FINAL
Site Inspection Report
Gowen Field Army Aviation Support Facility
Boise, Idaho

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

May 2023

Prepared for:

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Table of Contents

Appendices

Figures

Tables

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms 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
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
DO	dissolved oxygen
DQO	data quality objective
DUA	data usability assessment
EDR™	Environmental Data Resources, Inc.™
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
ERB	equipment rinsate blank
FedEx	Federal Express
FRB	field reagent blank
FTA	Fire Training Area
GPS	Global positioning system
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDANG	Idaho Air National Guard
IDARNG	Idaho Army National Guard
IDW	investigation-derived waste
IDWR	Idaho Department of Water Resources
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MIL-SPEC	military specification
ND	non-detect
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
ORP	oxidation-reduction potential
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
PQAPP	Programmatic UFP-QAPP
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

Executive Summary

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

The PA identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. However, based on subsequent discussions with ARNG following the completion of the PA, it was determined that only AOI 1 (see **Table ES-2**) will be assessed under this SI. AOI 2 and AOI 3 are being assessed by IDANG under a separate SI and are considered to be adjacent sources under this SI. The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at Gowen Field AASF in Boise, Idaho and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1. The Gowen Field AASF will also be referred to as the "facility" throughout this document.

The Boise Airport is located in Ada County, within the boundary of the city of Boise, in western Idaho. In 1941, the facility was constructed for use as an air base and named Gowen Field, which remained an active Army Air Corps Base during WWII. The IDANG and the Idaho ARNG (IDARNG) are located on separate parcels within the former Gowen Field. The IDARNG property at Gowen Field AASF consists of approximately 240 acres and is located adjacent to the Boise Airport and IDANG property. The IDARNG facility consists mostly of operations and support buildings, as well as an AASF (Idaho National Guard, 2019).

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

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

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

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

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

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

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

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

AOI	Potential Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary	Future Action
1	AASF	●	◐	◐	Proceed to RI

Legend:
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the 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) on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at Gowen Field AASF in Boise, Idaho. Gowen Field AASF is also referred to as the "facility" throughout this document.

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

1.2 SI Purpose

A PA was performed at Gowen Field AASF (AECOM Technical Services, Inc. [AECOM], 2019) that identified three Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically: AOI 1: the Army Aviation Support Facility (AASF), AOI 2: the Central Drainage Ditch, and AOI 3: Idaho Air National Guard (IDANG) AFFF Dump 1. AOIs 2 and 3 are being assessed by IDANG under a separate SI and are consequently considered to be adjacent sources under this SI. The objective of the SI is to identify whether there has been a release to the environment from AOI 1 and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

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

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2. Facility Background

2.1 Facility Location and Description

The Boise Airport is located in Ada County within the boundary of the city of Boise, in western Idaho (**Figure 2-1**). The Gowen Field AASF property is leased from the city of Boise by the Idaho ARNG (IDARNG) and the IDANG. The Army Reserves, Navy Reserves, and Marine Reserves are IDARNG tenants. The IDANG-managed portion of Gowen Field AASF is directly adjacent to the IDARNG facility.

Construction of the facility began at Boise Air Base in 1941. Later that year, the facility was named Gowen Field, which remained an active Army Air Corps Base during World War II. After the end of the war, Gowen Field was turned back over to the city of Boise in 1946. The IDANG was established concurrently with the US Air Force in 1947 and moved to Gowen Field shortly after. The IDARNG was a tenant under the IDANG's lease until 2013, when a separate lease with the city of Boise was established. The IDARNG currently occupies approximately 240 acres on the southwestern portion of Gowen Field AASF (Idaho National Guard, 2019).

2.2 Facility Environmental Setting

Gowen Field AASF is in the Boise River Valley, on a generally flat plot of land with an average elevation of about 2,800 feet above mean sea level (amsl) (**Figure 2-2**). Mountains to the south and north of the facility rise up to elevations of 8,500 feet amsl. The Boise River is to the north and northeast of the facility, at distances varying between 3.5 and 4 miles. The Snake River is to the southwest of the facility, at distances greater than 20 miles.

2.2.1 Geology

Gowen Field AASF is located in the Boise River Valley, within the broader Western Snake River Plain, just south of the foothills of the mountainous terrain of central Idaho. The Western Snake River Plain is a fault-bounded, intracontinental rift basin (Wood & Clemens, 2002). The Pliocene and Pleistocene geologic history of the Boise Valley includes crustal rifting, basin filling, river incision, eruptions of lava flows, and major flooding.

The Chalk Hills Formation constitutes the earliest sedimentation in the basin, characterized by a succession of fluvio-lacustrine sediments resulting from interconnected lakes, meandering streams, and lacustrine delta deposits. These lake levels declined and resulted in erosion of part of the Chalk Hills Formation in the Boise area. A subsequent rise in lake level led to the deposition of another lacustrine sequence, which includes shoreline sands, small deltas, and lacustrine mud in the deeper parts of the basin. These deposits are mapped as the Terteling Springs Formation (Wood & Clemens, 2002).

Spillover of this ancient lake system resulted in a slow lowering of the lake level and filling of the shrinking lake basins with interbedded mud and sand of lacustrine delta systems of the Glenns Ferry Formation (Wood & Clemens, 2002). In more recent geologic history, terraces were formed by rapid fluvial downcutting followed by coarse gravel deposition (Othberg, 1994). Gowen Field AASF sits above these Pleistocene-age terrace gravel deposits (**Figure 2-3**), which consist of unconsolidated silt, sand, and well-sorted gravel beds characterized by cut-and-fill channels, inclined bedding, and cross-bedding.

Soil borings were completed at depths of 50 feet below ground surface (bgs) (two borings) and 220 feet bgs (one boring) during the SI at Gowen Field AASF. Borings found well-graded gravel with sand as the dominant lithology of the unconsolidated sediments to 50 feet bgs. Well-graded

sand with silt was found as the dominant lithology from 50 to 220 feet bgs. Intermittent isolated layers of silt, gravel, and poorly graded silty sand were also observed in the deeper boring. These observations are consistent with the understood fluvial depositional environment. Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

Groundwater beneath the facility has been reported to range from as shallow as 120 feet bgs to depths greater than 200 feet bgs. The facility is currently supplied potable water by Suez Water Idaho, Inc. (Suez), a local provider, although some wells on-site were reported as being used for irrigation. The facility has used both shallow and deep aquifers for its water supply in the past.

The aquifer system in the Boise area consists of complex series of interbedded, tilted, faulted, and eroded sediments extending to depths of over 6,000 feet bgs. These sedimentary aquifers contain shallow, local flow systems, and a deeper, regional groundwater system (Petrich, 2004). Aquifer units are not well-defined in the region due to discontinuities and the lack of consistently identifiable contacts between units. Generally, highest groundwater production is from discrete sand aquifers located within the fluvial-lacustrine deposits within the upper 800 feet of the aquifer.

Within the Boise area, multiple wells have tapped into a deep aquifer (at 660 feet bgs). These wells are capable of yielding 180 to 1,400 gallons per minute (gpm). Suez wells are located approximately 2 miles north of the facility and have a 9.1-million-gallons-per-day capacity (Leidos, 2014). Several wells listed for domestic use are located 2-3 miles to the north of and 1-3 miles to the east of the facility (**Figure 2-3**). Many wells of unknown use are located around the facility, within a 1-mile buffer (Idaho Department of Water Resources [IDWR], 2019). It is possible that some of these wells are used for potable purposes. Suez Water Idaho owns and operates an out-of-use domestic water well at the former Gowen Field (Byrd Well), located approximately 2,700 ft upgradient from the former Fire Training Area (FTA). Byrd Well has reportedly not been used since 2005. An additional off-Base well (Mac Well), owned and operated by Suez Water Idaho, is reportedly active and located approximately 4,000 ft west of the western boundary of the former Gowen Field (Leidos, 2019).

Results of groundwater characterization and modeling in this area show that the deeper aquifer flows south toward the Snake River (Petrich, 2004; Petrich & Urban, 2004). This work indicates downward vertical hydraulic gradients in the study area and suggests that recharge to the deep aquifer occurs primarily in the eastern portion of the Boise River Valley, where parts of the Idaho Group are exposed at the earth's surface and ultimately discharge into major rivers. The study also indicated horizontal hydraulic conductivity ranging between 1 to 10 feet per day (ft/day) (from 0 to 200 feet bgs), 10 to 100 ft/day (from 200 to 400 feet bgs), and 100 to 1,000 ft/day (from 400 to 1200 feet bgs). In the area of Gowen Field, discharge to the Snake River drives the deep groundwater flow direction to the southwest. No portion of the recharge zone for the deep aquifer is coincident with Gowen Field.

Recharge to the shallow groundwater systems in the Boise River Valley occurs primarily from seepage from the canals and infiltration, mostly associated with irrigation. This creates variable shallow groundwater flow directions across the Boise River valley (Petrich & Urban, 2004). A groundwater study performed in the late 20th century of various locations in the southern portion of Gowen Field indicated that shallow groundwater flow within the immediate vicinity of the AASF is to the northeast. Groundwater elevations recorded during a 2018 PFOS/PFOA SI conducted by IDANG at Gowen Field ANG identified a general easterly groundwater flow. Furthermore, the SI indicated that south of Gowen Field AASF, groundwater flows toward the northeast. However, the SI found that immediately north of Gowen Field AASF, the groundwater flow direction appears to shift toward the east (**Figure 2-3**). The 2018 PFOS/PFOA SI indicated that deep groundwater

was encountered (Leidos, 2019); however, the easterly and variable flow direction appears consistent with the shallow aquifer.

Depths to groundwater were measured in the new monitoring well installed under this SI (GOWEN-MW001) along with seven existing Air National Guard (ANG monitoring wells, including MW-1-PRL01, RIMW-2, MW-3-PRL01, RIMW-4, MW-5-PRL01, MW-BOI10-01, and MW-BOI11-01 (**Figure 2-4**). A synoptic depth to groundwater gauging event was conducted on 12 November 2021, and depths to water ranged from 163.71 to 206.77 feet below top of casing. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate groundwater flow direction is to the northeast in the southwestern part of the facility before flowing to the southeast direction in the northeastern part of the facility. Hydraulic gradient values measured 0.0051 feet/foot between MW-BOI11 and the 2,650-foot contour in the southwest, while measuring 0.0012 feet/foot between MW-BOI05 and MW-BOI10 in the northeast. The groundwater flow directions appear consistent with the findings of the 2018 PFOS/PFOA SI conducted by IDANG. Additionally, the groundwater depths and flow direction may have been affected due to clustered IDANG well data, irrigation recharge, and nearby pumping wells.

2.2.3 Hydrology

Gowen Field AASF is located within the Boise River drainage basin, a semi-arid area that annually receives 11.84 inches of precipitation (National Oceanic and Atmospheric Administration [NOAA], 2020). Surface drainage at Gowen Field AASF is controlled both by the local surface topography and a system of drainage ditches. The most important drainage ditch, the Central Drainage Ditch, generally traverses the facility, with flow from east to west. This drainage ditch originates as the remnant of an intermittent stream on the adjacent IDANG property before traversing the IDARNG property and discharging to an off-facility retention pond, a stormwater control feature that maintains a semi-permanent pool of water (**Figure 2-5**). The retention pond is not owned by the IDARNG.

