alluvial sand and gravel from the Holdrege Formation (AECOM 2020).

Grand Island’s geology differs from the typical geological sequence of the High Plains, as there is no Tertiary material present. The geology that underlies the AASF #2 consists of material from the Niobrara Formation. This formation consists of argillaceous chalk, limestone, and shale. There is also substantial Quaternary mantle present in this area, which consists of sands, silts, clays, and alluvium. There appears to be no surficial difference between the areas of the High Plains where there is and is not Tertiary material present (AECOM 2020).

During the SI, the soil underling the Facility was found to be generally composed of organic silt, fine to coarse sand, low plasticity silty sand, medium to high plasticity clayey silt, and some gravel. The borings were completed at depths ranging from 16 to 24 ft below ground surface (bgs). Samples for grain size analyses were collected at two locations (AOI01-02 and AOI02-01) and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of sand (93 percent [%] to 95%), silt and clay (2.5% to 4.5%), and gravel (2.5%). Boring logs are presented in **Appendix D** and grain size results are presented in **Appendix E**.

2.2.2 Hydrogeology

There are two aquifers and an aquitard located in the area of the Facility: the Fullerton Formation Aquitard, the Holdrege Formation Aquifer, and the Formation Aquifer. The Grand Island Formation Aquifer is an unconfined water table aquifer within the alluvial sands and gravels of the Grand Island Formation. This allows for shallow groundwater under the Facility. The depth to water ranges from 10 to 16 ft below ground surface (bgs) with a total thickness of water ranging from about 50 to 60 ft. The predominant groundwater flow in the Grand Island Formation Aquifer is to the northeast (**Figure 2-2**). The Holdrege Formation Aquifer is a confined aquifer unit within the sands and gravels of the Holdrege Formation. The groundwater flow of the Holdrege Formation Aquifer flows to the northeast, which is a similar direction as the Grand Island Formation Aquifer. The Fullerton Formation Aquitard is an underlying clay unit with low permeability that acts as a barrier to groundwater flow. This aquitard creates a presence of head differences between the two aquifers (AECOM 2020).

The Grand Island Formation aquifer supplies most of the water for the region in the form of irrigation supply and potable water. The City of Grand Island uses 21 wells that lie between two channels of the Platte River, using three pumps that allow water to be moved from the basins into town (AECOM 2020).

There are no potable wells located within the boundary of the Facility; however, there are domestic wells and several irrigation wells downgradient and side gradient of the AASF #2 (**Figure 2-3**). There are several additional livestock, irrigation, and commercial/industrial wells within a 1-mile radius of the Facility. Drinking water for the AASF #2 is supplied by the City of Grand Island, which sources water from groundwater via sand and gravel aquifers that underlies the area (AECOM 2020).

Depths to water in December 2021 ranged from approximately 11 to 19 ft bgs during synoptic water level measurements. Total boring completion depths, to accommodate temporary well installation, ranged from 16 to 24 ft bgs. Groundwater elevation contours from the SI are presented on **Figure 2-5**. Although the anticipated regional groundwater flow direction is to the northeast, the observed groundwater flow direction at Grand Island AASF #2 is primarily to the southeast based on calculated groundwater elevations (**Figure 2-5**).

2.2.3 Hydrology

The AASF #2 is in the Platte River floodplain (**Figure 2-3**). The primary surface water feature found south of the Facility is an intermittent tributary of the Warm Slough. The Warm Slough

generally flows southwest to northeast and eventually drains into the Platte River approximately 24 miles from the Facility. Surface water flow direction at the Facility is to the southeast towards Warm Slough (AECOM 2020).

The Platte River is classified as the longest braided river in North America. It flows from the Rocky Mountains in Colorado and Wyoming to the Missouri River, which drains into the Mississippi River. As a braided river, the Platte River is a network of multiple small shallow channels that all flow in the same direction. The Platte River is prone to flooding and has contributed to flooding in Grand Island as recently as 2019 (AECOM 2020).

2.2.4 Climate

The climate at the facility has four defined seasons where the summers are warm and mostly clear; the winters are freezing, windy, snowy, and typically have a lot of cloud cover. Temperatures vary from average highs of 62.3 degrees Fahrenheit (°F) to average lows of 39.2°F. The average annual temperature is 50.75°F. Average precipitation is 26.61 inches of rain (AECOM 2020).

2.2.5 Current and Future Land Use

The AASF #2 is a fenced, controlled access Facility and is adjacent to Central Nebraska Regional Airport. Reasonably anticipated future land use is not expected to change from the current land use; however, future infrastructure improvements, land acquisitions, and land use controls are unknown (AECOM 2020).

2.2.6 Sensitive Habitat and Threatened/Endangered Species

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

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Hall County, Nebraska (U.S. Fish and Wildlife Service 2022):

- **Birds**: Piping Plover (*Charadrius melodus*) – Federally Threatened, Whooping Crane (*Grus americana*) – Federally Endangered
- **Fishes**: Pallid Sturgeon (*Scaphirhynchus albus*) – Federally Endangered
- **Flowering Plants**: Western Prairie Fringed Orchid (*Platanthera praeclara*) – Federally Threatened
- **Insects**: Monarch Butterfly (*Danaus plexippus*) – Federal Candidate
- **Mammal**: Northern Long-eared Bat (*Myotis septentrionalis*) – Federally Threatened

2.3 HISTORY OF PFAS USE

Two potential PFAS release areas were identified at the Facility during the PA where aqueous film-forming foam (AFFF) was stored (AECOM 2020). Interviews and records obtained during the PA indicate that AFFF is stored on-site for its use within Tri-Max™ 30 fire extinguishers. Additionally, the hangar fire suppression system, which was installed in 2010, contains high-expansion foam (HEF) concentrate. The hangar fire suppression system was initially tested with a full hangar release. According to the PA, one Tri-Max™ 30 extinguisher is filled with soap and water for training purposes and there have been no reports of the extinguishers ever being used or dispensed at the facility. A description of each AOI is presented in **Section 3**.

Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

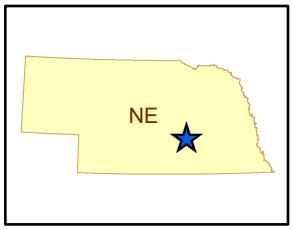
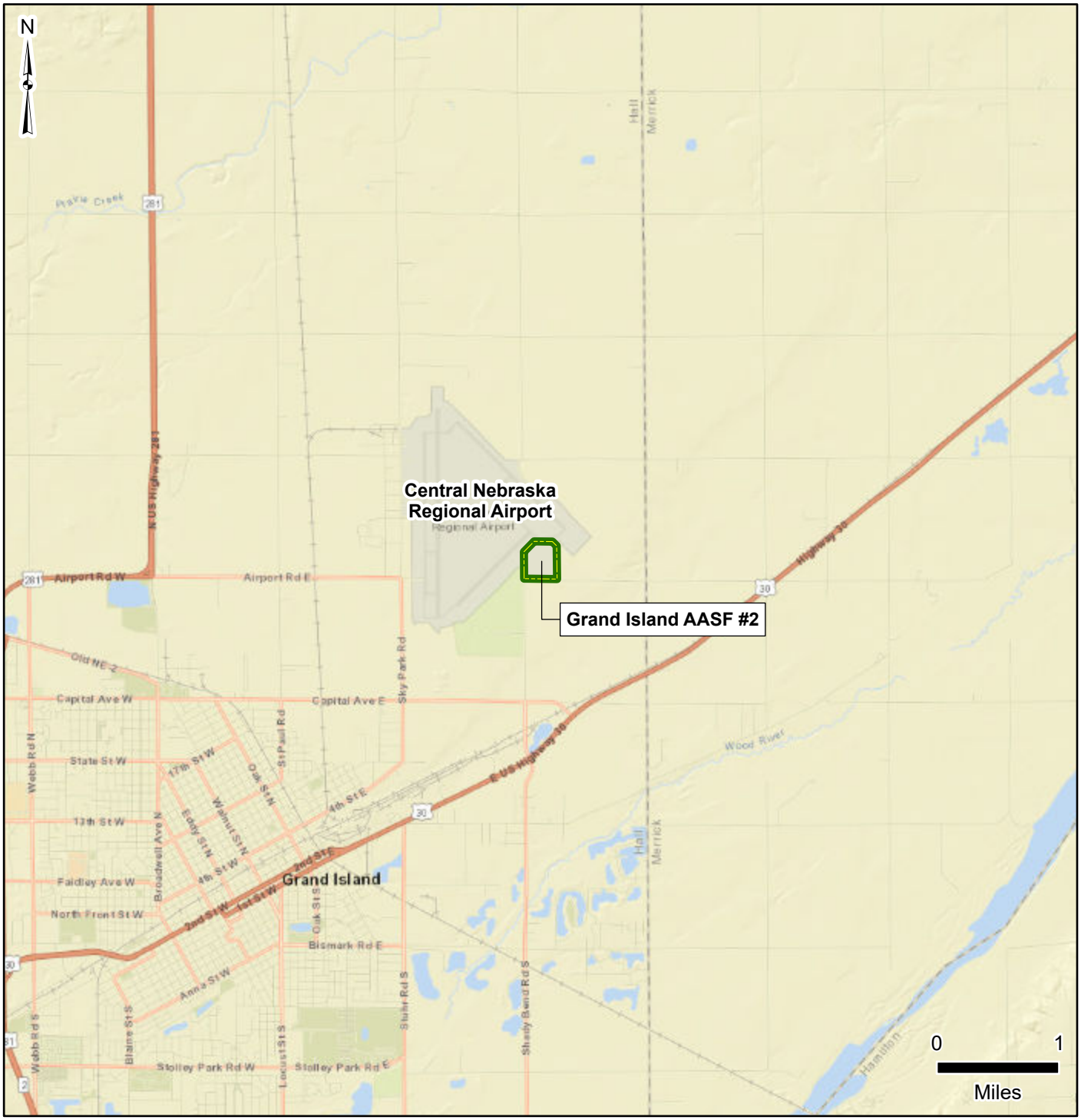


Figure 2-1
Facility Location



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

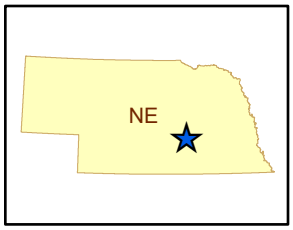
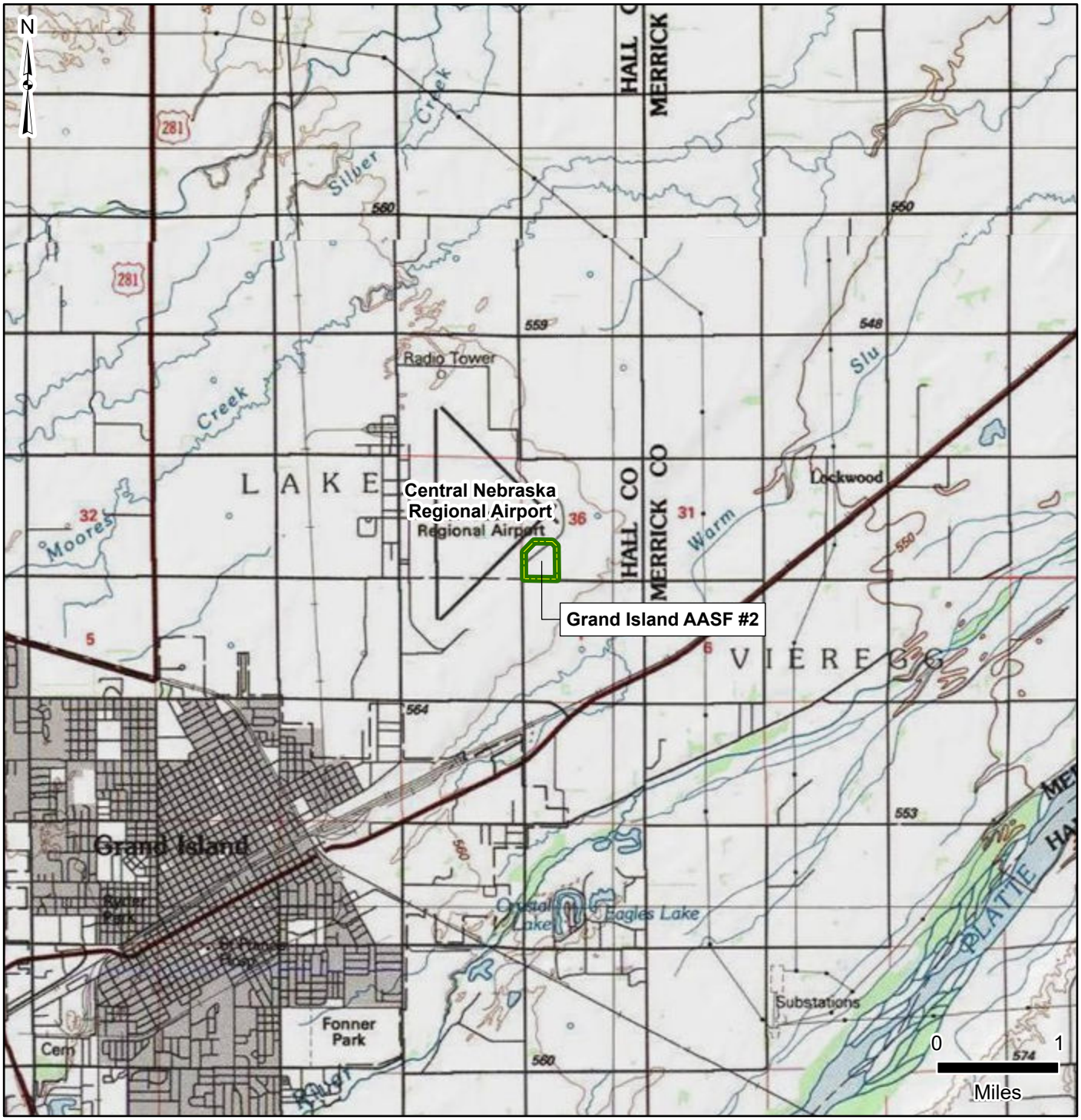


Figure 2-2
Topography



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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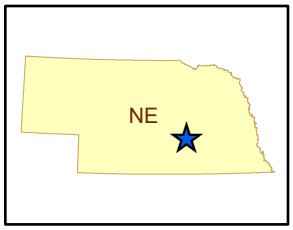
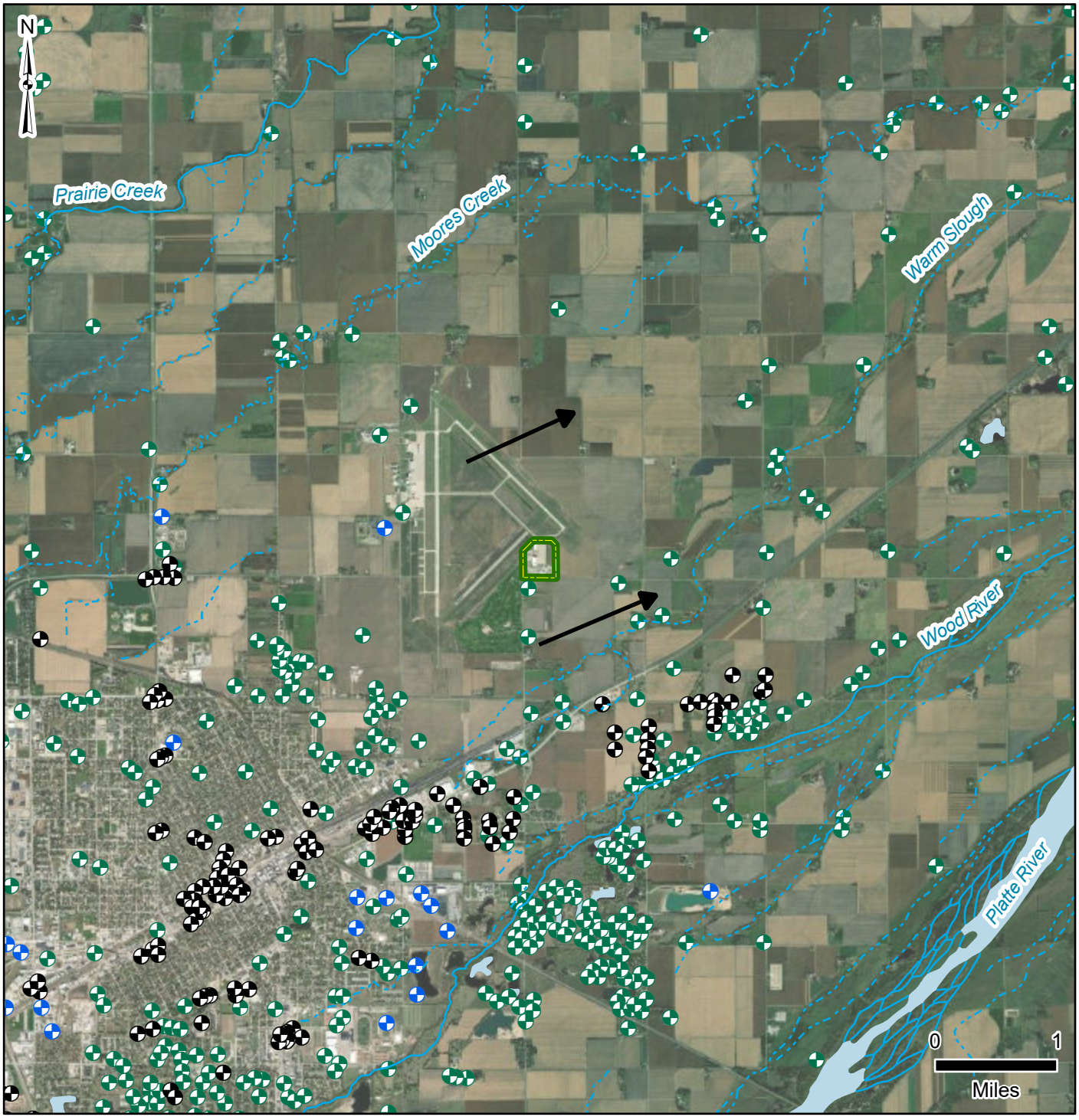
Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 2-3
Groundwater Features





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Facility Data
- Facility Boundary

Well Type
- Commerical/Industrial
- Domestic
- Monitoring Well

Hydrology/Hydrogeology
- Inferred Groundwater Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

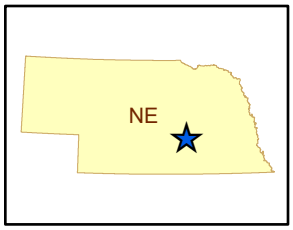
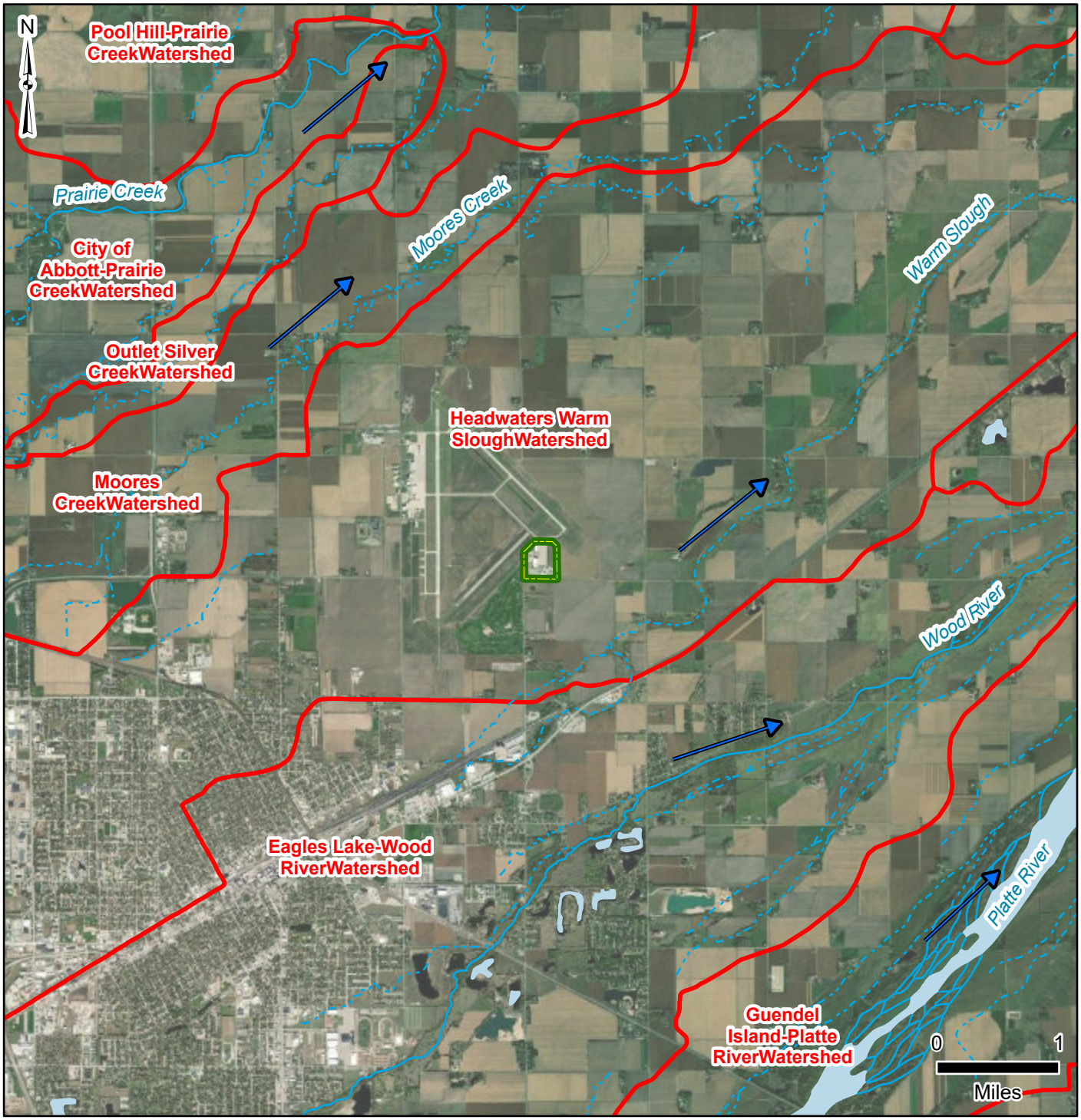


Figure 2-4
Surface Water Features



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Facility Data
- Facility Boundary

Hydrology
- Surface Water Flow Direction
- Perennial Creek/Stream
- Intermittent Creek/Stream
- Waterbody
- Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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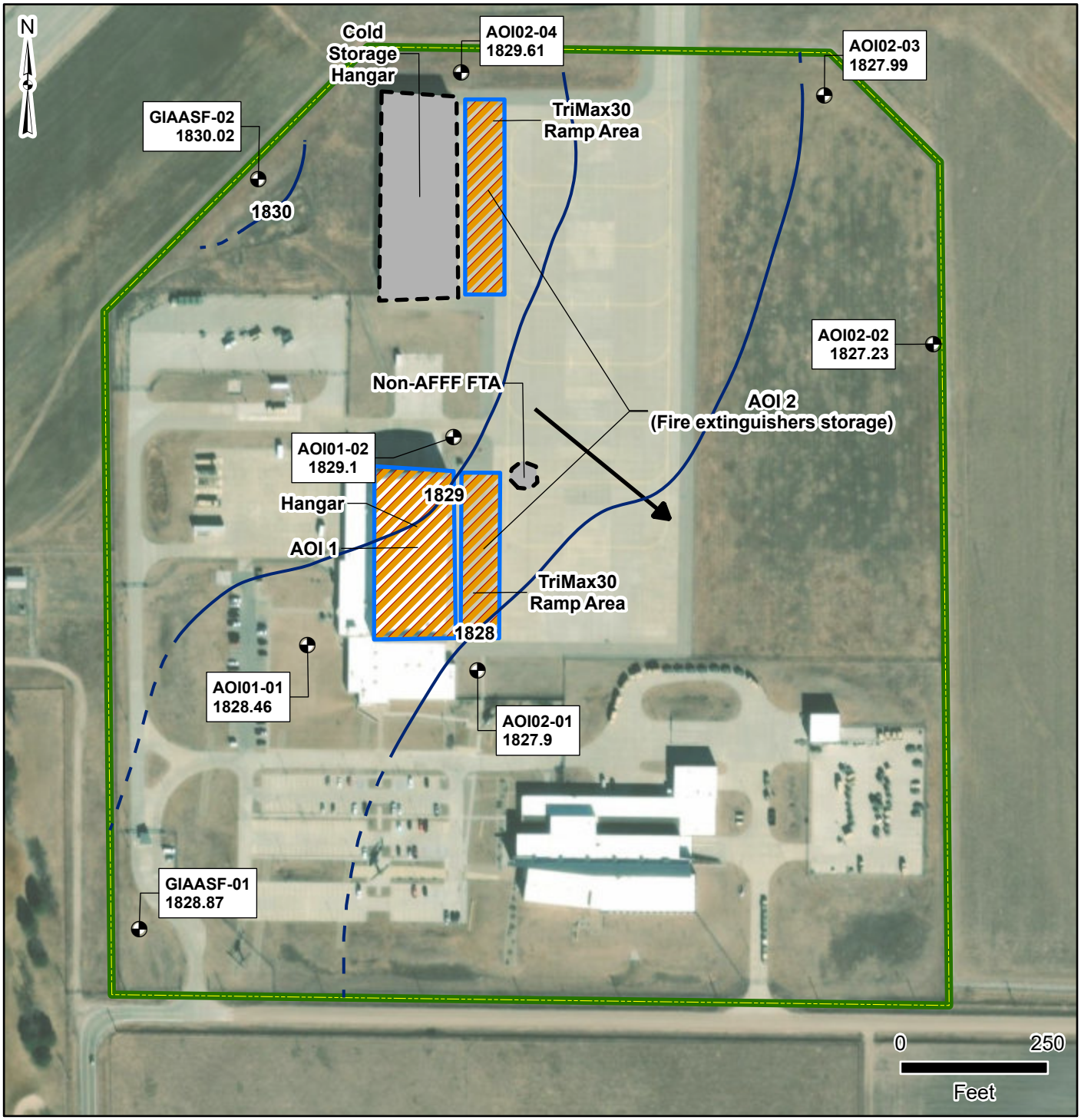
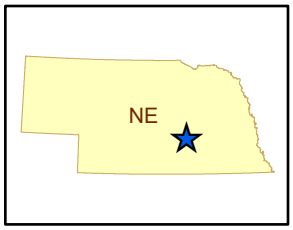
Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 2-5
Groundwater Elevations, December 2021





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

Hydrogeology
- Groundwater Flow Direction
- Groundwater Elevation Contour Interval (1 Foot)
- Dashed where Inferred

- Temporary Well Location

Note: Anticipated regional groundwater flow direction is to the northeast.