Fivemile Creek, an intermittent stream that flows only during periods of heavy rainfall or snowmelt runoff, runs parallel to and south of West Gowen Road. The creek originates in the mountains, approximately 3 miles away, and discharges into the New York Canal, approximately 1 mile downstream of the property. This canal eventually discharges into the Boise River, which is used for crop irrigation (Leidos, 2014). None of these surface water features are used for drinking water in Boise.

2.2.4 Climate

Gowen Field AASF is located within Ada County, Idaho, which has a semi-arid climate with hot and dry summers and moderately cold winters. The average annual temperature is 53.5 degrees Fahrenheit (°F), ranging from an average winter low of 26.3 °F to an average summer high of 89.1 °F. The mean annual precipitation in Boise is approximately 11.73 inches, with most of the precipitation occurring from November through May each year (NOAA, 2020). Gowen Field AASF averages over 39 days with more than 0.1 inches of precipitation. Ada County only receives an annual snowfall average of 12.48 inches (Leidos, 2019).

2.2.5 Current and Future Land Use

Currently, the IDARNG property at Gowen Field AASF consists of approximately 240 acres and is located adjacent to the Boise Airport and IDANG property. The IDARNG facility consists mostly of operations and support buildings, as well as an AASF; access to the facility is controlled. Land surrounding the facility to the north, east, and west is used for industrial purposes and airport operations. Land to the south of the facility is used for agricultural purposes and livestock grazing.

Residential areas are not located immediately adjacent to the facility. The closest residential areas are located approximately 0.75 miles to the north of the northern edge of the facility.

Gowen Field AASF is located entirely within Ada County, within the city of Boise, Idaho. Based on official 2017 estimates from the US Census Bureau, Boise's population is 226,570, and it is the largest city in Idaho (US Census Bureau, 2017). The IDARNG has been operating at Gowen Field AASF since 1946, and land use is not expected to change in the future.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

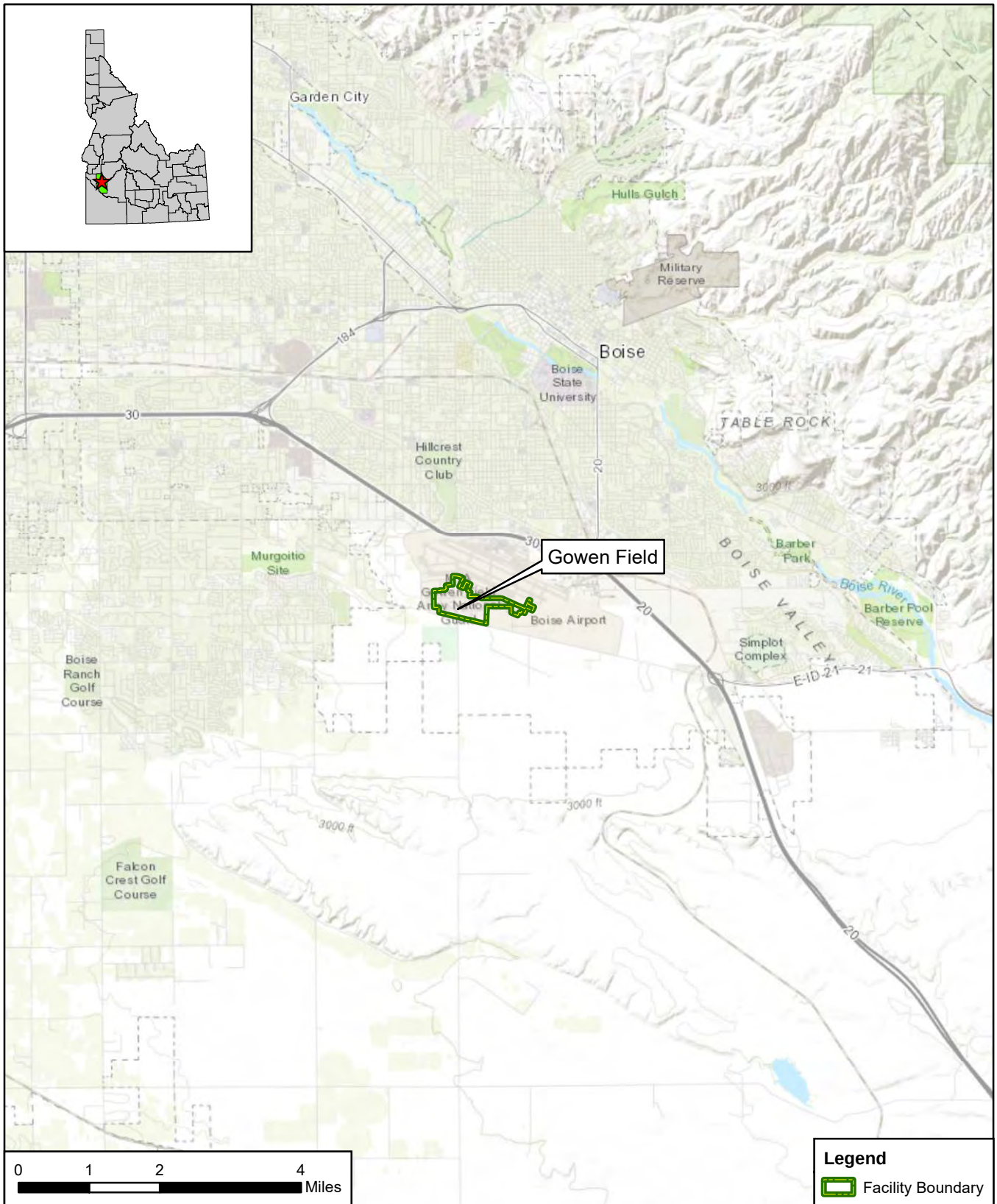
A wildlife survey has not occurred at the facility, and the facility does not have any significant areas of habitat. The following species have not been identified at the facility but may be present in the surrounding area.

The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Ada County, Idaho (US Fish and Wildlife Service [USFWS], 2021).

- **Insects**: Monarch butterfly, *Danaus plexippus* (candidate)
- **Mammals**: Gray wolf, *Canis lupus* (under review)
- **Birds**: Yellow-billed cuckoo, *Coccyzus americanus* (threatened); Greater sage-grouse, *Centrocercus urophasianus* (resolved taxon)
- **Snails**: Snake River physa snail, *Physa natricina* (endangered)
- **Flowering plants**: Slickspot peppergrass, *Lepidium papilliferum* (threatened)

2.3 History of PFAS Use

PFAS-containing materials were potentially released to soil, sediment, and groundwater within the boundary of Gowen Field AASF through nozzle testing and fuel spill response between 2005 and 2015. Three AOIs were identified during the PA based on preliminary data and assumed groundwater flow directions. These AOIs included the AASF (AOI 1), the Central Drainage Ditch (AOI 2), and IDANG AFFF Dump 1 (AOI 3). However, based on subsequent discussions with ARNG following the completion of the PA, it was determined that only AOI 1 will be assessed under this SI. AOI 2 and AOI 3 are being assessed by IDANG under a separate SI and are considered to be adjacent sources under this SI. Therefore, only AOI 1 is presented in **Section 3**.



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Base Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN,		PM	CM	8/17/2022

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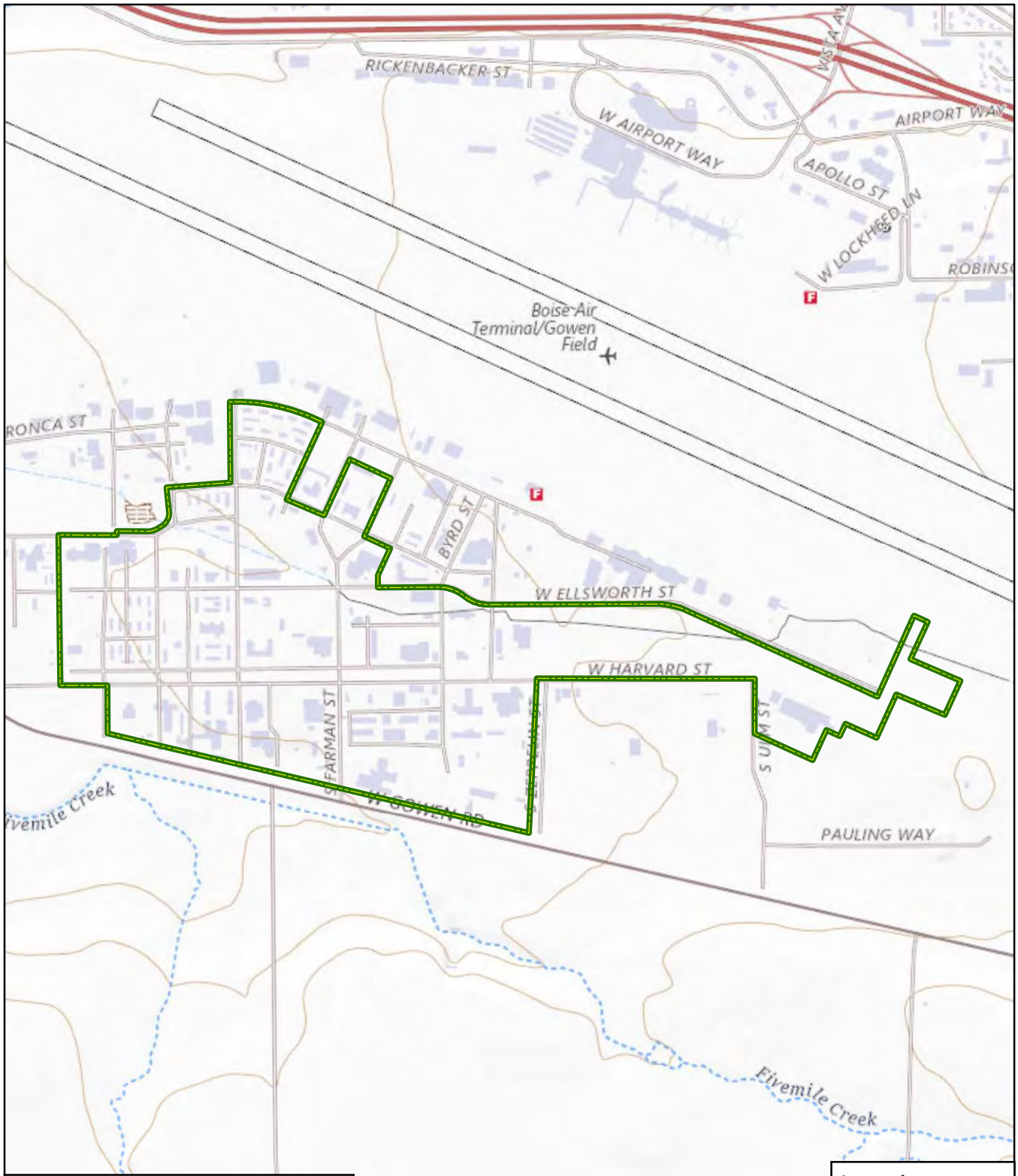
Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	8/17/2022