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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3. SUMMARY OF AREAS OF INTEREST

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, two potential release areas were identified at Grand Island AASF #2 and grouped into two AOIs. The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 – HANGAR FIRE SUPPRESSION SYSTEM

The Hangar Fire Suppression System was installed in 2010 when the hangar was constructed. The Hangar Fire Suppression system consists of a 250-gallon tank filled with 2 % HEF[3] concentrate. After installation in 2010, the fire suppression system was tested with a full hanger release. During the fire suppression testing, the hangar doors, which have rubber seals at the bottom of the door to prevent leaks, were closed. The HEF was directed to the trench drains in the hangar, which drain to an oil/water separator and eventually discharge to the Grand Island City Sanitary Wastewater Treatment Plant. The fire suppression system has been serviced annually by a contractor, where the system pressure is checked without releasing any of the HEF concentrate. The fire suppression system was last serviced in 2017 and is housed in a room with no floor drains adjacent to the hanger. During the visual site inspection conducted as part of the PA, there was visible corrosion and rust-stained concrete under valves in the fire suppression system room. The interviewee indicated this was most likely caused by the valve leaking HEF concentrate. Direct interviewee knowledge prior to 2017 is unavailable; therefore, it is unknown if the rubber seals at the bottom of the hangar doors leaked during the 2010 fire suppression system testing. There is a cold storage hangar located to the north of the main hangar; however, it does not contain a fire suppression system (AECOM 2020). Additionally, there is a non-AFFF FTA east of the main hangar where training exercises were conducted using ABC handheld fire extinguishers and soap/water filled TriMax™ mobile units. There has been no reported use of AFFF during training exercises in this area (AECOM 2020).

3.2 AOI 2 – TRI-MAX™ 30 FIRE EXTINGUISHERS

There are six Tri-Max™ 30 fire extinguishers filled with AFFF located at the AASF #2. It is unknown when the fire extinguishers arrived at the Facility. The Tri-Max™ 30 fire extinguishers are placed in various locations on the ramp area in front of the two hangars. One Tri-Max™ 30 extinguisher is filled with soap and water for training purposes. There were two additional empty Tri-Max™ 30 extinguishers found in crates in the cold storage hanger at the Facility that were never filled with AFFF. The fire extinguishers were serviced in 2019; the NEARNG sent the AFFF-filled Tri-Max™ 30 fire extinguishers to the Lincoln AASF #2 in Lincoln, Nebraska, where they could be sent to a contractor to undergo hydrostatic testing. There have been no reports or accounts of the Tri-Max™ 30 extinguishers ever being used or dispensed at the Facility (AECOM 2020).

[3] HEF is not expected to be PFAS-containing. In order to be conservative, the area containing this system was included in this SI.

3.3 ADJACENT SOURCES

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

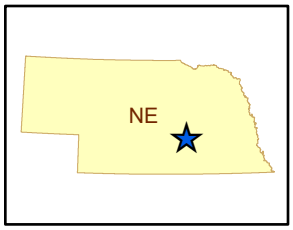
3.3.1 Central Nebraska Regional Airport

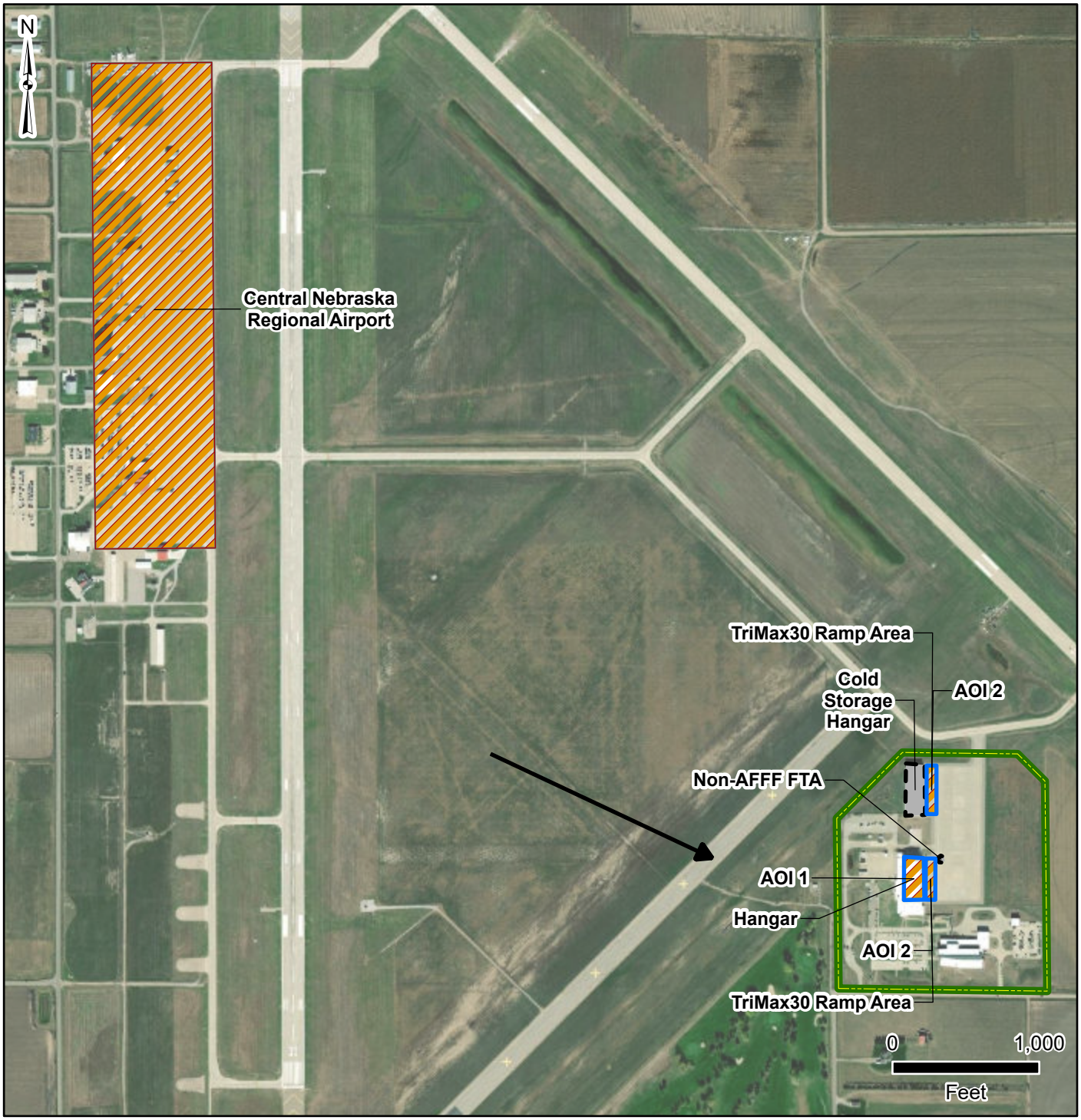
The Central Nebraska Regional Airport was constructed in 1937 and is owned and operated by the Hall County Airport Authority. The Facility is southeast and side- to down-gradient of the Central Nebraska Regional Airport. The airport does not have a fire department. There are public, corporate, and private aircraft hangars, which could potentially have AFFF fire suppression systems. It is unknown whether the adjacent Central Nebraska Regional Airport uses AFFF in any capacity (AECOM 2020).

Based on the synoptic water levels collected during SI field activities (presented in **Table 5-3**), local groundwater flow at the Facility is to the southeast. However, regional groundwater flow is reportedly to the northeast (see **Section 2.2.2**).

Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 3-1
Areas of Interest





Path: G:\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\GrandIsland\GrandIslandSIReport.aprx

Facility Data

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

Hydrogeology

- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for the Grand Island AASF #2 (AECOM 2020)
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP-QAPP Addendum (EA 2021a)
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figure 2-1**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins Lancaster Laboratories Environmental LLC, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP); Accreditation No. 0001.01 and the National Environmental Laboratory Accreditation Program (NELAP) (Commonwealth of Pennsylvania Department of Environmental Protection, Accreditation No. 36-00037). PFAS data underwent 100 % Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019b) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual (QSM) Table B-15 (2020). PFAS data were compared to applicable SLs 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 (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, Grand Island Army Aviation Support Facility #2, Nebraska*, dated September 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, Grand Island Army Aviation Support Facility #2, Nebraska*, dated October 2021 (EA 2021a)

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

- *Final Site Safety and Health Plan, Grand Island Army Aviation Support Facility #2, Nebraska*, dated August 2021 (EA 2021b)

The SI field activities were conducted on 10 and 15 December 2021 and consisted of direct-push technology (DPT) borings, 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**. Field Change Request Forms can be found in **Appendix B4**.

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 QSM Version 5.3 Table B-15 to fulfill the project DQOs:

- Twenty-five (25) soil samples from eight soil boring locations
- Eight (8) grab groundwater samples from eight temporary well locations
- Five (5) quality assurance (QA)/quality control (QC) samples

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each medium. Field documentation is provided in **Appendix B**. A log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**. Land survey data is provided in **Appendix B3**. Photographs were not collected during this field effort.

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

The U.S. Army Corps of Engineers (USACE) TPP Process, Engineer 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.

A combined TPP Meeting 1 and 2 was held on 21 September 2021, prior to SI field activities. Meeting minutes are provided in **Appendix C**. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include ARNG G9, USACE, NEARNG, and Nebraska Department of Environment and Energy representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The combined TPP Meeting 1 and 2 minutes were memorialized in the UFP-QAPP Addendum (EA 2021a). A TPP Meeting 3 will be held to discuss the results of the SI. Meeting minutes for TPP 3 will be included in Appendix C of the final report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

The 811 Nebraska Dig line was contracted to notify them of intrusive work at the Facility. Utility clearance was performed at each of the proposed boring locations on 3 December 2021 with input from the EA field team. Additionally, the first 5 ft of each boring were pre-cleared by EA's drilling subcontractor, Plains Environmental Services, Inc., 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

A sample from a potable water source at EA's office in Lincoln, Nebraska, was collected on 10 November 2021, prior to mobilization. Results of the sample confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the sample was analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15. These results can be found in **Appendix E**.

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

5.2 SOIL BORINGS AND SOIL SAMPLING

Soil samples were collected via DPT drilling methods in accordance with Standard Operating Procedure 047 *Direct-Push Technology Sampling* (EA 2021a). A GeoProbe® 5410 truck-mounted setup sampling system was used to collect continuous soil cores to the target depth. A hand auger was used to remove soil from the top 5 ft of the boring in compliance with utility clearance procedures.

Three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One boring (AOI01-02) included an additional discrete subsurface soil sample (i.e., four total samples from this boring), which was inadvertently analyzed for PFAS from the 17–18 ft bgs interval that was sampled for geotechnical analyses. One subsurface soil sample was collected approximately 1 ft above the groundwater table, and one collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Groundwater was encountered at depths ranging from 10 to 18 ft bgs during drilling. Total boring completion depths, to accommodate temporary well installation, ranged from 16 to 24 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, moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix D**.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via 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). One sample per AOI was additionally analyzed for total organic compound (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM D422) 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® 5410 truck-mounted dual-tube sampling system. 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 intervals, using a peristaltic pump with PFAS-free HDPE tubing. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected in a separate container. 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).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. One field blank (FB) was collected 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.