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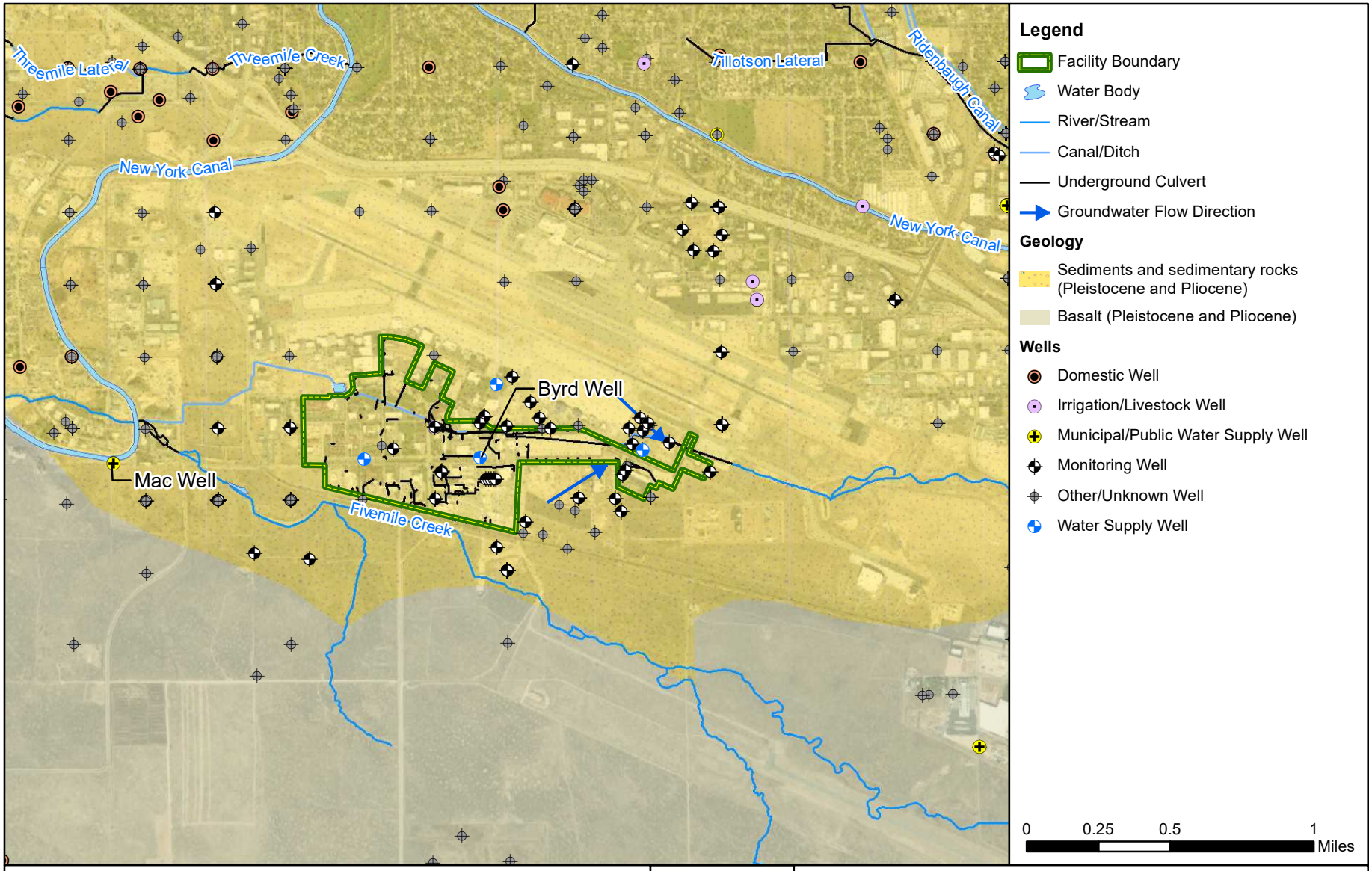
Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	10/28/2022

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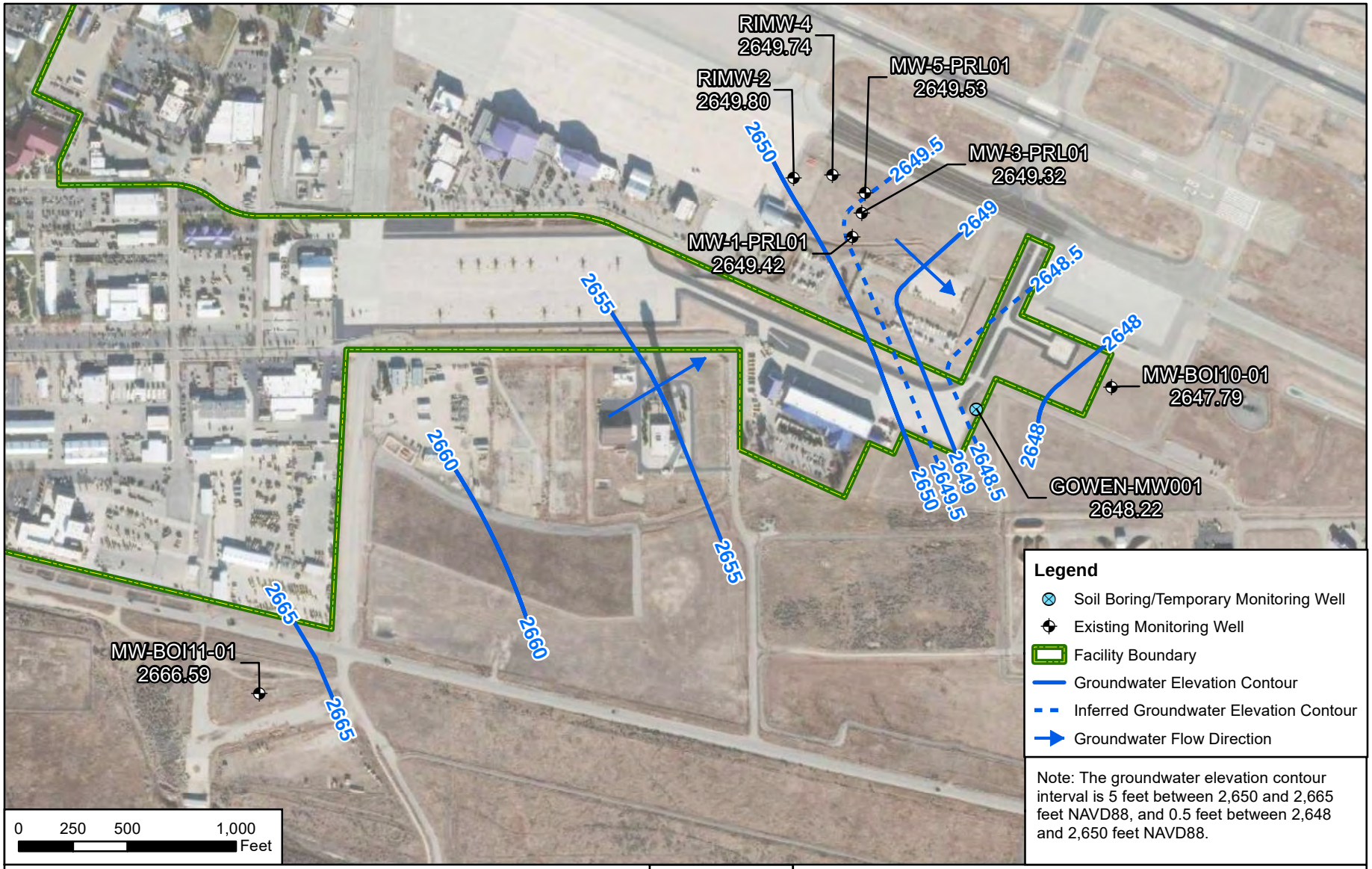
Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/17/2022

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Groundwater Elevations, November 2021

AECOM
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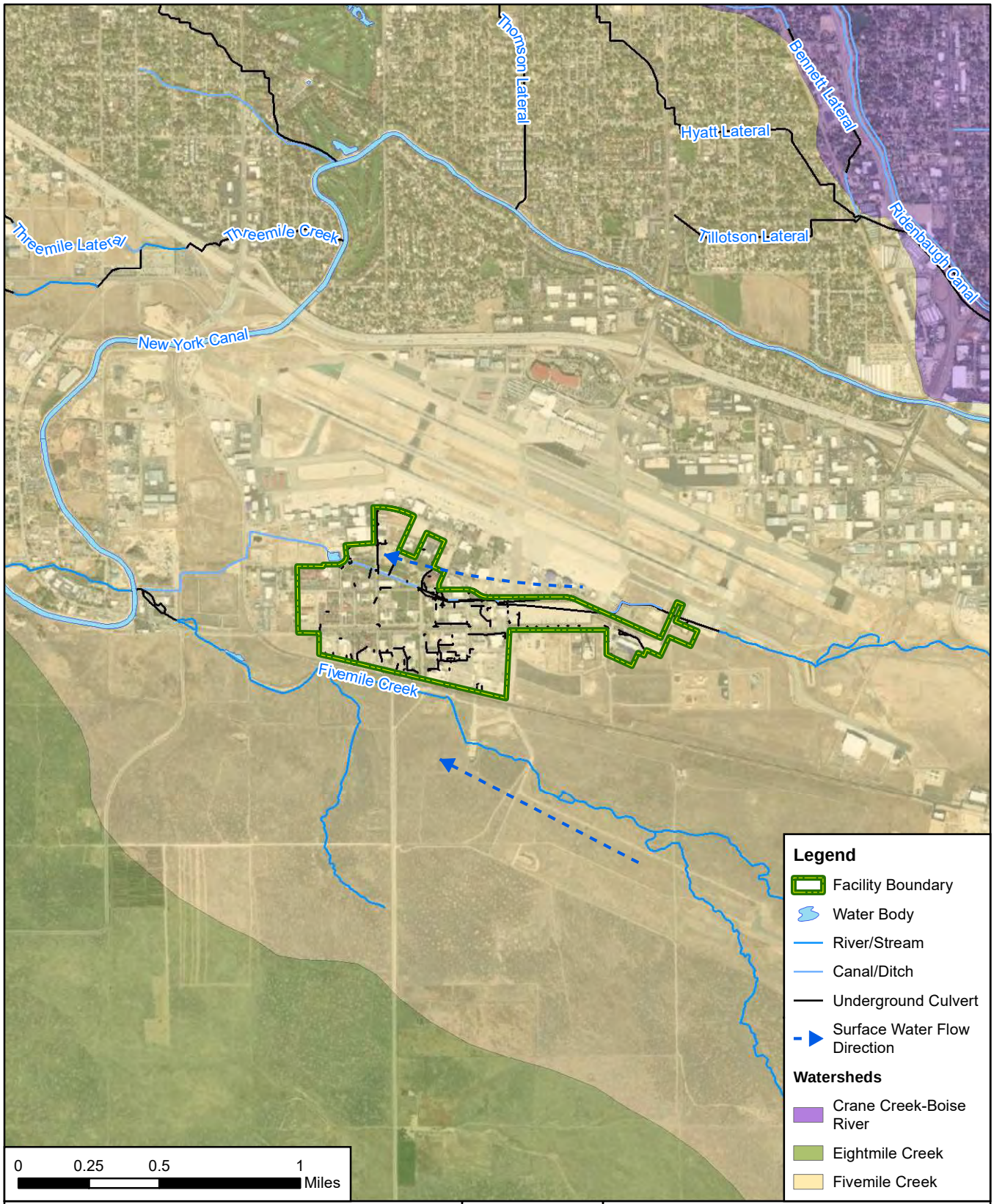
Germantown, MD 20876

Figure 2-4



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/17/2022

Surface Water Features

AECOM
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Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Three potential PFAS release areas, the AASF, the Central Drainage Ditch, and IDANG AFFF Dump 1, were identified at Gowen Field AASF and grouped into three AOIs (AECOM, 2019). This SI Report assesses AOI 1: AASF. The Central Drainage Ditch (labeled AOI 2 in the PA) and IDANG AFFF Dump 1 (labeled AOI 3 in the PA) are being assessed by IDANG under a separate SI and are considered adjacent sources in this Report. The potential PFAS release areas are shown on **Figure 3-1**.