DPT borings were converted to temporary wells, which were subsequently abandoned in accordance with the UFP-QAPP Addendum (EA 2021a) using bentonite chips and surface completion material (native topsoil material) at completion of sampling activities.

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor facility-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements were collected on 15 December 2021 from the newly installed temporary monitoring wells, taken from the survey mark on the northern side of the well casing. Groundwater elevation data are provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R10 real-time kinematic differential global positioning system. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum of 1988 (vertical). Surveying data were collected on 15 December 2021 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. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the UFP-QAPP Addendum (EA 2021a).

Soil IDW (i.e., soil cuttings) were left in place at the point of source. The soil cuttings were distributed on the downgradient side of the borehole. Liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were containerized in a properly labeled 55-gallon drum, which was labeled and secured outside the Grand Island NEARNG Armory building (north of building). The liquid IDW container remains at the Facility awaiting off-site disposal following USACE and ARNG approval of a Letter Work Plan for IDW Disposal. The Letter Work Plan will be submitted for review and approval upon issuance of the Draft Final SI Report.

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

5.7 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 National Environmental Laboratory Accreditation Program-certified laboratory.

A select number of soil samples were also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D, and grain size by ASTM D422.

5.8 DEVIATIONS FROM UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on field conditions. These deviations were discussed between EA, ARNG, and USACE. One deviation from the UFP-QAPP Addendum is noted below:

- AOI01-02: This location was moved to a grassy area on the northeast side of the hangar within a preferential drainage pathway resulting from a potential release from the hangar. This change is noted in the Field Change Request Form provided in **Appendix B4**.

Additional deviations occurred that were not documented on a Field Change Request Form. Field duplicates for soil samples were collected at a frequency 10% as specified in the UFP-QAPP Addendum (EA 2021a); however, one of the duplicate sample containers was broken during shipment to the laboratory. Therefore, the actual field duplicate frequency for soil samples was 7.7%. Additionally, photographs of field activities were not collected during the SI; therefore, no photographic log is presented in this SI report. The UFP-QAPP Worksheet 17 indicated that a subsample of each groundwater sample would be collected in a separate container and undergo a shaker test to identify if there is any foaming. However, the separate containers were shipped to the laboratory for prescreening rather than conducting a shaker test in the field. The prescreen sample for AOI01-01-GW was inadvertently not provided to the laboratory.

Table 5-1.
Samples by Medium
Grand Island AASF #2, Grand Island, Nebraska
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (QSM Version 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
AOI01-01-SB-0-2	12/10/2021	0-2	X				
AOI01-11-SB-0-2	12/10/2021	0-2	X				Field duplicate of AOI01-01-SB-0-2
AOI01-01-SB-8-9	12/10/2021	8-9	X				
AOI01-01-SB-17-18	12/10/2021	17-18	X				
AOI01-02-SB-0-2	12/10/2021	0-2	X				
AOI01-02-SB-6-7	12/10/2021	6-7	X				
AOI01-02-SB-14-15	12/10/2021	14-15	X				
AOI01-02-SB-17-18	12/10/2021	17-18	X	X	X	X	
AOI2-01-SB-0-2	12/10/2021	0-2	X				
AOI2-01-SB-6-7	12/10/2021	6-7	X				
AOI2-01-SB-14-15	12/10/2021	14-15	X				
AOI2-01-SB-17-18	12/10/2021	17-18		X	X	X	Not analyzed for PFAS
AOI2-02-SB-0-2	12/10/2021	0-2	X				
AOI2-02-SB-5-6	12/10/2021	5-6	X				
AOI2-02-SB-9-10	12/10/2021	9-10	X				
AOI2-03-SB-0-2	12/10/2021	0-2	X				
AOI2-13-SB-0-2	12/10/2021	0-2	X				Field duplicate of AOI2-03-SB-0-2
AOI2-03-SB-4-5	12/10/2021	4-5	X				
AOI2-03-SB-9-10	12/10/2021	9-10	X				
AOI2-04-SB-0-2	12/10/2021	0-2	X				
AOI2-04-SB-6-7	12/10/2021	6-7	X				
AOI2-04-SB-12-13	12/10/2021	12-13	X				
GIAASF-01-SB-0-2	12/10/2021	0-2	X				

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (QSM Version 5.3 Table B-15)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
GIAASF-12-SB-0-2	12/10/2021	0-2					Not analyzed, no intact containers received
GIAASF-01-SB-5-6	12/10/2021	5-6	X				
GIAASF-01-SB-9-10	12/10/2021	9-10	X				
GIAASF-02-SB-0-2	12/10/2021	0-2	X				
GIAASF-02-SB-4-5	12/10/2021	4-5	X				
GIAASF-02-SB-9-10	12/10/2021	9-10	X				
Groundwater Samples							
AOI01-01-GW	12/10/2021	-	X				
AOI01-02-GW	12/10/2021	-	X				
AOI2-01-GW	12/10/2021	-	X				
AOI2-02-GW	12/10/2021	-	X				
AOI2-03-GW	12/10/2021	-	X				
AOI2-04-GW	12/10/2021	-	X				
GIAASF-01-GW	12/10/2021	-	X				
GIAASF-11-GW	12/10/2021	-	X				Field duplicate of GIAASF-01-GW
GIAASF-02-GW	12/10/2021	-	X				
Blank Samples/Source Water							
GIAASF-FB-12102021	12/10/2021	-	X				Field Blank
GIAASF-EB-12102021	12/10/2021	-	X				Equipment Blank
DECON_TEST_11102021	11/10/2021	-	X				Source Water

Table 5-2. Soil Boring Depths and Temporary Well Screen Intervals
Grand Island AASF #2, Grand Island, Nebraska
Site Inspection Report

Area of Interest	Boring ID	Soil Boring Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)
1	AOI01-01	24	18-23
	AOI01-02	20	14-19
2	AOI02-01	20	14-19
	AOI02-02	16	9-14
	AOI02-03	16	9-14
	AOI02-04	20	12-17
Facility Boundary	GIAASF-01	16	10-15
	GIAASF-02	16	9-14

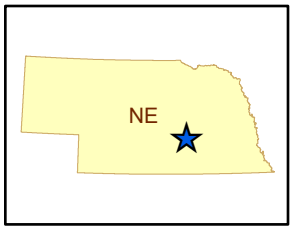
Table 5-3.
Groundwater Elevations
Grand Island AASF #2, Grand Island, Nebraska
Site Inspection Report

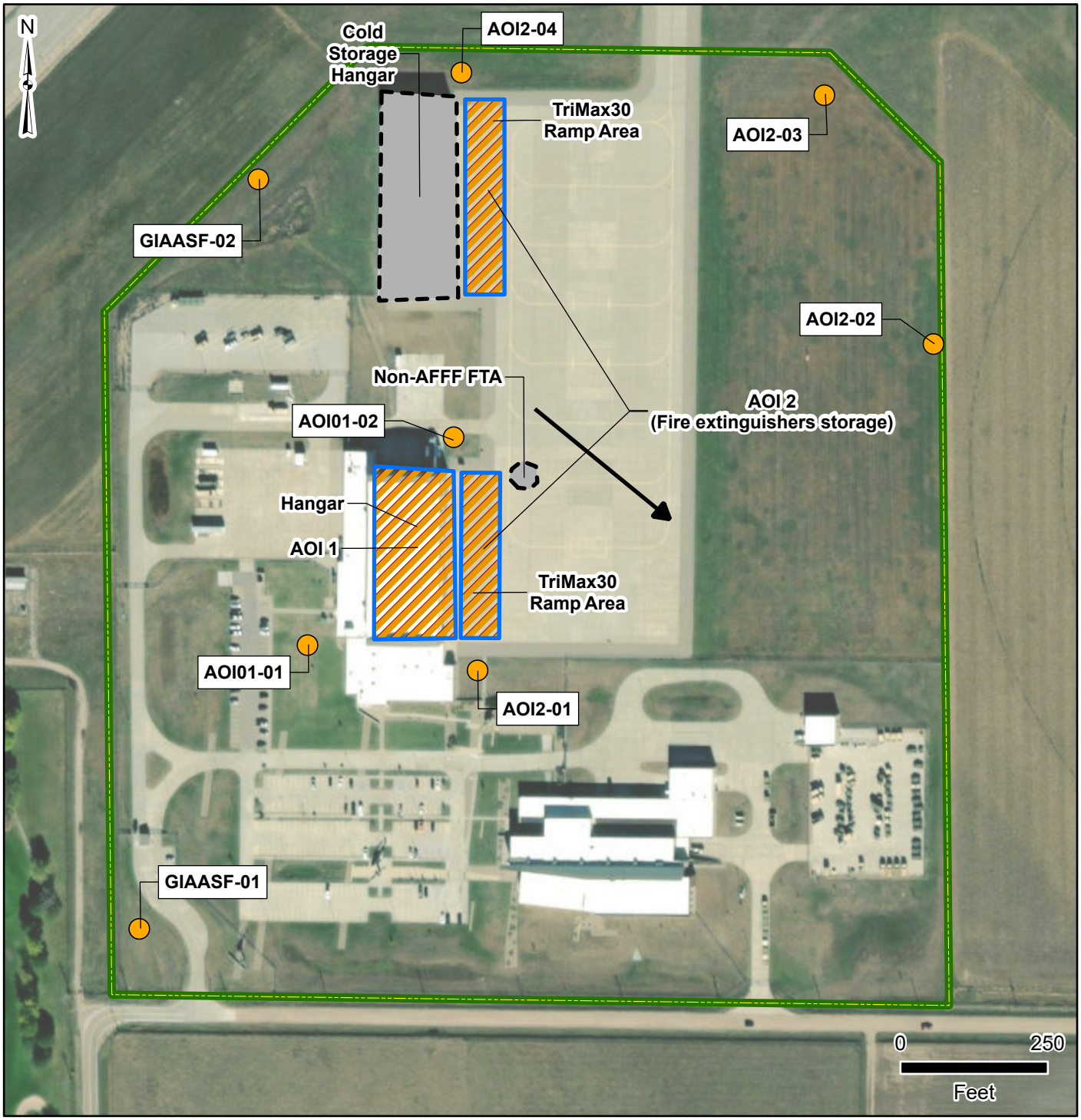
Monitoring Well ID	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
AOI01-01	1847.07	18.61	16.57	1828.46
AOI01-02	1846.88	17.78	15.87	1829.10
AOI02-01	1845.80	17.90	16.43	1827.90
AOI02-02	1838.79	11.56	10.34	1827.23
AOI02-03	1839.23	11.24	9.29	1827.99
AOI02-04	1843.91	14.30	12.4	1829.61
GIAASF-01	1840.76	11.89	11.19	1828.87
GIAASF-02	1841.11	11.09	9.65	1830.02

Notes:
amsl = Above mean sea level
bgs = Below ground surface
btoc = Below top of casing ground
ft = feet
ID = Identification

Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 5-1
Site Inspection Sample Locations





Path: G:\Federal\Nationwide\PFAS\MAES_6342503831\PROJECTS\SIReport\GrandIsland\GrandIslandSIReport.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:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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6. SITE INSPECTION RESULTS

This section presents the analytical results of the SI for each AOI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Sections 6.3 and 6.4**. **Tables 6-2 through 6-5** present results for the relevant compounds in soil or groundwater. Tables that contain all results are provided in **Appendix E**, and the laboratory reports are provided in **Appendix F**.

6.1 SCREENING LEVELS

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

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 Screening Levels in Groundwater and Soil using EPA'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.

µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the Facility; the residential scenario is applied to surface soil results (0 to 2 ft bgs) and the industrial/commercial worker scenario is applied to shallow and deep 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, grain size, and pH, which are important for evaluating transport through the soil medium. **Appendix E** contains the results of the TOC and pH sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. 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 (e.g., pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC 2018).

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes the Hangar Fire Suppression System equipped with HEF. The detected compounds are summarized in **Tables 6-2 through 6-5**. 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 through 6-4** summarize the soil results.

Soil was sampled at two boring locations associated with the potential release area at AOI 1. Soil was sampled from three intervals at each of the boring locations: surface (0–2 ft bgs), shallow subsurface soil (less than 15 ft bgs), and deep subsurface soil (up to 18 ft bgs). One boring (AOI01-02) included an additional discrete subsurface soil sample (i.e., four total samples from this boring).

Of the two surface soil samples and five subsurface soil samples collected from AOI 1, none of the relevant compounds were detected in surface soil or subsurface soil.

6.3.2 AOI 1 – Groundwater Analytical Results

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

Groundwater samples were collected from two temporary wells at AOI 1 during the SI activities. PFBS and PFHxS were detected in groundwater at both temporary monitoring well locations below the SLs of 601 ng/L and 39 ng/L, respectively. PFBS was detected at concentrations

ranging from 1.6 J ng/L to 5.2 ng/L. PFHxS was detected at concentrations ranging from 3.3 ng/L to 6.2 ng/L. PFOA was detected (3.7 ng/L) in one temporary monitoring well location (AOI01-02) below the SL (6 ng/L). PFOS and PFNA were not detected in groundwater at any location within AOI 1.

6.3.3 AOI 1 – Conclusions

Based on the results of the SI, none of the relevant compounds were detected soil samples. Three relevant compounds (PFBS, PFHxS, and PFOA) were detected in groundwater at the source area (AOI 1); however, concentrations did not exceed the associated SLs. Therefore, further evaluation of AOI 1 is not warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2, which includes storage of six Tri-Max™ 30 fire extinguishers. The detected compounds are summarized in **Tables 6-2 through 6-5**. Soil and groundwater results are presented on **Figures 6-1 through 6-7**.

6.4.1 AOI 2 – Soil Analytical Results

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

Soil was sampled at four boring locations associated with the potential release area at AOI 2. Soil was sampled from three intervals at each of the boring locations: surface (0–2 ft bgs), shallow subsurface soil (less than 7 ft bgs), and deep subsurface soil (up to 15 ft bgs).

Of the four surface soil samples and eight subsurface soil samples collected from AOI 2, none of the relevant compounds were detected in surface soil or subsurface soil.

6.4.2 AOI 2 – Groundwater Analytical Results

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

Groundwater samples were collected from four temporary wells at AOI 2 during the SI activities. PFHxS and PFOS were detected in one temporary monitoring well at maximum concentrations of 130 ng/L and 9 ng/L, respectively, which exceeded the applicable SLs. PFBS was detected in groundwater at all temporary monitoring well locations below the SL (601 ng/L). PFOA was detected in groundwater at two temporary monitoring well locations (AOI02-03 and AOI02-04) below the SL (6 ng/L). PFNA was not detected in groundwater at any location within AOI 2.

6.4.3 AOI 2 – Conclusions

Based on the results of the SI, none of the relevant compounds were detected in soil samples. Two relevant compounds (PFHxS and PFOS) were detected in groundwater at the source area

(AOI 2) at concentrations above their respective SLs. Based on the exceedances of the SLs in ground water, further evaluation of AOI 2 is warranted.

6.5 BOUNDARY SAMPLE LOCATIONS

This section presents the analytical results for soil and groundwater in comparison to SLs for samples collected at facility boundary. The detected compounds are summarized in **Tables 6-2 through 6-5**. Soil and groundwater results are presented on **Figures 6-1 through 6-7**.

6.5.1 Boundary Locations – Soil Analytical Results

Figures 6-1 through 6-5 present the ranges of detections in soil. **Tables 6-2 and 6-4** summarize the soil results.

Soil boundary sample locations were comprised of two boring locations (GIAASF-01 and GIAASF-02) along the facility boundary. Boring location GIAASF-01 was along the western/side gradient boundary of the facility. Boring location GIAASF-02 was along the northern/upgradient boundary of the facility. Soil was sampled from three intervals in the three borings; surface (0–2ft bgs), shallow subsurface soil (less than 6 ft bgs), and deep subsurface soil (less than 10 ft bgs).

Of the two surface soil samples and four subsurface soil samples collected from the Facility boundary, none of the relevant compounds were detected in surface soil or subsurface soil.

6.5.2 Boundary Locations – Groundwater Analytical Results

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

Groundwater samples were collected from two temporary well locations along the western/side gradient and northern/upgradient boundaries of the Facility. PFOS (5.5 ng/L) was detected in groundwater at the northern/upgradient temporary monitoring (GIAASF-02) well location above the SL of 4 ng/L. PFBS (maximum concentration of 4.4 ng/L), PFHxS (maximum concentration of 12 ng/L), and PFOA (maximum concentration of 3.5 ng/L) were detected in groundwater at both boundary temporary monitoring well locations below the applicable SLs. The observed PFBS, PFHxS, and PFOA concentrations were higher at GIAASF-01 as compared to GIAASF-02. PFNA (maximum concentration of 0.7 J ng/L) was detected in groundwater at GIAASF-02 below the SL. PFNA was not detected in groundwater at GIAASF-01.

6.5.3 Boundary Locations – Conclusions

Based on the results of the SI, none of the relevant compounds were detected soil samples. One relevant compound (PFOS) was detected in groundwater along the northern/upgradient Facility boundary at concentrations above the associated SL Therefore, further evaluation of the Facility boundary area is needed to determine contribution from potential upgradient sources.

Table 6-2. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Grand Island AAFS #2

Location ID			AOI01-01		AOI01-01		AOI01-02		AOI2-01		AOI2-02		AOI2-03		AOI2-03		AOI2-04		GIAASF-01		GIAASF-02	
Sample Name			AOI01-01-SB-0-2		AOI01-11-SB-0-2		AOI01-02-SB-0-2		AOI2-01-SB-0-2		AOI2-02-SB-0-2		AOI2-03-SB-0-2		AOI2-13-SB-0-2		AOI2-04-SB-0-2		GIAASF-01-SB-0-2		GIAASF-02-SB-0-2	
Parent Sample ID					AOI01-01-SB-0-2										AOI2-03-SB-0-2							
Sample Date			12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021	
Depth (ft bgs)			0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**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)	1,900	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	13	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	19	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

2. The Screening Levels for soil are based on a residential scenario for incidental ingestion of contaminated soil.
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.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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Table 6-3. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, Grand Island AAFS #2

		Location ID	AOI01-01		AOI01-02		AOI01-02		AOI2-01		AOI2-02		AOI2-03		AOI2-04		GIAASF-01		GIAASF-02	
		Sample Name	AOI01-01-SB-8-9		AOI01-02-SB-14-15		AOI01-02-SB-6-7		AOI2-01-SB-6-7		AOI2-02-SB-5-6		AOI2-03-SB-4-5		AOI2-04-SB-6-7		GIAASF-01-SB-5-6		GIAASF-02-SB-4-5	
		Parent Sample ID																		
		Sample Date	12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021	
		Depth (ft bgs)	8-9		14-15		6-7		6-7		5-6		4-5		6-7		5-6		4-5	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**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)	25,000	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
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.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, Grand Island AAFS #2

		Location ID	AOI01-01		AOI01-02		AOI2-01		AOI2-02		AOI2-03		AOI2-04		GIAASF-01		GIAASF-02	
		Sample Name	AOI01-01-SB-17-18		AOI01-02-SB-17-18		AOI2-01-SB-14-15		AOI2-02-SB-9-10		AOI2-03-SB-9-10		AOI2-04-SB-12-13		GIAASF-01-SB-9-10		GIAASF-02-SB-9-10	
		Parent Sample ID																
		Sample Date	12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021	
		Depth (ft bgs)	17-18		17-18		14-15		9-10		9-10		12-13		9-10		9-10	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**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)	25,000	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1,600	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	µg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
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.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).

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Table 6-5. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection, Grand Island AASF #2

		Location ID	AOI01-01		AOI01-02		AOI2-01		AOI2-02		AOI2-03		AOI2-04		GIAASF-01		GIAASF-01		GIAASF-02	
		Sample Name	AOI01-01-GW		AOI01-02-GW		AOI2-01-GW		AOI2-02-GW		AOI2-03-GW		AOI2-04-GW		GIAASF-01-GW		GIAASF-11-GW		GIAASF-02-GW	
		Parent Sample ID															GIAASF-01-GW			
		Sample Date	12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021		12/10/2021	
Analyte	**Screening Level[1]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**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	ng/L	5.2		1.6	J	8		3.2		0.62	J	1.6	J	4.4		4.8		1.1	J
Perfluorohexanesulfonic acid (PFHxS)	39	ng/L	6.2		3.3		130		8.5		0.83	J	2		12		12		2.2	
Perfluorononanoic acid (PFNA)	6	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.7	J
Perfluorooctanesulfonic acid (PFOS)	4	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	9		ND	U	ND	U	5.5	
Perfluorooctanoic acid (PFOA)	6	ng/L	ND	U	3.7		ND	U	ND	U	4.2		1.3	J	3.5		3		0.95	J

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. July 2022.

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

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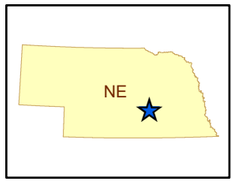
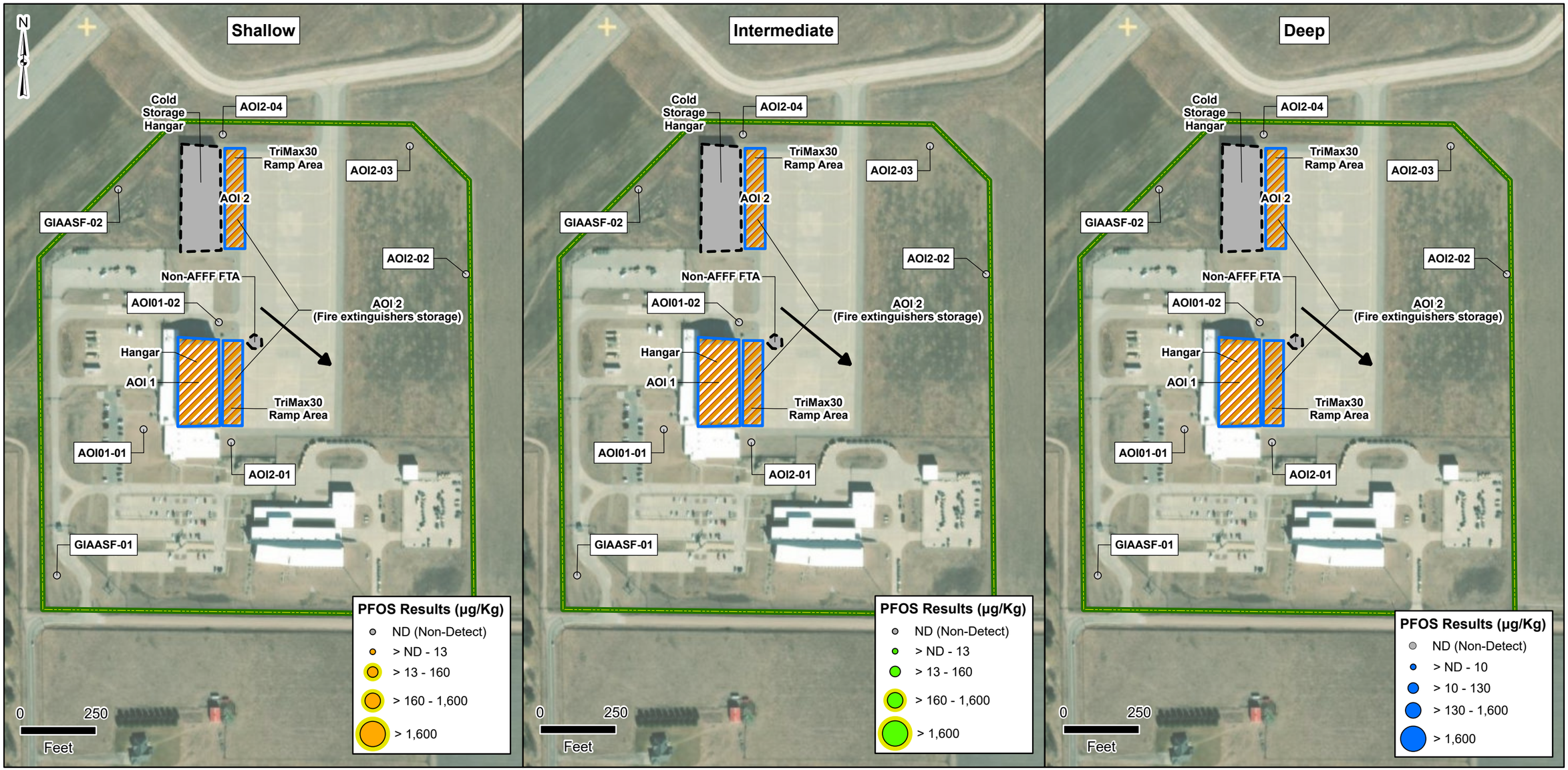
Grand Island AASF #2, Nebraska