3.1 AOI 1 AASF

The Gowen Field AASF hangar, flight line, and apron are located in the southeast corner of the IDARNG Gowen Field AASF facility. The AASF consists of a main hangar (built between 2002 and 2003), an enclosed wash rack (within a small hangar built between 2016 and 2017), an exterior wash rack area, flight line, small maintenance building, and an adjacent drainage field.

At the time of the PA, a 200-gallon Tri-Max™ AFFF unit was stored inside the enclosed wash rack at the AASF and contains the only AFFF still on IDARNG property at Gowen Field AASF. The AFFF unit is a hose-operated system and is not connected to a suppression system in the building. There was no reported usage of this unit, and no evidence of spills or leaking in the vicinity (AECOM, 2019). Another 200 to 225-gallon Tri-Max™ unit was stored outside of the main hangar, on the east end of the AASF. This unit is currently empty. Five empty extinguishers of various sizes (30-gallons or less) were also stored in this outdoor area. It is unclear what the contents of these extinguishers once were. Storm and floor drains on the flight line and inside the AASF hangars drain to the east and eventually discharge to the drain field adjacent to the AASF or to the sanitary sewer system (AECOM, 2019). Water entering the drain field flows through one of two grease/sand traps and is discharged to the subsurface via a 'seepage trench', which is a lined gravel pit. A valve system that can direct water off-site to the sanitary sewer system is also in place.

Historically, Tri-Max™ 30-gallon units that contained AFFF were discharged in the vicinity of the AASF from 2005 to 2015; there were about 12 to 15 30-gallon Tri-Max™ units on the flight line during this time. It was reported that these units were fully expended before they were removed from the AASF, although the exact location of the foam discharge is unknown. Additionally, nozzle testing of the Tri-Max™ units was conducted on the wash rack area and over the fence from the east compound into the adjacent grassy area about once every 3 years from 2005 to 2015. AFFF was also reportedly discharged on the flight line to clean up fuel spills on multiple occasions. The number of fuel spills and the quantity of AFFF used during these fuel spills are unknown (AECOM, 2019). Information on AFFF storage and use at the AASF prior to the 1990s is unknown.

3.2 Adjacent Sources

Nine off-facility potential sources were identified adjacent to Gowen Field AASF during the PA and are not associated with ARNG activities. The adjacent potential sources are shown on **Figure 3-1** and briefly described below for informational purposes only and were not investigated as part of this SI.

- IDANG Former FTA #1: An unlined training area at which AFFF was released directly to the ground surface. Located cross-gradient of AOI 1 but is located directly adjacent to the Central Drainage Ditch that eventually flows onto IDARNG property.
- IDANG Former FTA #2: Area used for fire training activities with possible use of AFFF. Located upgradient of AOI 1.

- City Burn Pit: Off-facility burn pit where Gowen Field fire personnel conducted fire training activities using AFFF. Located 1.6 miles east of Gowen Field, cross-gradient of AOI 1.
- IDANG Hangar 148: Hangar equipped with an AFFF fire suppression system which has historically been tested with foam occasionally vacuumed up and disposed of at the AFFF Dump 2. Located upgradient of AOI 1.
- IDANG Hangars 1529 and 1530: The attached hangars share an AFFF fire suppression system which has historically been tested with foam occasionally vacuumed up and disposed of at the AFFF Dump 2. Located upgradient of AOI 1.
- IDANG Hangar 155: The hangar's fire suppression system was equipped with AFFF until 2005. No reported releases have escaped the confines of the hangar. Located upgradient of AOI 1.
- Fire Station (Building 138): AFFF is carried on four engines in the station with an additional 880 gallons of AFFF stored in 55-gallon drums with secondary containment measures in place. Located upgradient of AOI 1.
- IDANG AFFF Dump 2: One of two locations where AFFF released at IDANG hangars was occasionally disposed. Located upgradient of AOI 1.
- 2012 Plane Crash: Location where IDANG responded to a private plane crash on the south side of the main runway, about 0.4 miles from IDARNG property, during which an unknown quantity of AFFF was used to extinguish flames. Located cross-gradient of AOI 1.

In 2018, the IDANG conducted an SI for perfluorinated compounds at Gowen Field (Leidos, 2019). The IDANG SI evaluated the presence or absence of PFOS, PFOA, PFBS, PFNA, PFHpA, and PFHxS at the following eight potential release areas which are located upgradient or cross gradient of AOI 1:

- IDANG Former FTA #1,
- IDANG Hangar 148,
- IDANG Hangar 1529,
- IDANG Hangar 1530,
- IDANG Hangar 155,
- Fire Station (Building 138),
- IDANG AFFF Dump 1 (AOI 3), and
- IDANG AFFF Dump 2.

Three other potential release areas (IDANG Former FTA #2, 2012 Plane Crash, and Building 1515 [Hush House]) were not evaluated during the 2018 IDANG SI. At the time of the 2018 IDANG SI, the only exceedances observed were PFOA and PFOS in groundwater at the IDANG Former FTA #1. However, all potential release areas were recommended for further investigation due to presence of the relevant compounds in soil, surface water, sediment, and/or groundwater.

Comparing the 2018 IDANG SI results to the current OSD screening levels, the following exceedances were observed:

- Upgradient of AOI 1
    - At the Fire Station (Building 138), PFOA and PFHxS were detected in groundwater at concentrations of 8.3 J ng/L and 210 ng/L, respectively.

        - At the IDANG AFFF Dump #2, PFOS was detected in groundwater with a concentration of 27 J ng/L.
    - Cross-gradient of AOI 1
        - At the IDANG Former FTA #1, PFOS was detected up to 390 J µg/kg in shallow subsurface soil. Additionally, PFOS and PFNA were detected in groundwater at concentrations of 290 ng/L and 18 ng/L, respectively.
        - At the IDANG AFFF Dump #1, PFOS was detected in groundwater with a concentration of 4 J ng/L.

This information is presented for informational purposes only as these potential release areas have the potential to migrate towards the IDARNG facility.

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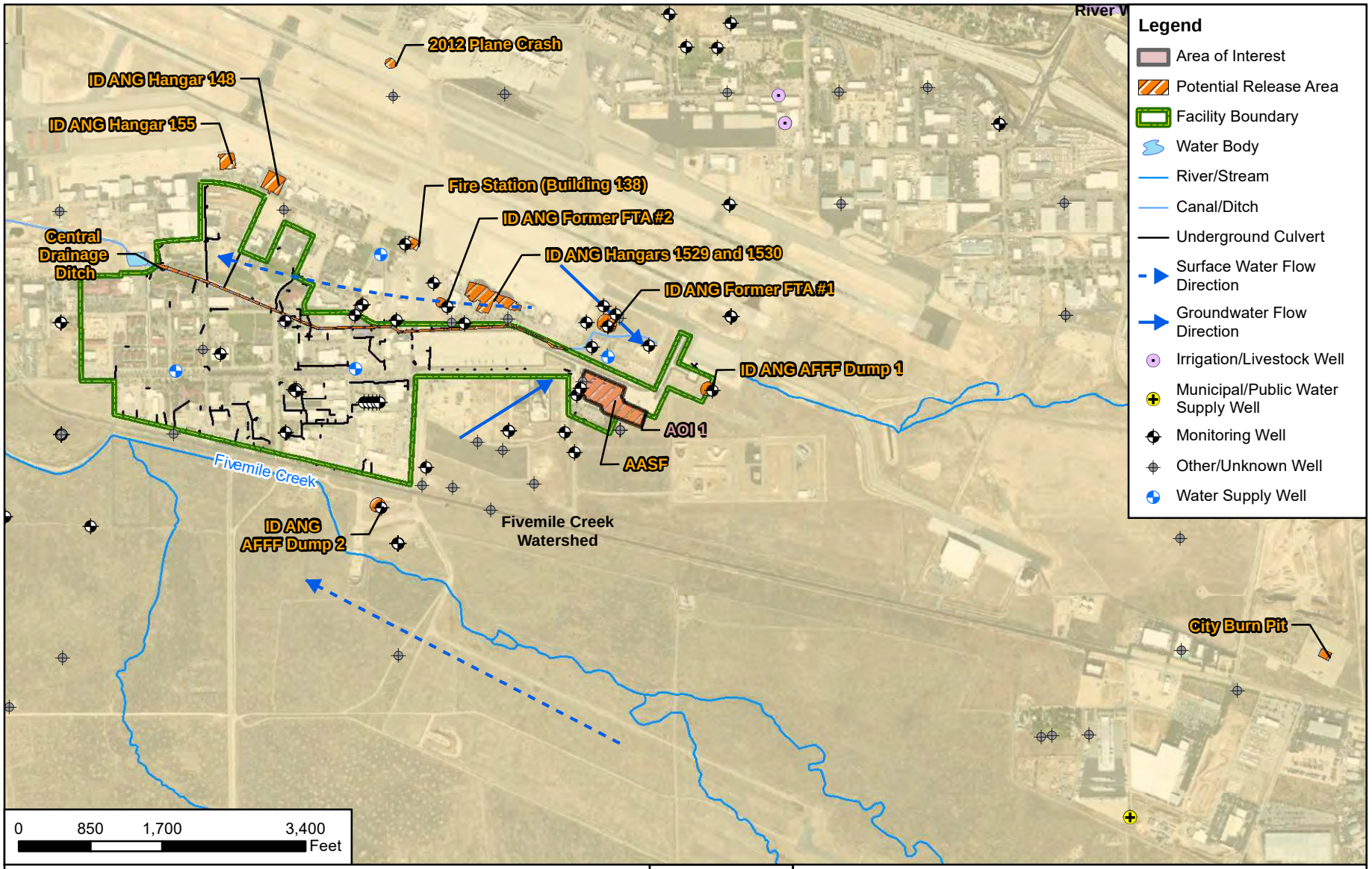

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:20,400	CHK BY	EG	8/17/2022
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/17/2022

Area of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

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

4.1 Problem Statement

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

4.2 Information Inputs

Primary information inputs included:

- The PA for Gowen Field AASF (AECOM, 2019);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 Study Boundaries

The scope of the SI was bounded by the property limits of the facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). To determine the presence/absence of PFAS, soil sampling was confined to the top 50 feet of the upper geologic formation and groundwater was sampled at the first encountered water table aquifer. Temporal boundaries were limited to the summer season, which was the earliest available time field resources were available to complete the study.

4.4 Analytical Approach

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

4.5 Data Usability Assessment

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

whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017).

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

5. Site Inspection Activities

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

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Gowen Field, Boise, Idaho* dated December 2019 (AECOM, 2019);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Gowen Field, Boise, Idaho* dated July 2021 (AECOM, 2021a); and
- *Final Site Safety and Health Plan, Gowen Field, Boise, Idaho* dated March 2021 (AECOM, 2021b).

The SI field activities were conducted from 8 to 15 November 2021 and consisted of utility clearance, sonic boring, soil sample collection, permanent monitoring well installation, groundwater sample collection, water level gauging that included nearby off-facility monitoring wells, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as noted in **Section 5.10**.