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 2022
AECOM 2019

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

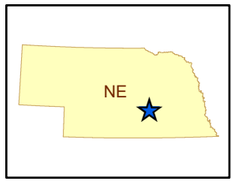
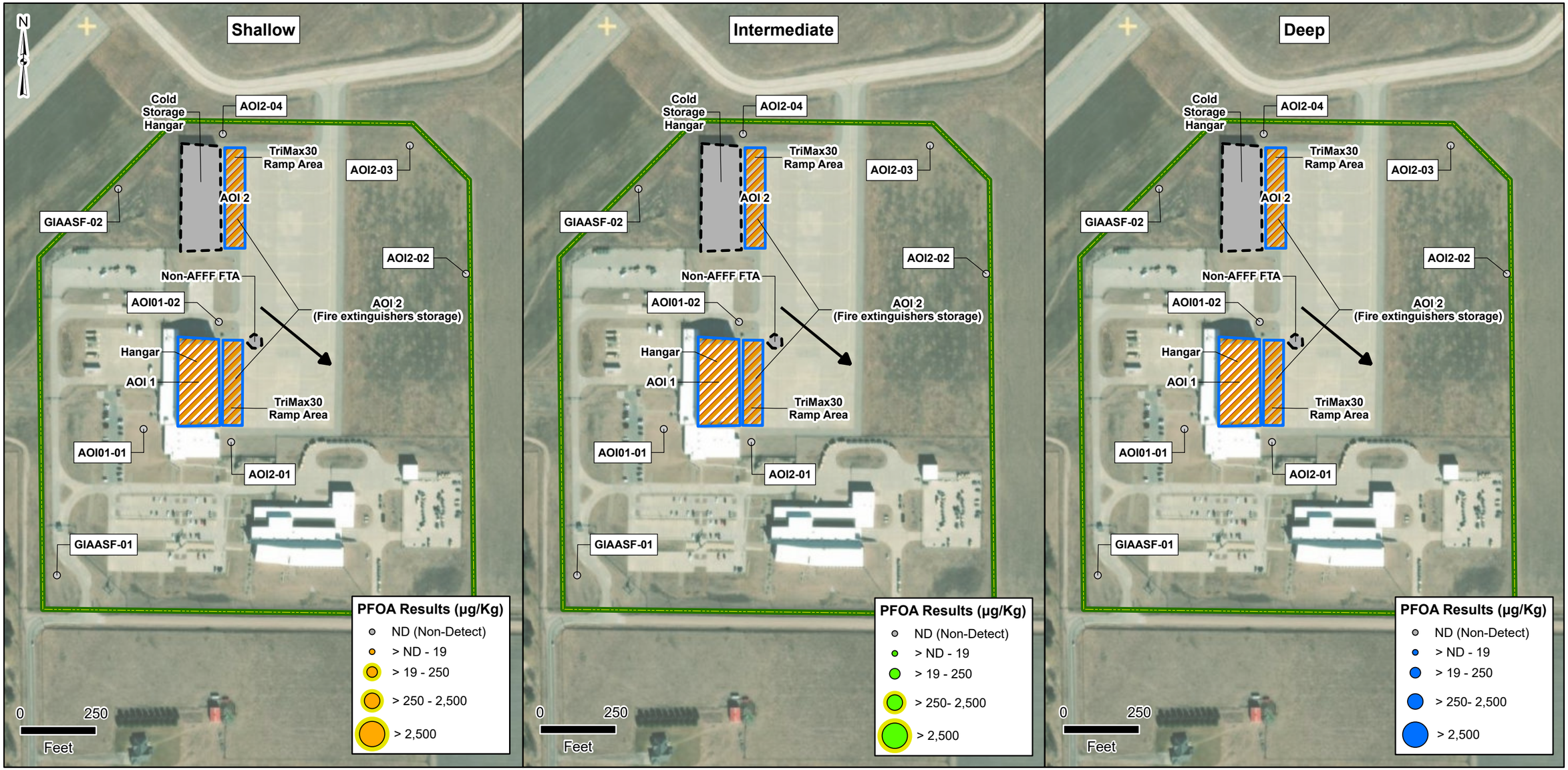


Figure 6-2
PFOA Detections in Soil



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

Hydrogeology
- Groundwater Flow Direction

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 2022
AECOM 2019

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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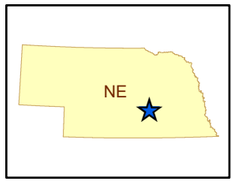
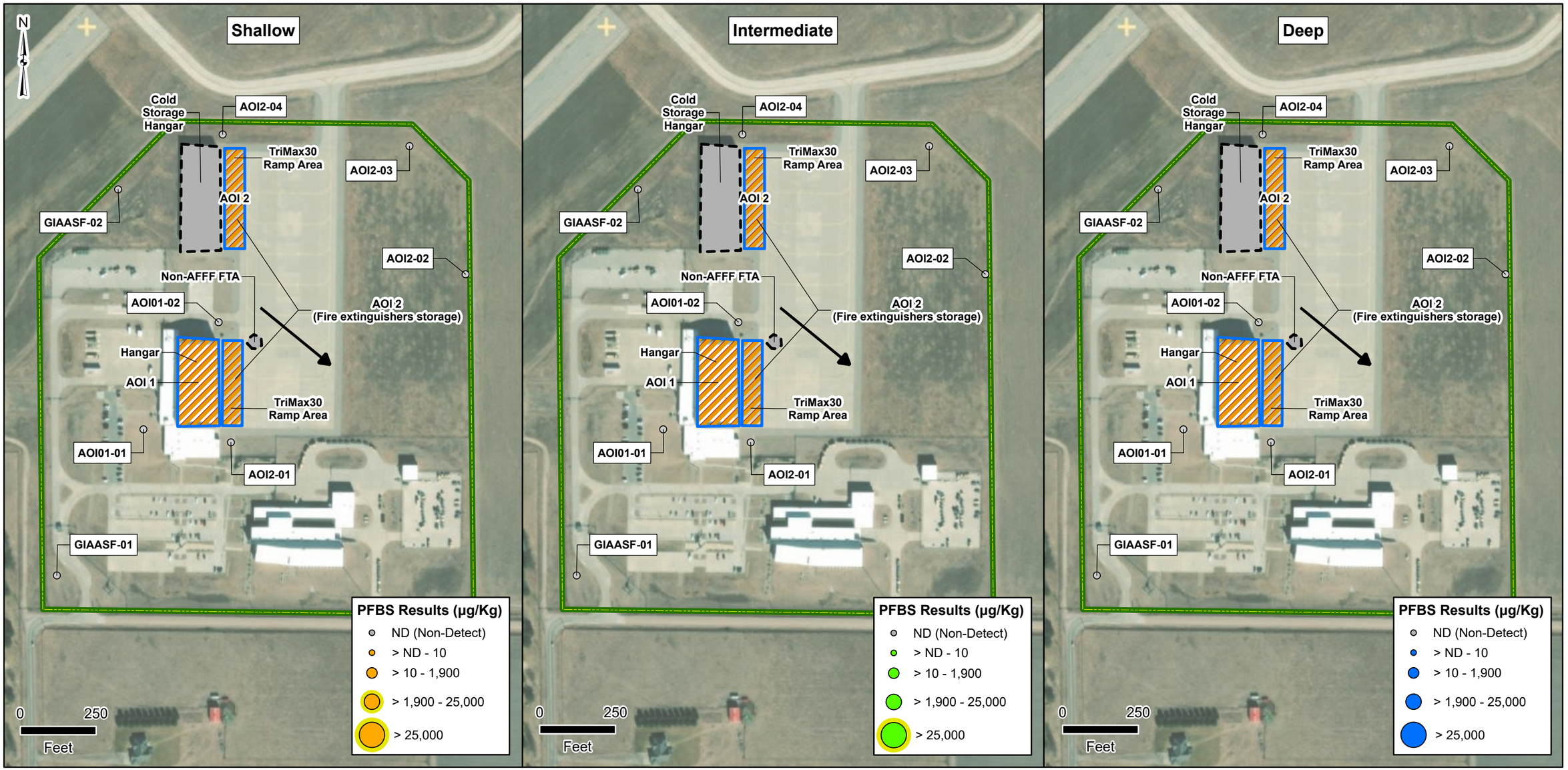
Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 6-3
PFBS Detections in Soil





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 2022
AECOM 2019

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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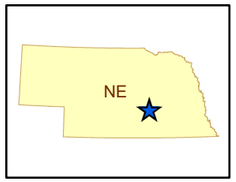
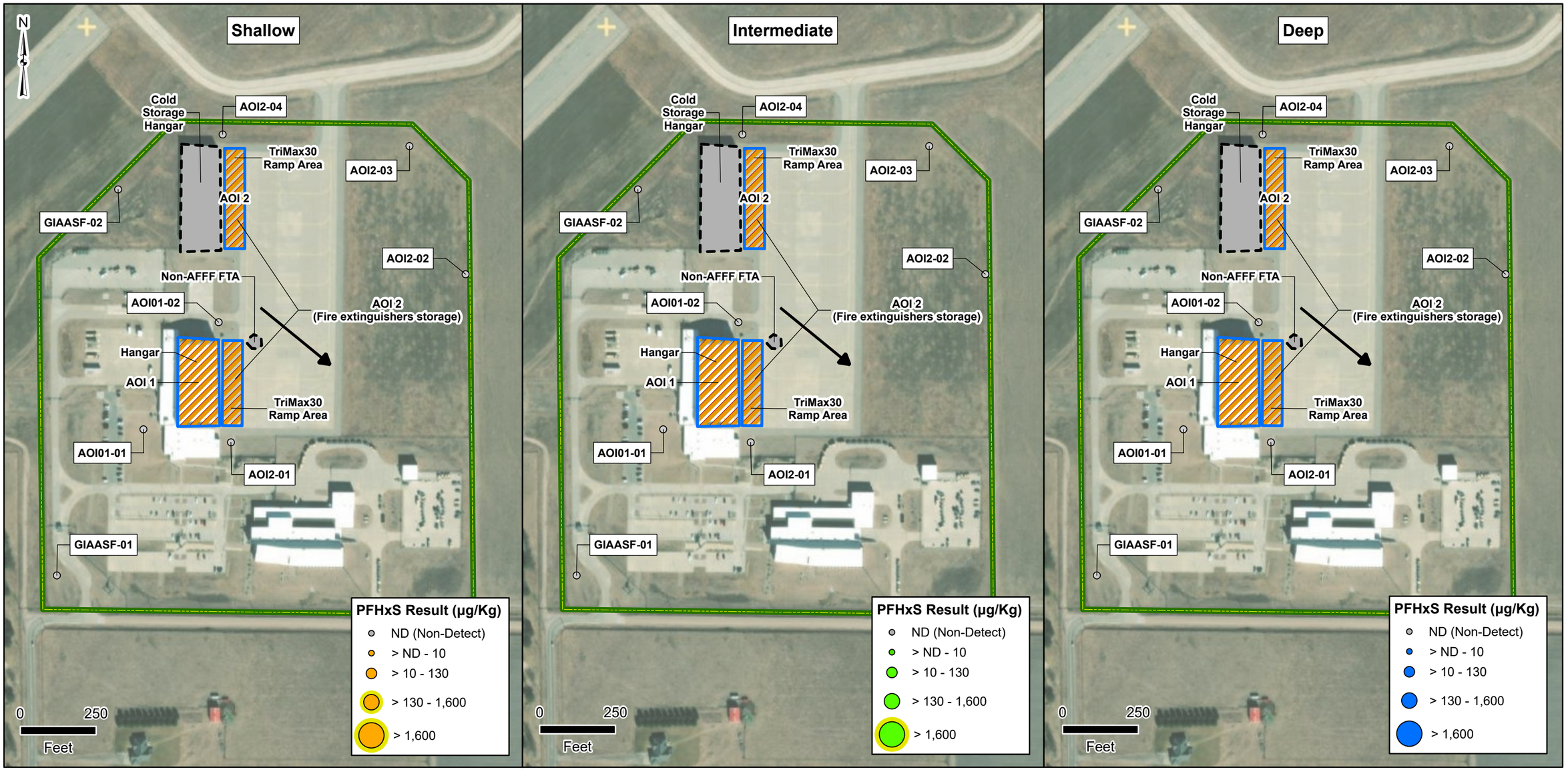
Army National Guard Site Inspections
Site Inspection Report
Grand Island AASF #2, Nebraska

Figure 6-4
PFHxS Detections in Soil





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 2022
AECOM 2019

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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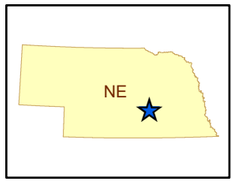
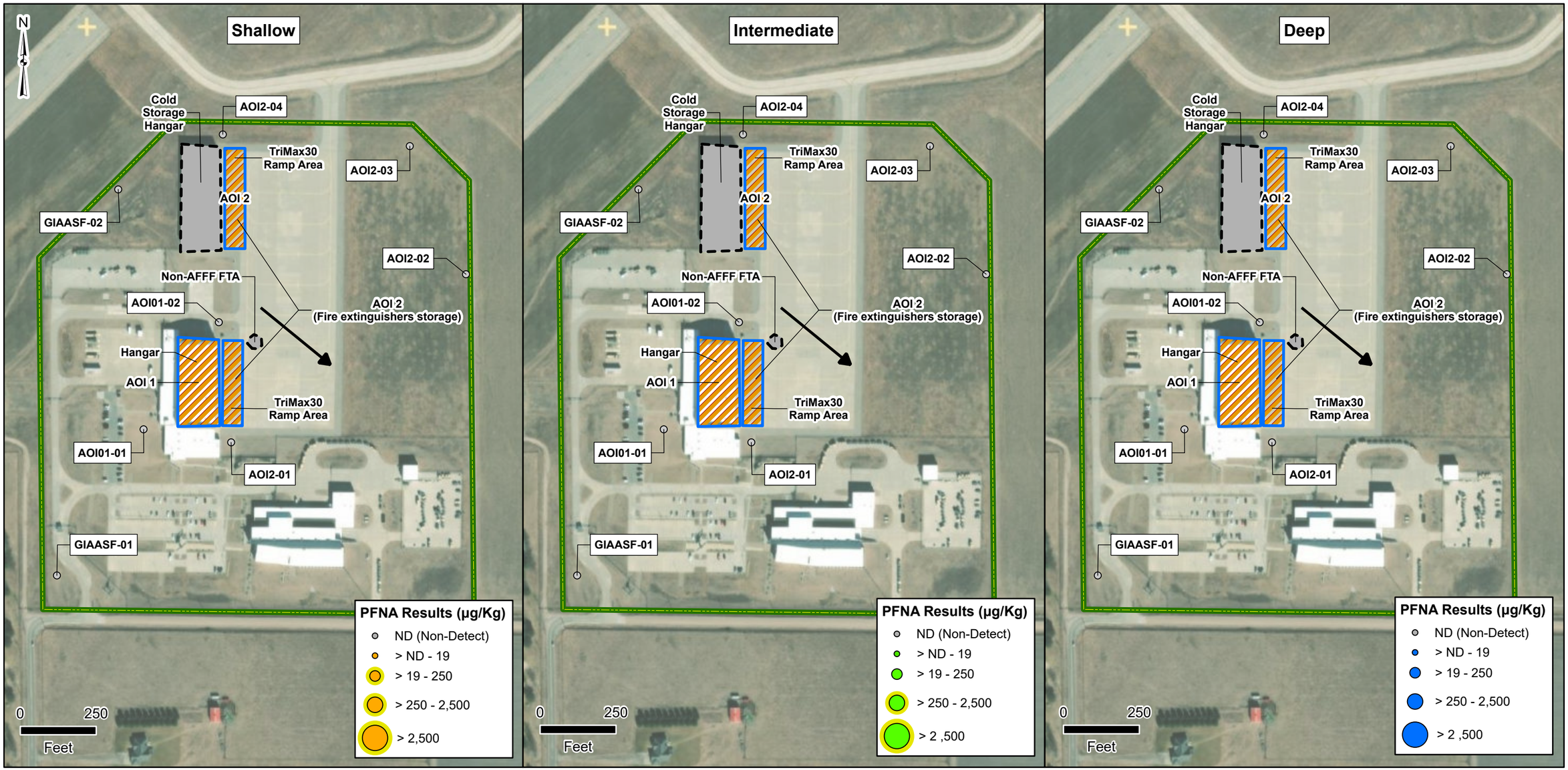
Site Inspection Report
Grand Island AASF #2, Nebraska

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 2022
AECOM 2019

Date:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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Army National Guard Site Inspections
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Grand Island AASF #2, Nebraska

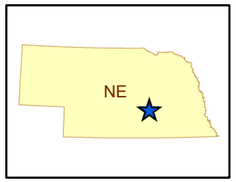
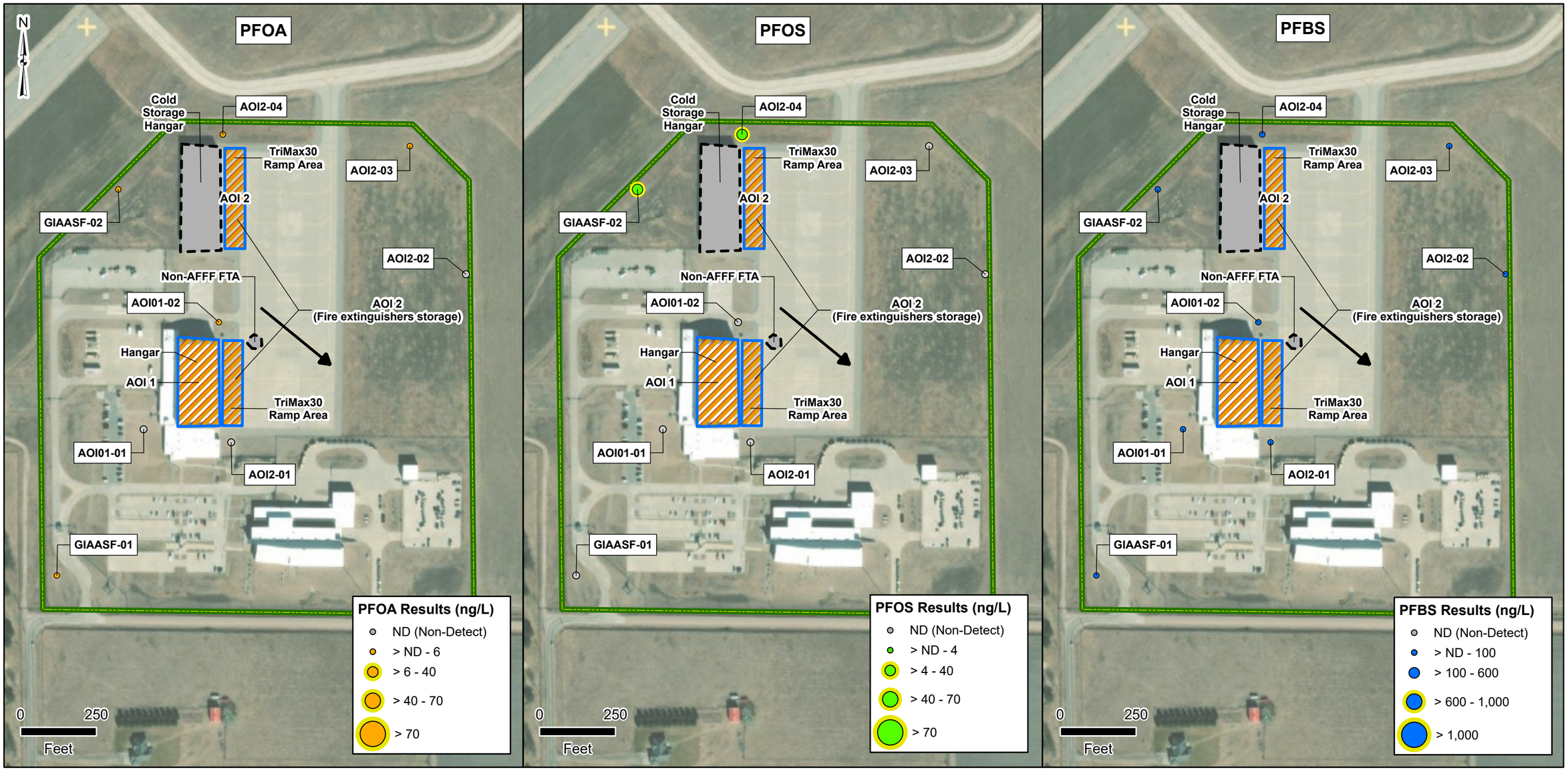


Figure 6-6
PFOA, PFOS and PFBS Detections in Groundwater



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:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

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Site Inspection Report
Grand Island AASF #2, Nebraska

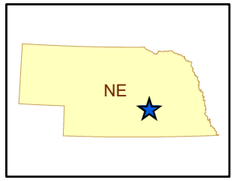
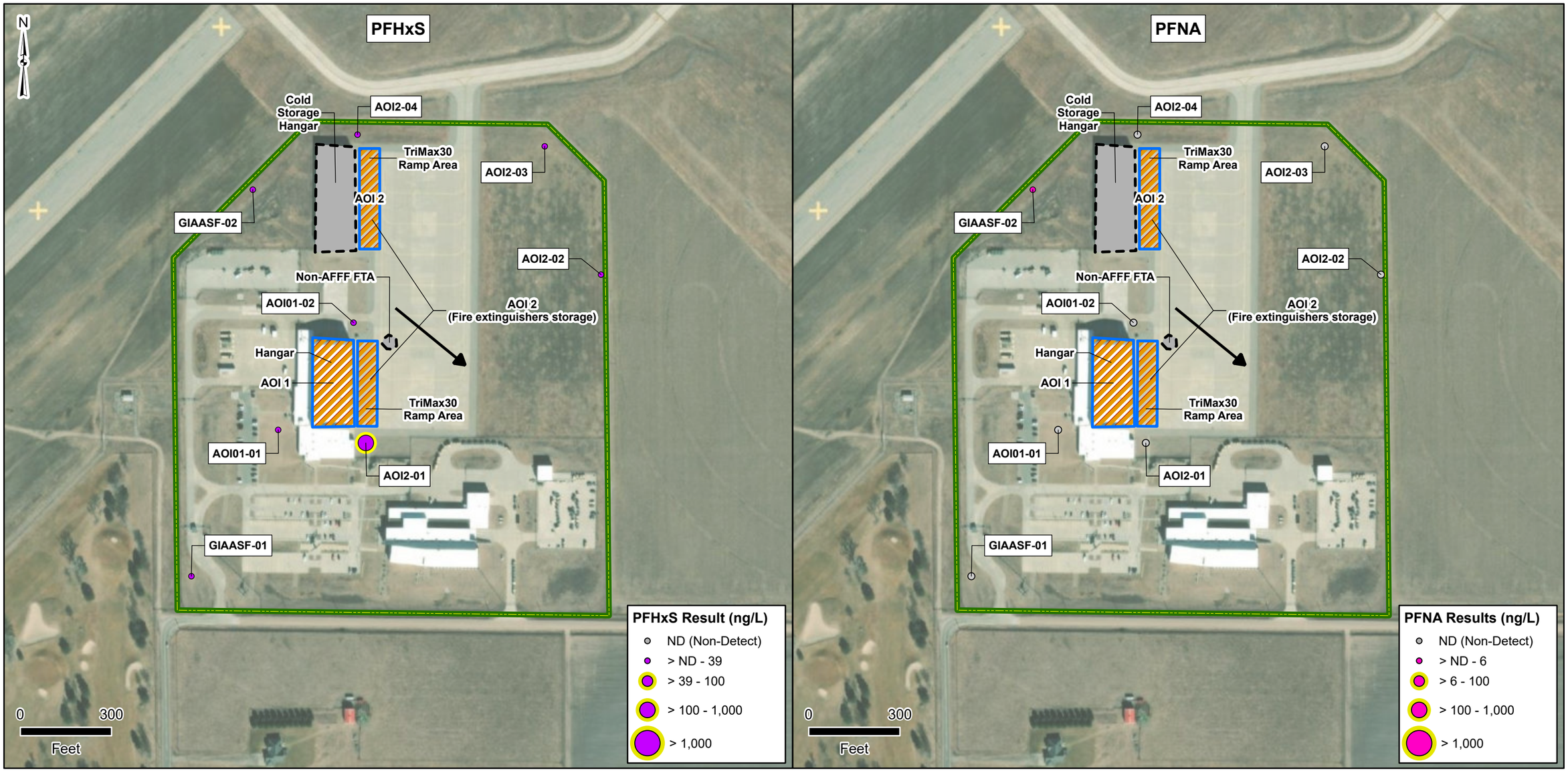


Figure 6-7
PFHxS and PFNA Detections in Groundwater



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:.....January 2023
Prepared By:.....EA
Prepared For:.....USACE
Projection:.....WGS 84 UTM 14N

Path: G:\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\GrandIsland\GrandIslandSIReport.aprx

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7. EXPOSURE PATHWAYS

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

1. Contaminant source
2. Environmental fate and transport
3. Exposure point
4. Exposure route
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 a RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the Facility include site workers (e.g., facility staff and visiting soldiers), 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 relevant compounds in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the hangar fire suppression system which was tested with a full hanger release. HEF is not expected to be PFAS-containing. In order to be conservative, the area containing this system was included in the SI.

No relevant compounds were detected in surface or subsurface soil at AOI 1. Therefore, all exposure pathways for receptors to surface and subsurface soil are considered incomplete. The CSM is presented in **Figure 7-1**.

7.1.2 AOI 2

AOI 2 consists of the area where six Tri-Max™ 30 fire extinguishers filled with AFFF are located at the AASF #2 and where releases through training or storage may have occurred.