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

- Thirteen (13) soil samples from six boring locations;
- One (1) groundwater sample from one (1) new permanent monitoring well;
- Thirteen (13) quality assurance (QA)/QC samples.

Figure 5-1 provides the sample locations for all media across the facility. **Table 5-1** presents the list of samples collected for each media. Field documentation is provided in **Appendix B**. A Log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Sampling forms are provided in **Appendix B2**, Field Change Request Forms are provided in **Appendix B3**, and land survey data are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

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

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

A combined TPP Meeting 1 and 2 was held on 15 March 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, IDARNG, USACE, Idaho Department of Environmental Quality and ANG. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021a).

A TPP Meeting 3 was held [date to be determined] after the Draft Final SI Report submittal to regulators and will discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM's drilling subcontractor, Yellow Jacket Drilling Services placed a ticket with DIGLINE, Inc. Idaho utility clearance provider to notify them of intrusive work on 16 April 2021. However, because the AASF is a private facility, the participating DIGLINE, Inc. locators did not clear utilities at the entire facility. Therefore, AECOM contracted Ground Penetrating Radar Systems, LLC (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 8 November 2021 with input from the AECOM field team and Gowen Field AASF facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use in a PFAS investigation prior to the start of field activities. A sample from a potable water source at Gowen Field AASF was collected on 24 September 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

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

5.2 Soil Borings and Soil Sampling

Soil samples were collected via sonic drilling methods in accordance with the SI QAPP Addendum (AECOM, 2021a). A 7-inch diameter core barrel with an 8-inch diameter override casing was used to collect continuous soil cores to the target depth at soil borings AOI01-01 and AOI01-02. At boring GOWEN-MW001, an 8-inch diameter core barrel with a 9-inch override casing was used to collect continuous soil cores to 97 feet bgs and then telescoped down to a 7-inch diameter core barrel with an 8-inch diameter override casing to the target depth. A hand auger was used to collect soil from the top 5 feet of the boring, in accordance with AECOM utility clearance

procedures. The soil boring locations are shown on **Figure 5-1**, and depths are provided **Table 5-2**.

Three discrete soil samples were collected for chemical analysis from borings AOI01-01 and AOI01-02: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample(13 to 15 feet bgs), and one from the bottom of the boring (49 to 50 feet bgs). At boring GOWEN-MW001, discrete soil samples were collected from surface soil (0 to 2 feet bgs), subsurface soil (13 to 15 feet bgs), and one (1) foot above the water table (202 to 203 feet bgs). Due to moisture found at 145 to 146 feet bgs at boring GOWEN-MW001, a fourth soil sample was collected at 145 to 146 feet bgs.

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

Soil borings were completed at depths of 50 feet bgs (AOI1-1, AOI1-2) and 220 feet bgs (GOWEN-MW001) during the SI at Gowen Field AASF. Borings encountered well-graded gravel with sand as the dominant lithology of the unconsolidated sediments between 0 and 50 feet bgs. Well-graded sand with silt was found as the dominant lithology between 50 and 220 feet bgs. Intermittent isolated layers of silt, gravel, and poorly graded silty sand were also observed in the deeper boring. These observations are consistent with the understood land fill material and fluvial depositional environment.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain of custody (CoC) procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15), TOC (USEPA Method 9060A) and pH (USEPA Method 9045D) and grain size (ASTM Method D-422) in accordance with the SI QAPP Addendum (AECOM, 2021a).

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

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

5.3 Permanent Well Installation and Groundwater Grab Sampling

During the SI, one permanent monitoring well was installed within or downgradient of potential source areas. The location of the well is shown on **Figure 5-1**.

A TSI 150T sonic drill rig was used to install one 4-inch-diameter monitoring well (GOWEN-MW001). The monitoring well was constructed with Schedule 80 poly-vinyl chloride, flush-threaded 10-foot sections of riser, 0.010-inch slotted well screen, and a threaded bottom cap. The location and depth of the permanent well was determined based on the depth to groundwater. A

filter pack of 12/20 silica sand was installed in the annulus around the well screen to a minimum of 2 feet above the well screen. Bentonite (3/8 inches) was placed above the filter sand to 4 feet bgs and hydrated with water. The bentonite was allowed to set for 24 hours prior to well development in accordance with the SI QAPP Addendum (AECOM, 2021a). GOWEN-MW001 was completed with a flush mount well vault. The screen interval of the groundwater monitoring well is provided in **Table 5-3**, and a Well Diagram is provided in **Appendix E**.

Development and sampling of the well was completed in accordance with the SI QAPP Addendum (AECOM, 2021a). The newly installed monitoring well was developed more than 24 hours following installation by pumping and surging using a variable speed submersible pump. During development, a HDPE bailer was lost in the well during sand/sediment removal. Efforts were made over several days to recover the bailer, but were unsuccessful due to sand lock. Additionally, a pipe recovery tool made of stainless steel was lost during the attempted bailer recovery. Therefore, the upper seven feet of the well screen was developed. Samples were collected no sooner than 24 hours following development via low-flow sampling methods using a Geotech® 1.66- by 18-inch bladder pump with new, disposable PFAS-free, HDPE tubing. The well was purged at a rate determined in the field to reduce 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**). Water levels were measured to the nearest 0.01 inch and recorded. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in the groundwater sample.

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

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

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 12 November 2021. Groundwater elevation measurements were collected from the new permanent monitoring well, as well as from seven existing off-facility monitoring wells located on IDANG property, adjacent to Gowen Field AASF. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of the well casing was surveyed by Idaho-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed well on the facility was collected on 12 November 2021 in the applicable Universal Transverse Mercator zone projection with North American Datum 1983 (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B4**. The off-facility IDANG well survey data was provided by IDANG via email.

5.6 Investigation-Derived Waste

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

Soil IDW (i.e., soil cuttings) and liquid IDW (i.e., purged groundwater and decontamination fluids) generated during SI activities were containerized in properly labeled 55-gallon drums (see SOP 3-05). This IDW was not sampled for PFAS and will assume the PFAS characteristics of the associated soil and groundwater samples collected from their source location.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were contained in labeled, 55-gallon DOT-approved steel drums, and left onsite in a designated waste storage area. During the TPP 1&2 meeting, IDEQ requested that IDW generated within or adjacent to a former wood preserving operation Installation Restoration Program site also be sampled for additional analytes associated with those operations. The former wood preserving operation site is located partially within the footprint of the AASF's southwestern boundary (**Figure 5-1**) and was addressed and managed by the IDANG. Based on the results of two (1987 and 1990) SIs conducted at the site, semi-volatile organic compounds (SVOCs), in the form of 2-methylnaphthalene, pentachlorophenol, and phenanthrene, have impacted site soil and primarily reside in the shallow surface layer (above 5 feet bgs), extending no deeper than 50 feet bgs. Although SVOC contamination was not anticipated during this current SI, liquid and soil IDW collected during the SI sampled for the SVOCs list of 2-methylnaphthalene, pentachlorophenol, and phenanthrene. SVOCs were not detected in either IDW sample, AOI1-1-IDW and AOI1-2-IDW. Results of this analysis are presented in **Appendix G**.

ARNG will coordinate waste profiling, transportation, and disposal of the solid IDW. ARNG will manage and dispose of the liquid IDW under a separate contract in accordance with SOP No. 042A for Treating Liquid Investigation-Derived Material (Purge water, drilling water, and decontamination fluids) (EA Engineering, Science, and Technology, Inc., 2021).

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 by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D. Liquid and soil IDW collected during the SI were analyzed for the SVOCs list of 2-methylnaphthalene, pentachlorophenol, and phenanthrene by USEPA Method 8270D (SW-846).

5.8 Deviations from SI QAPP Addendum

Three deviations from the SI QAPP Addendum occurred during the SI fieldwork. The deviations are noted below and are documented in Field Change Request Forms (**Appendix B3**).

- During the installation of the permanent monitoring well, the drilling team recommended the use of an 8-inch core barrel and 9-inch override casing in place of a 6-inch barrel and 8-inch casing to 97 feet, and subsequently a 7-inch core barrel and 8-inch override casing to 217 feet. This larger casing was used to create a larger well annulus to accommodate and

construct the 4-inch diameter permanent monitoring well. This action was documented in a field change request form provided in **Appendix B3**.

- On 12 November 2021, the catch basin that was selected as sediment sample location AOI1-03 was observed by the field team to be free of sediment; thus, a sediment sample could not be collected. Additional catch basins were evaluated as potential replacement sample locations; however, they were also found to be free of sediment. Subsequently, to maintain contiguous sample numbering in AOI 1, sample ID AOI1-03 was repurposed as a supplemental surface soil sample in the vicinity of monitoring well GOWEN-MW001. This action was documented in a field change request form provided in **Appendix B3**.
- On 10 November 2021, the field team observed an IDANG firetruck conducting nozzle testing within AOI 1 and adjacent to AOI 1 in the grassy areas along the southeast and southwest edges of the flight line. Although testing was suspected to be conducted with water only (no foam observed), a third surface soil sample (0 to 2 feet bgs) (AOI01-03) was collected within the drainage ditch southeast of AOI01-01. Two additional surface soil samples, AOI01-04 and AOI01-05, were also collected southwest of AOI01-01. This action was documented in a field change request form provided in **Appendix B3**.

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Gowen Field, Boise, Idaho

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	SVOCs (USEPA Method 8270)*	Comments
Soil Samples								
AOI1-01-SB-0-2	11/8/2021 11:15	0 - 2	x					
AOI1-1-SB-13-15	11/12/2021 10:40	13 - 15	x	x	x	x		
AOI1-1-SB-13-15-D	11/12/2021 10:40	13 - 15	x	x	x			FD
AOI1-1-SB-13-15-MS	11/12/2021 10:40	13 - 15	x	x	x			MS
AOI1-1-SB-13-15-MSD	11/12/2021 10:40	13 - 15	x	x	x			MSD
AOI1-1-SB-49-50	11/12/2021 11:20	49 - 50	x					
AOI1-02-SB-0-2	11/8/2021 11:30	0 - 2	x					
AOI1-2-SB-13-15	11/12/2021 8:35	13 - 15	x					
AOI1-2-SB-49-50	11/12/2021 9:00	49 - 50	x					
AOI1-3-SB-0-2	11/15/2021 10:25	0 - 2	x					
AOI1-4-SB-0-2	11/15/2021 10:40	0 - 2	x					
AOI1-4-SB-0-2-D	11/15/2021 10:40	0 - 2	x					FD
AOI1-5-SB-0-2	11/15/2021 10:55	0 - 2	x					
GOWEN-MW001-SB-0-2	11/8/2021 10:45	0 - 2	x					
GOWEN-MW001-SB-13-15	11/8/2021 15:15	13 - 15	x					
GOWEN-MW001-SB-145-146	11/8/2021 13:15	145 - 146	x					
GOWEN-MW001-SB-202-203	11/8/2021 16:50	202 - 203	x					
AOI1-1-IDW	11/12/2021 11:50	NA					x	Composite
AOI1-2-IDW	11/12/2021 11:55	NA					x	Composite
Groundwater Samples								
GOWEN-MW001-GW	11/15/2021 10:05	NA	x					
GOWEN-MW001-GW-D	11/15/2021 10:05	NA	x					FD
GOWEN-MW001-GW-MS	11/15/2021 10:05	NA	x					MS
GOWEN-MW001-GW-MSD	11/15/2021 10:05	NA	x					MSD
Quality Control Samples								
GOWEN-FRB-01	11/15/2021 14:00	NA	x					
GOWEN-ERB-01	11/8/2021 13:00	NA	x					from drill rig hose
GOWEN-ERB-02	11/8/2021 14:45	NA	x					from hand auger
GOWEN-ERB-03	11/13/2021 14:00	NA	x					from drill bit

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
QSM = Quality Systems Manual
SVOCs = semi-volatile organic compounds
TOC = total organic carbon
USEPA = United States Environmental Protection Agency
*SVOC analysis conducted for investigation-derived waste characterization per Idaho Department of Environmental Quality.

Table 5-2
Soil Boring Depths
Site Inspection Report, Gowen Filed, Boise, Idaho

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Start Date	End Date
1	AOI1-1	50	11/12/21 10:30 AM	11/12/21 11:30 AM
	AOI1-2	50	11/12/21 7:55 AM	11/12/21 9:30 AM
	GOWEN-MW001	220	11/8/21 2:50 PM	11/11/21 3:15 PM

Notes:
bgs = below ground surface

Table 5-3
Permanent Monitoring Well Screen Intervals and Groundwater Elevations
Site Inspection Report, Gowen Filed, Boise, Idaho

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Monitoring Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	GOWEN-MW001	220	207-217	2,852.43	2852.77	204.21	204.55	2,648.22
ANG Wells	MW-1-PRL01	unknown	204.65-214.65	2,847.66	unknown	198.24	unknown	2,649.42
	RIMW-2	unknown	205-215	2,850.98	unknown	201.18	unknown	2,649.80
	MW-3-PRL01	unknown	205-215	2,849.40	unknown	200.67	unknown	2,649.32
	RIMW-4	unknown	203-213	2,852.26	unknown	202.52	unknown	2,649.74
	MW-5-PRL01	unknown	210.62-220.62	2,856.30	unknown	206.77	unknown	2,649.53
	MW-BOI10	unknown	200-220	2,853.94	unknown	206.15	unknown	2,647.79
	MW-BOI11	unknown	190-210	2,830.30	unknown	163.71	unknown	2,666.59

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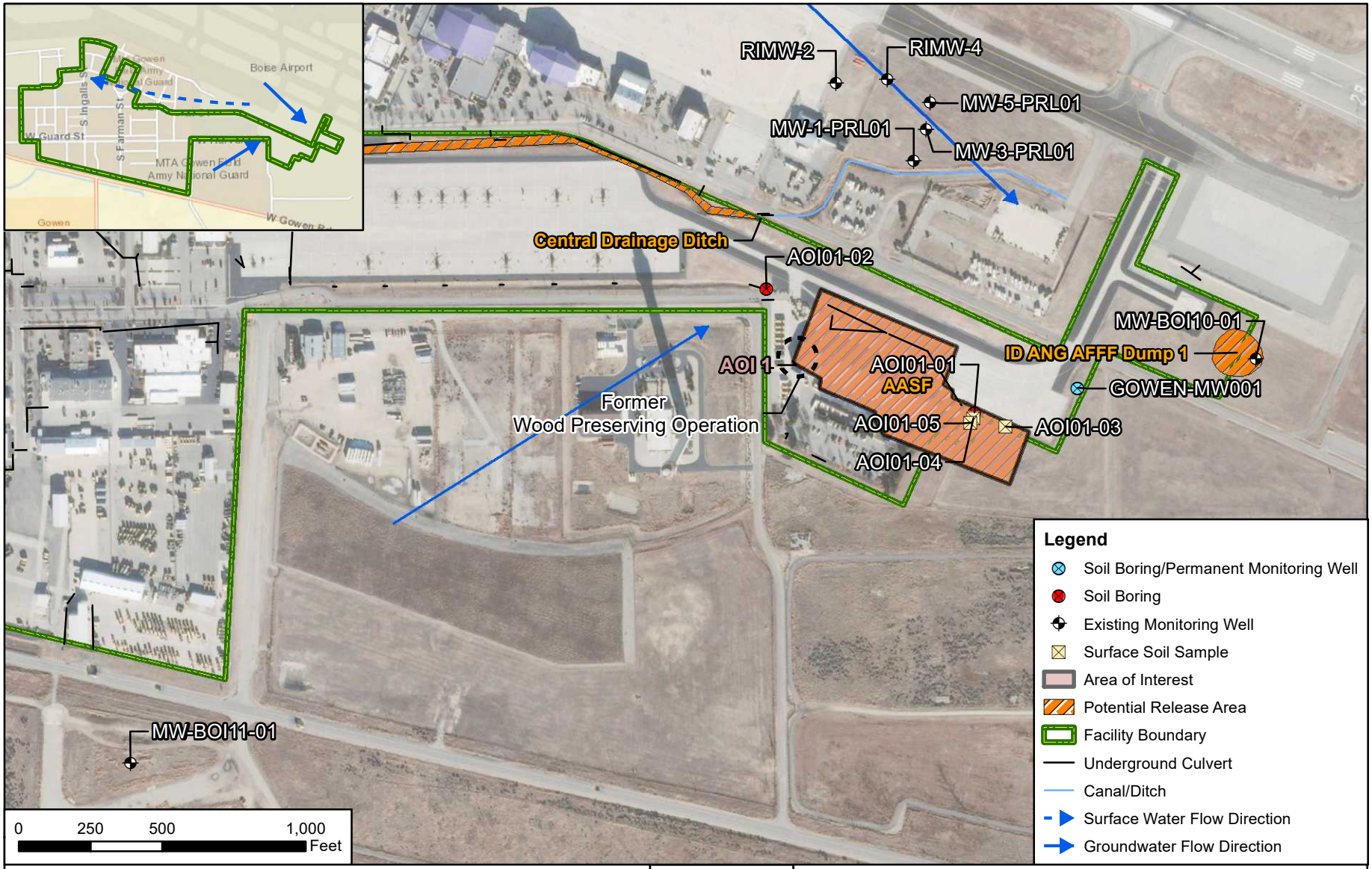

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	10/28/2022	GIS BY	MS	10/28/2022
SCALE	1:6,000	CHK BY	CH	10/28/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	10/28/2022

N

Site Inspection Sample Locations

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Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.5**. **Table 6-2** through **Table 6-5** present results in soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

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

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

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

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

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

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

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

6.2 Soil Physicochemical Analyses

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

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: AASF . The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**. As noted in Section 5.8, AOI01-03 was repurposed as a supplemental surface soil sample in the vicinity of monitoring well GOWEN-MW001.

6.3.1 AOI 1 Soil Analytical Results

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

Soil was sampled at three soil boring locations and three surface soil locations surrounding the AOI. At each of the three soil boring locations, AOI01-01, AOI01-02, and GOWEN-MW001, three soils samples were collected: the shallow surface interval (0 to 2 feet bgs), the deep interval (bottom of boring at AOI01-01 and AOI01-02, and two feet above groundwater at GOWEN-MW001), and the intermediate interval (13 to 15 feet bgs). Due to moisture found at 145 to 146 feet bgs at boring GOWEN-MW001, a fourth soil sample was collected at 145 to 146 feet bgs. At the three remaining locations located within the eastern portion of the potential release area, AOI01-03, AOI01-04, and AOI01-05, a sample was collected from only the surface soil interval (0 to 2 feet bgs).

PFOA, PFOS and PFHxS exceeded their respective SLs in surface soil at AOI 1, both within and downgradient of the potential release area and the location of the IDARNG fire tuck nozzle check observed during the SI fieldwork. Surface soil detections included the following

- PFOS exceeded the OSD SL of 13 micrograms per kilogram (µg/kg) at every location with concentrations ranging between 35.0 µg/kg to 359 µg/kg.
- At location GOWEN-MW001, PFOA exceeded the OSD SL of 19 µg/kg at a concentration of 19.5 µg/kg and PFHxS exceeded the OSD SL of 130 µg/kg at a concentration of 236 µg/kg.
- PFBS was detected at every location at a maximum concentration of 2.46 µg/kg, three orders of magnitude below the OSD SL of 1900 µg/kg.

- PFNA was detected in surface soil at every location, except AOI01-02, at a maximum concentration of 7.37 µg/kg.

PFOS was detected at AOI01-01 in both the shallow subsurface (13 to 15 feet bgs) and at the deep interval (49 to 50 feet bgs), at concentrations of 0.662 J µg/kg and 1.50 µg/kg, respectively. PFHxS was also detected at AOI01-01 in both the shallow subsurface (13 to 15 feet bgs) and at the deep interval (49 to 50 feet bgs) at concentrations of 0.033 J µg/kg and 0.079 µg/kg, respectively. PFNA was detected at the deep interval at AOI01-01 at a concentration of 0.042 J µg/kg. These concentrations of PFOS, PFHxS, and PFNA are several orders of magnitude below the SLs. PFOA and PFBS were not detected in any shallow subsurface or deep soil location.

6.3.2 AOI 1 Groundwater Analytical Results

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

Groundwater was sampled from one permanent monitoring well GOWEN-MW001. PFOS was detected below the SL at a concentration of 1.87 ng/L. PFOA, PFHxS, PFNA, and PFBS were not detected groundwater at AOI 1.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA, PFOS and PFHxS were detected in surface soil at concentrations above their respective SLs. Exceedances in surface soil adjacent to and downgradient of AOI 1 may be the result of ANG activities. PFOS was detected in groundwater at a concentration below the SL. Based on the exceedances of the SLs in soil, further evaluation at AOI 1 is warranted.

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

Area of Interest		AOI01													
Sample ID		AOI01-01-SB-0-2		AOI01-02-SB-0-2		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-04-SB-0-2-D		AOI01-05-SB-0-2		GOWEN-MW001-SB-0-2	
Sample Date		11/08/2021		11/08/2021		11/15/2021		11/15/2021		11/15/2021		11/15/2021		11/08/2021	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)															
PFBS	1900	0.089	J	0.046	J	0.825	J	0.025	J	0.035	J	0.115	J	2.46	
PFHxS	130	3.90		0.106	J	17.7		0.283	J	0.303	J	5.50		236	
PFNA	19	1.62		ND	U	0.277	J	7.37		5.08		5.96		0.348	J
PFOA	19	2.49		ND	U	3.78		5.59		4.60		6.53		19.5	
PFOS	13	56.9		ND	U	359		42.3		35.0		39.1		131	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest		AOI01							
Sample ID		AOI01-01-SB-13-15		AOI01-01-SB-13-15-D		AOI01-02-SB-13-15		GOWEN-MW001-SB-13-15	
Sample Date		11/12/2021		11/12/2021		11/12/2021		11/08/2021	
Depth		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)									
PFBS	25000	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	0.033	J	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U
PFOS	160	0.662	J	0.310	J	ND	U	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

Area of Interest	AOI01							
Sample ID	AOI01-01-SB-49-50		AOI01-02-SB-49-50		GOWEN-MW001-SB-145-146		GOWEN-MW001-SB-202-203	
Sample Date	11/12/2021		11/12/2021		11/08/2021		11/08/2021	
Depth	49-50 ft		49-50 ft		145-146 ft		202-203 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)								
PFBS	ND	U	ND	U	ND	U	ND	U
PFHxS	0.079	J	ND	U	ND	U	ND	U
PFNA	0.042	J	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U
PFOS	1.50		ND	U	ND	U	ND	U