No relevant compounds were detected in surface or subsurface soil at AOI 2. Therefore, all exposure pathways for receptors to surface and subsurface soil are considered incomplete. The CSM is presented in **Figure 7-2**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1

PFBS, PFHxS, and PFOA were detected in groundwater collected from temporary wells associated with AOI 1; however, no concentrations exceeded their respective SLs. Due to the depth to groundwater at AOI 1 (17 to 18 ft bgs), it is unlikely that construction workers would be exposed to PFAS through the groundwater via ingestion during trenching activities. Additionally, there is no active construction underway at the Facility. Therefore, the exposure pathway for construction workers via the ingestion of groundwater is considered to be incomplete. There are no known potable wells present at the Facility; therefore, the exposure pathways for the site workers/trespasser are considered to be incomplete. Downgradient potable wells were identified as shown in **Figure 2-3**. Due to the detections of relevant compounds in groundwater which are present below the SLs, the groundwater pathway is considered potentially complete to off-facility residents. The CSM is presented in **Figure 7-1**.

7.2.2 AOI 2

PFHxS and PFOS were detected in groundwater above the applicable SLs collected from two temporary wells associated with AOI 2. PFBS and PFOA were also detected in groundwater collected from temporary wells associated with AOI 2; however, concentrations were below the applicable SLs. Although there is no active construction underway at the Facility, due to the relatively shallow depth to groundwater (11 ft bgs), it is possible that future construction workers would be exposed to PFAS in groundwater via ingestion during trenching activities. Therefore, the exposure pathway for construction workers via the ingestion of groundwater is considered to

be incomplete for current construction workers, but potentially complete with exceedances of SL for future construction workers. There are no known potable wells present at the Facility; therefore, the exposure pathways for the site workers/trespasser, are considered to be incomplete. Downgradient potable wells were identified as shown in **Figure 2-3**. Due to the detections of relevant compounds in groundwater above SLs, the groundwater pathway is considered potentially complete to off-facility residents. The CSM is presented in **Figure 7-2**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

No surface water or sediment samples were collected during the SI. However, the SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

No relevant compounds were detected in surface or subsurface soil samples collected at AOI 1, AOI 2, or the Facility Boundary that could potentially be transported to surface water bodies via stormwater runoff. Although an intermittent tributary (Warm Slough) is located south of the Facility, there are no surface water features located on the Facility. Therefore, the exposure pathways for site workers/trespassers, construction workers, off-site residents, and off-site recreational users are considered incomplete for both AOI 1 and AOI 2. The CSMs for AOI 1 and AOI 2 are presented on **Figure 7-1** and **Figure 7-2**, respectively.

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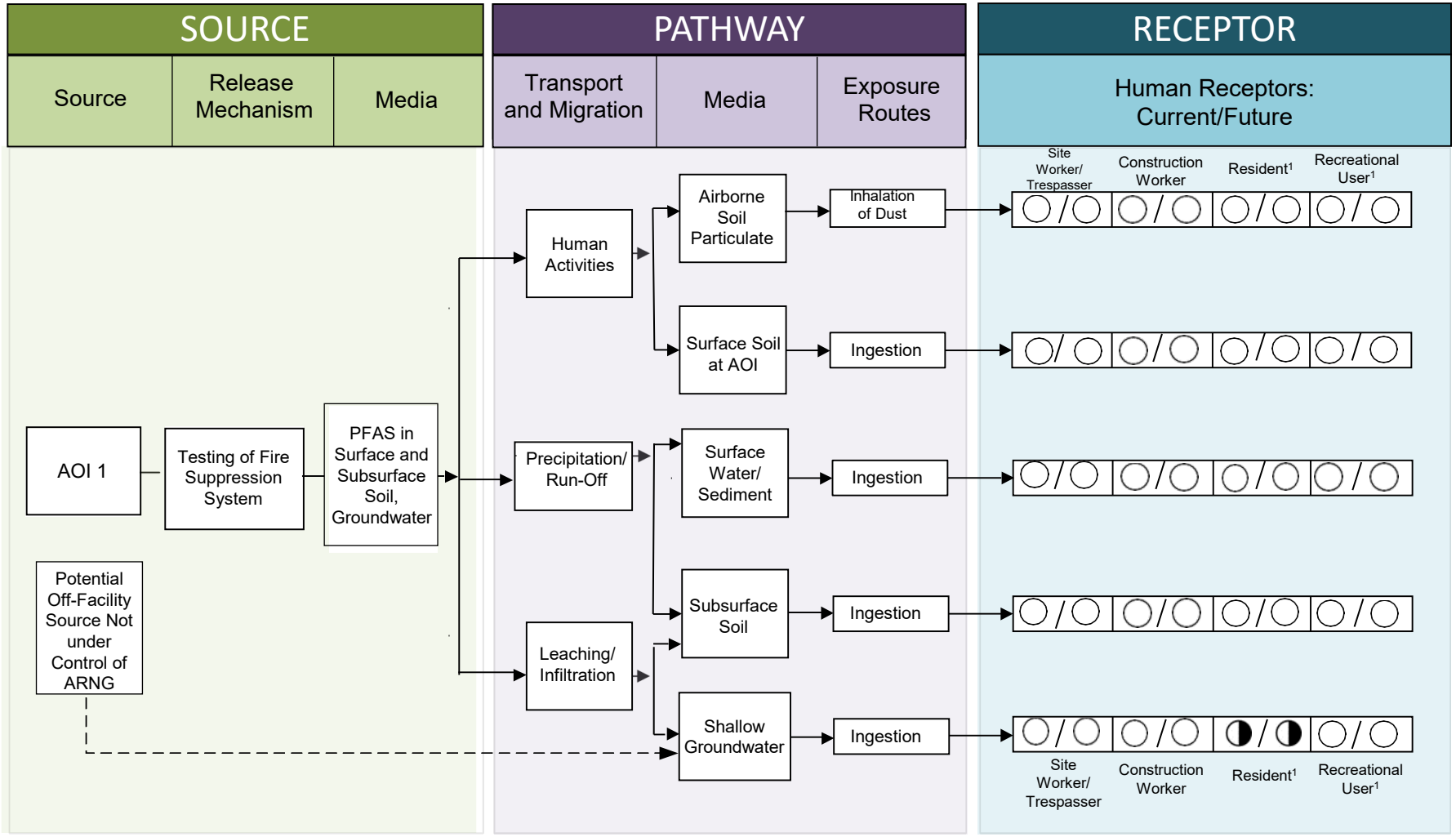

LEGEND

- 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

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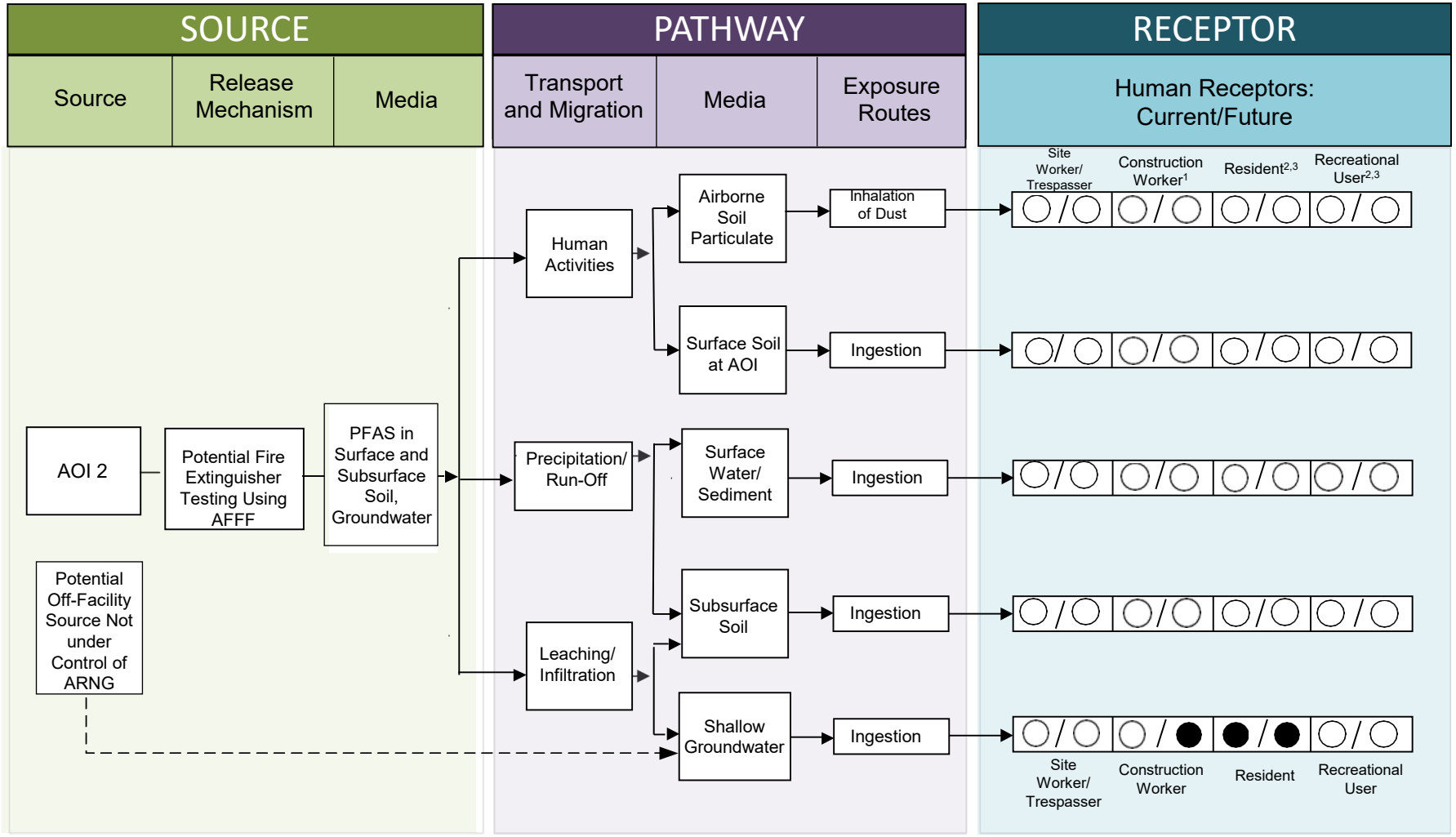

LEGEND

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

Notes:

1. No current active construction at the facility.
2. The resident and recreational users refer to off-site receptors.
3. Inhalation of dust for off-site receptors is likely insignificant.

Figure 7-2
Conceptual Site Model
AOI 2

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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 on 10 and 15 December 2021. The SI field activities included soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 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 24 compounds by LC/MS/MS compliant with QSM Version 5.3 Table B-15 as follows:

- Twenty-five (25) soil samples from eight boring locations;
- Eight (8) grab groundwater samples from eight temporary well locations; and
- Five (5) QA/QC samples were collected

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

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA is not warranted for AOI 1 at this time; however, further evaluation under CERCLA is warranted for AOI 2 (including the Facility boundary) (see **Table 8-1**). Based on the CSMs developed and revised based on the SI findings, there is potential for exposure to groundwater at AOI 2 and at the facility boundary from sources on the facility resulting from historical DoD activities. Sample chemical analytical concentrations collected during this SI were compared against the project SLs for soil and groundwater, as described in **Table 6-1**.

- AOI 1:

    — PFBS, PFHxS, and PFOA were detected in groundwater near the source area (AOI 1). PFBS and PFHxS were detected below applicable SLs in both of the temporary wells

associated with the AOI with maximum concentrations of 5.2 ng/L and 6.2 ng/L, respectively. PFOA was detected below the applicable SL in one temporary well associated with the AOI with a maximum concentration of 3.7 ng/L. Based on the results of the SI, further evaluation of AOI 1 is not warranted in the RI.

— The relevant compounds were not detected in any of the surface or subsurface soil samples collected at AOI 1.

- AOI 2:

— PFBS, PFHxS, PFOS, and PFOA were detected in groundwater near the source area at AOI 2. PFHxS and PFOS were detected above applicable SLs (39 ng/L and 4 ng/L, respectively) in two of the temporary wells associated with the AOI with maximum concentrations of 130 ng/L and 9 ng/L, respectively. PFBS and PFOA were detected below the applicable SLs in three of the temporary wells associated with the AOI with maximum concentrations of 8 ng/L and 4.2 ng/L, respectively. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

— The relevant compounds were not detected in any of the surface or subsurface soil samples collected at AOI 2.

- The Facility boundary:

— PFBS, PFHxS, PFNA, PFOS, and PFOA were detected in groundwater near the Facility boundary and upgradient of the known source areas. PFOS was detected above the applicable SL (4 ng/L) in one temporary well associated with the Facility boundary with a maximum concentration of 5.5 ng/L. Relevant compounds were detected in groundwater upgradient of AOI 1 and AOI 2, which suggests potential contributions from off-facility sources.

— The relevant compounds were not detected in any of the surface or subsurface soil samples collected at the Facility boundary.

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

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

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

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Groundwater Facility Boundary	Future Action
1	Hangar Fire Suppression System	○	◐	●	No Further Action
2	Tri-Max ™ 30 Fire Extinguishers	○	●	●	Proceed to RI

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

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9. REFERENCES

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