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

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

Chemical Abbreviations

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

Acronyms and Abbreviations

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

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

	Area of Interest	AOI01			
	Sample ID	GOWEN-MW001-GW		GOWEN-MW001-GW-D	
	Sample Date	11/15/2021		11/15/2021	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)					
PFBS	601	ND	U	ND	U
PFHxS	39	ND	U	ND	U
PFNA	6	ND	U	ND	U
PFOA	6	ND	U	ND	U
PFOS	4	1.87	J	1.85	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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

Interpreted Qualifiers

J = Estimated concentration

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

Notes

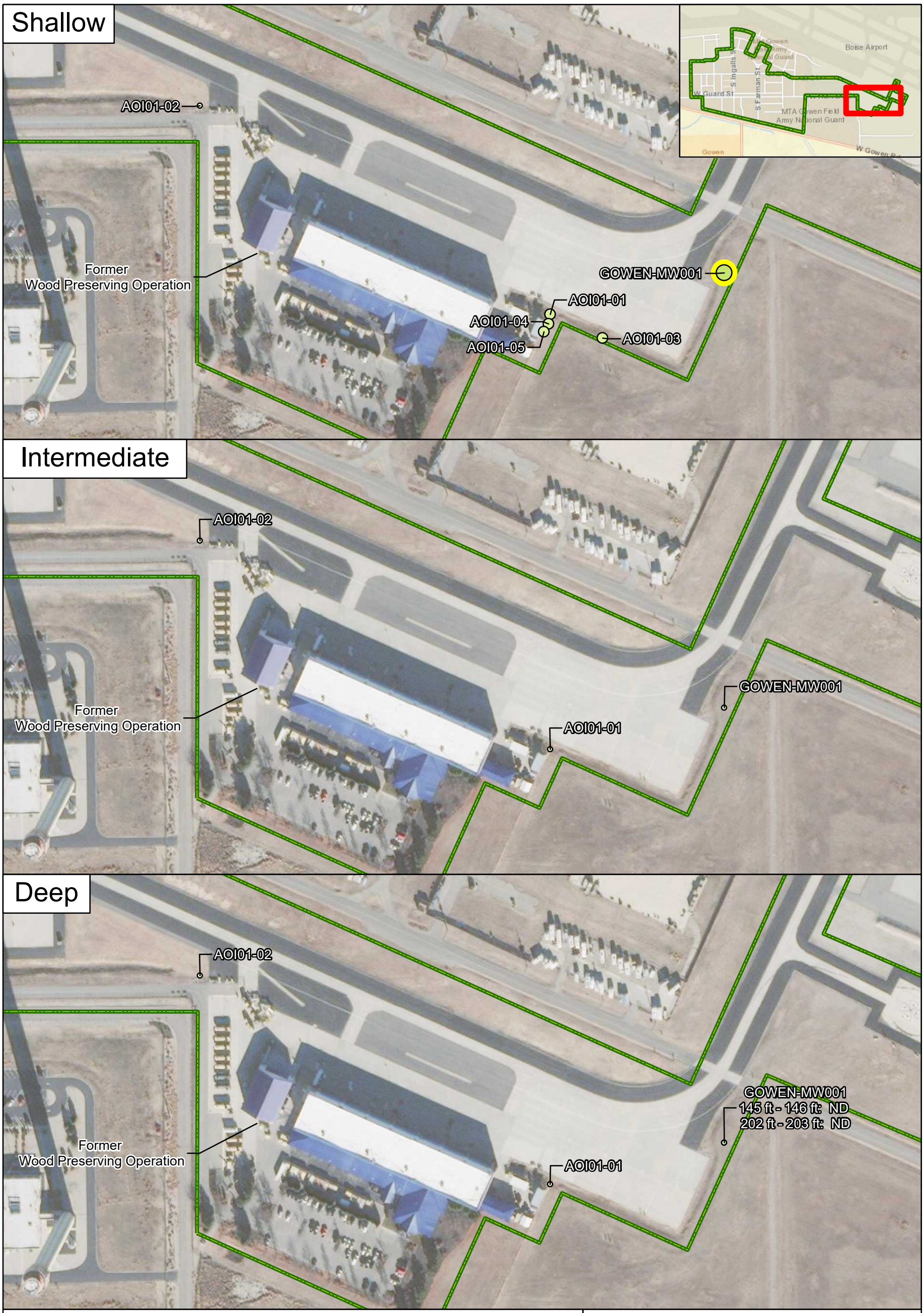
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

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

Acronyms and Abbreviations

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



Facility Boundary

PFOA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 100 200 400 Feet

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

PFOA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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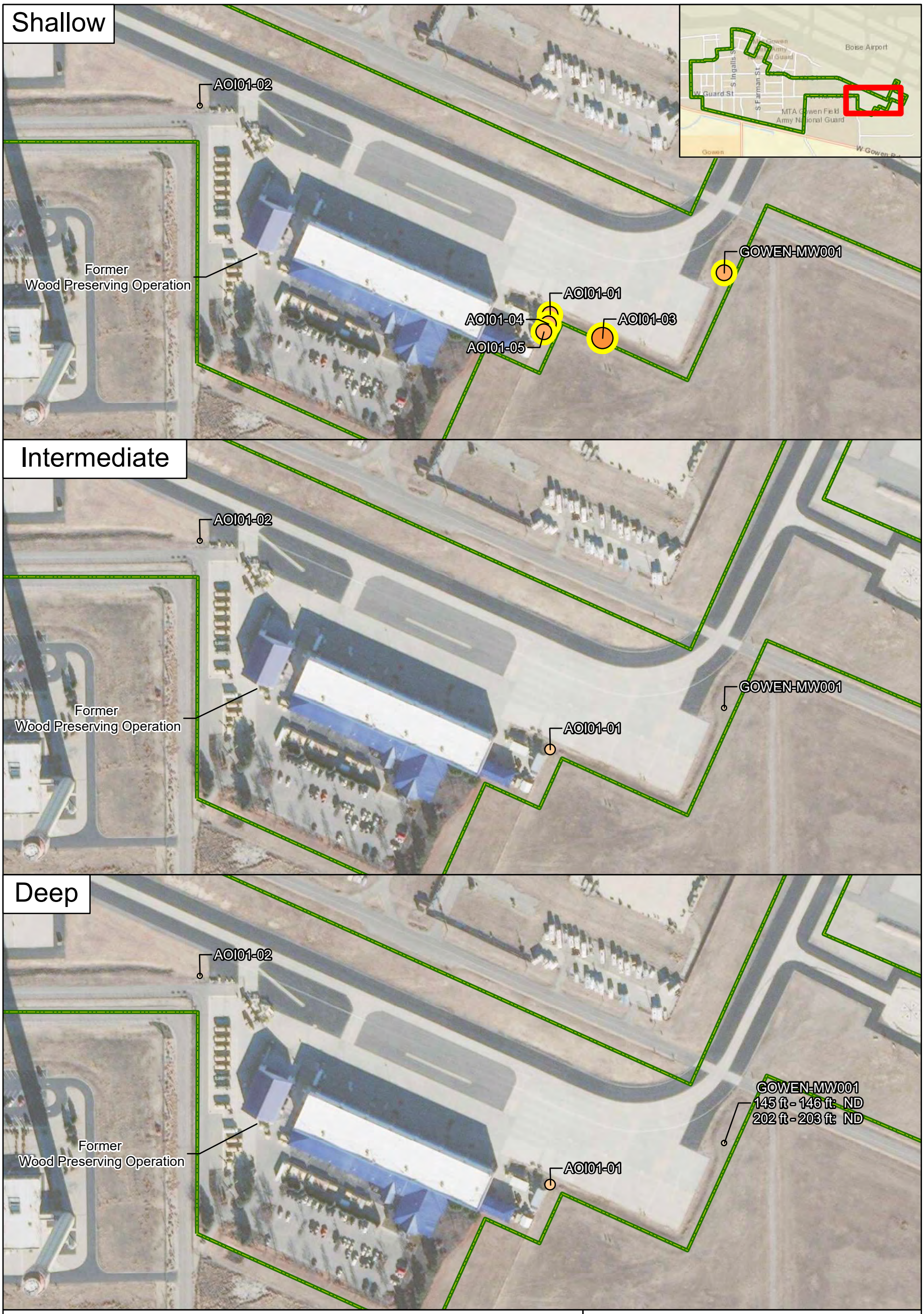
Figure 6-1



Facility Boundary

PFOS Results (µg/Kg)

- ND
- >ND - 13
- >13 - 160
- >160 - 1,600
- >1,600

N

0 100 200 400 Feet

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

PFOS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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Figure 6-2

Facility Boundary

PFBS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

N

0 100 200 400 Feet

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

PFBS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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Figure 6-3

Facility Boundary

PFHxS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 130
- >130 - 1,600
- >1,600

N

0 100 200 400 Feet

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

PFHxS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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Figure 6-4

Facility Boundary

PFNA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 100 200 400 Feet

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

PFNA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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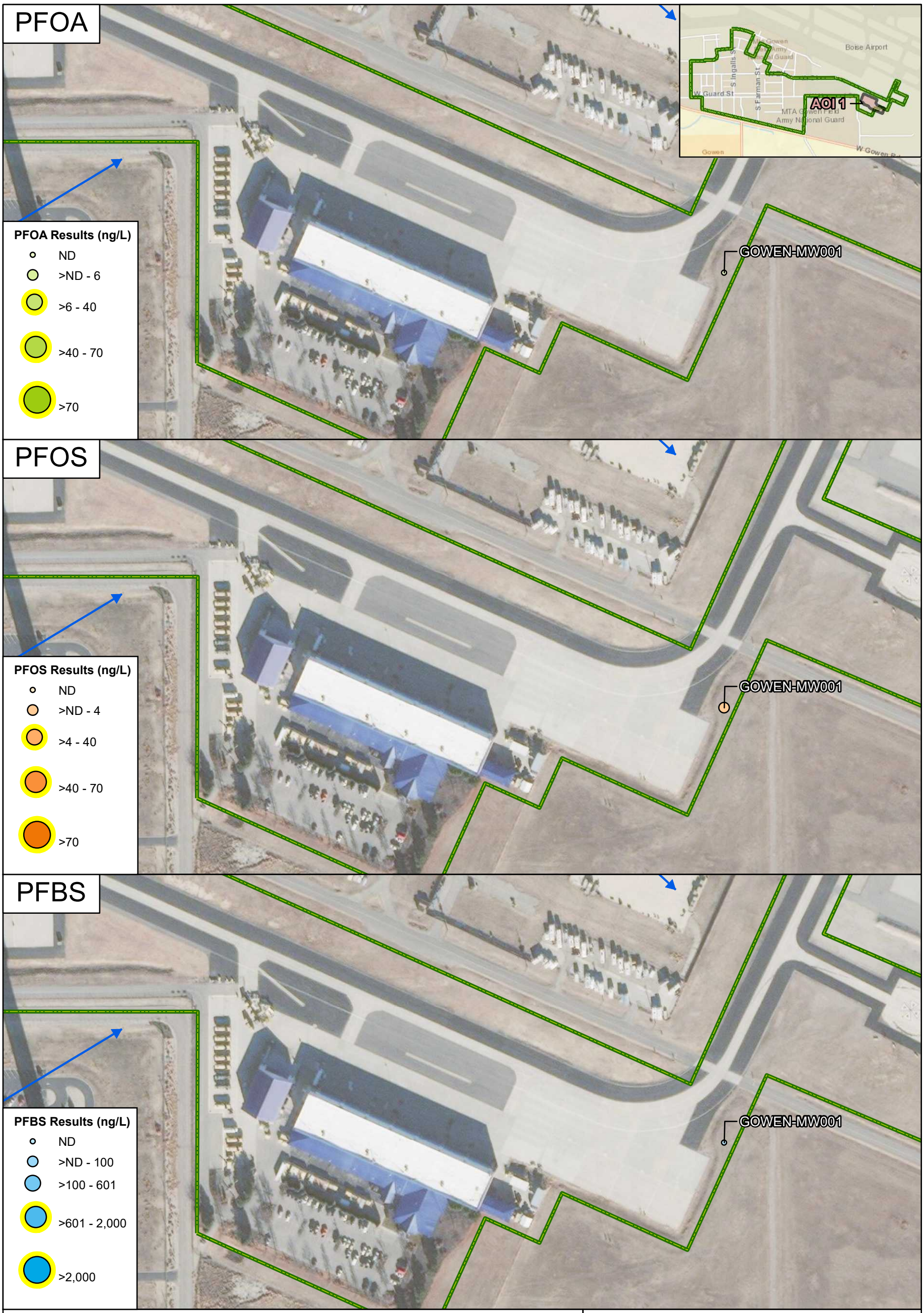
Figure 6-5



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

PFOA, PFOS, and PFBS Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	10/5/2022	GIS BY	MS	10/5/2022
SCALE	1:2,400	CHK BY	EG	10/5/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	10/5/2022

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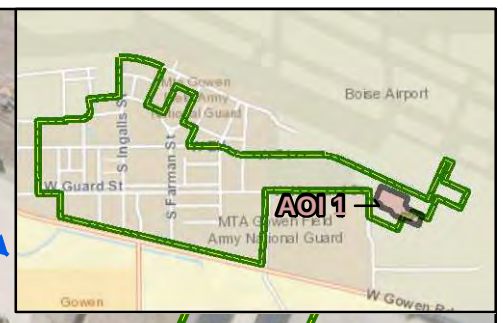
Figure 6-6

PFHxS



GOWEN-MW001

PFHxS Results (ng/L)

- ND
- >ND - 39
- >39 - 100
- >100 - 1,000
- >1,000

PFNA

GOWEN-MW001

PFNA Results (ng/L)

- ND
- >ND - 6
- >6 - 100
- >100 - 1,000
- >1,000

Facility Boundary

Groundwater Flow Direction

N

0 100 200 400 Feet

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

PFHxS and PFNA Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Gowen Field AASF, ID			
REVISED	8/17/2022	GIS BY	MS	8/17/2022
SCALE	1:2,400	CHK BY	EG	8/17/2022
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong		PM	CM	8/17/2022

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Figure 6-7

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7. Exposure Pathways

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

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

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

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in 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), and residents outside the facility boundary.

7.1 Soil Exposure Pathway

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

7.1.1 AOI 1

Between 2005 and 2015, AFFF may have been released at AOI 1 during Tri-Max use, AFFF storage by IDARNG adjacent to the small maintenance building and drainage field, and nozzle checks by IDANG's fire truck observed during the SI fieldwork.

PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in surface soil at AOI 1, with PFOA, PFOS and PFHxS exceeding their respective SLs. Site workers and construction workers could contact

constituents in surface soil via incidental ingestion and inhalation of dust. Additionally, off-facility trespassers may potentially be exposed to PFOA, PFOS, and PFBS via inhalation of dust caused by on-facility ground disturbing activities. Therefore, the surface soil exposure pathway for site workers, construction workers, and trespassers are potentially complete. PFOS, PFHxS, and PFNA were detected in subsurface soil at AOI 1. No active construction was observed during SI field activities; however, future construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. Residential structures are not present at AOI 1, therefore the resident soil exposure pathway is incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1

PFOS was detected at a concentration below the SL in groundwater at permanent monitoring well GOWEN-MW001, which is inferred to be cross or downgradient of the potential PFAS release area. Drinking water for Gowen Field AASF is supplied by a local supplier, Suez, which uses three public supply wells that are located within 2 miles of the facility boundary. However, recharge for the deep aquifer does not occur in the Gowen Field AASF footprint, and it is unlikely that these wells will be impacted; therefore, the deep groundwater pathway to all receptors is incomplete (Leidos, 2019). Additionally, groundwater was observed at a depth of 204.21 feet bgs; therefore, the exposure pathway for future construction workers is incomplete. Several private water or irrigation wells are located downgradient of AOI 1 that may be screened in the shallow aquifer and could potentially be impacted by the PFAS release at AOI 1. Therefore, the exposure pathway for groundwater to off-facility residents is potentially complete. The CSM is presented on **Figure 7-1**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to sediment and surface water via leaching and run-off. Surface drainage at Gowen Field AASF is controlled both by the local surface topography, piped stormwater catch basins and a system of drainage ditches. The nearest drainage ditch generally traverses the facility, with flow from east to west. This drainage ditch, the Central Drainage Ditch, originates as the remnant of an intermittent stream on the adjacent IDANG property before traversing the IDARNG property and discharging to an off-facility retention pond. Additionally, IDANG Former FTA #1, adjoining the Central Drainage Ditch, exhibited PFOS in the soil (390 µg/kg, sample interval 13 to 15 feet bgs) and groundwater (290 ng/L) (Leidos, 2019). PFOA, PFOS, PFHxS, PFNA, and PFBS were detected in soil and groundwater at AOI 1, therefore, the surface water and sediment ingestion exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete. The PA did not identify any IDARNG potential release areas along the Central Drainage Ditch. The FTA #1 and Central Drainage Ditch are being assessed by IDANG under the ANG PFAS program. Because the off-

facility retention pond has no known recreational uses, the surface water and sediment ingestion exposure pathway for off-facility residents and recreational users is considered incomplete.

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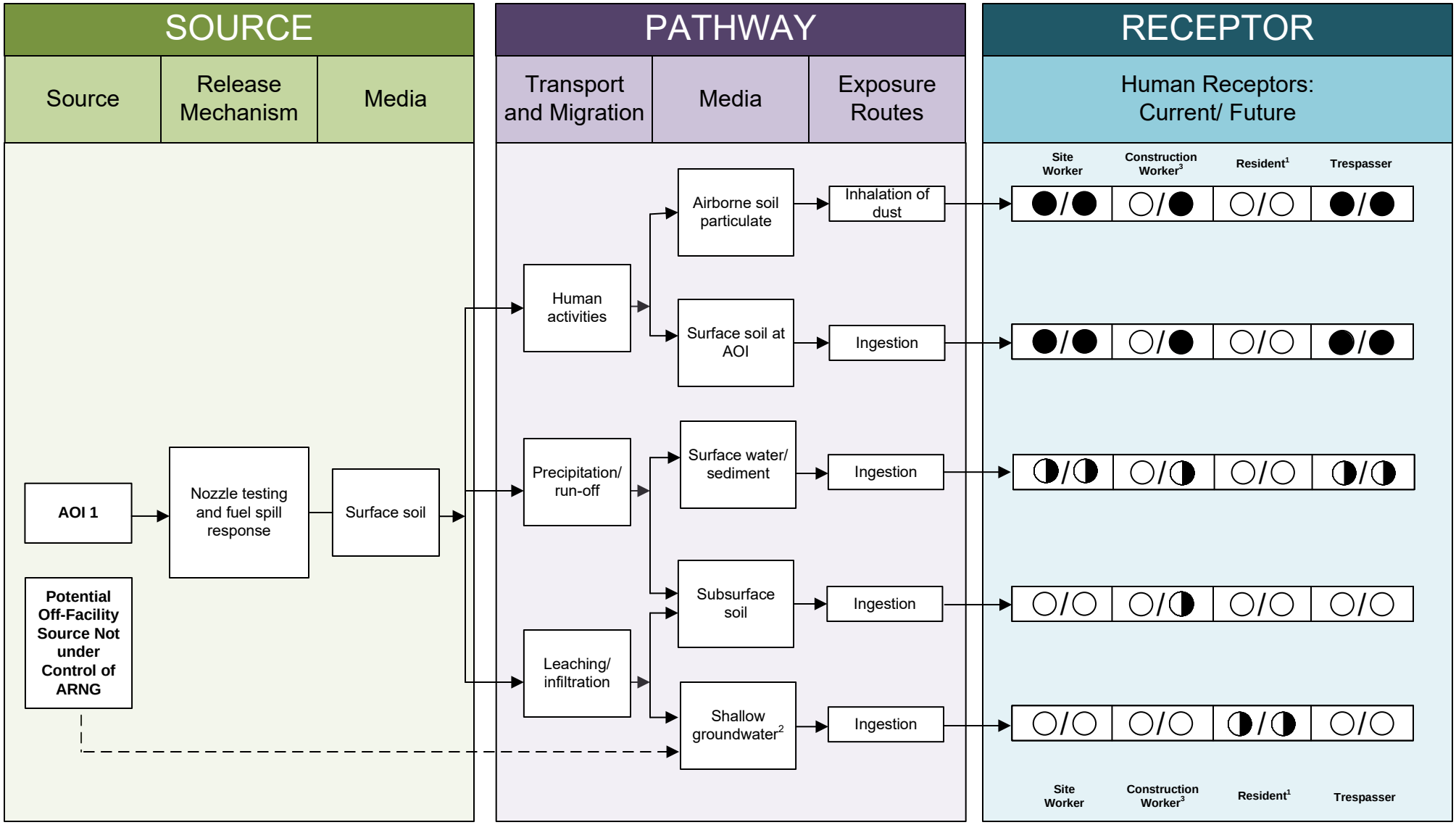

LEGEND

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

Notes:

1. The resident refers to off-site receptors.
2. Exposure pathways for groundwater in the deep aquifer is incomplete for all receptors.
3. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1
Gowen Field AASF

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8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted from 8 to 15 November 2021 and consisted of utility clearance, sonic soil boring installation, soil sample collection, permanent monitoring well installation, groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a), except as previously noted in **Section 5.10**.

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

- Thirteen (13) soil samples from six boring locations;
- One groundwater sample from one permanent monitoring well;
- Thirteen (13) QA/QC samples.

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

8.2 Outcome

Based on the results of this SI, further evaluation is warranted in an RI for AOI 1 (see **Table 8.1**). Based on the CSMs developed and revised in light of the SI findings, there is not a complete pathway between source and on-facility drinking water receptors at this time. However, due to the limited groundwater data collected during the SI, further evaluation of the groundwater pathway is necessary during the RI. Sample analytical concentrations collected during the SI were compared to the risk-based project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - PFOA, PFOS and PFHxS exceeded their respective SLs in surface soil. PFOA exceeded the SL of 19 µg/kg with a concentration of 19.5 µg/kg at GOWEN-MW001. PFOS exceeded the SL of 13 µg/kg with a maximum concentration of 359 µg/kg at AOI01-03. PFHxS exceeded the SL of 130 µg/kg with a concentration of 236 µg/kg at GOWEN-MW001. AOI01-03 is located within AOI 1, and GOWEN-MW001 is located adjacent to and downgradient of AOI 1. Exceedances in surface soil adjacent to and downgradient of AOI 1 may be the result of ANG activities. Based on the results of the SI, further evaluation of AOI 1 is warranted in the RI.
    - The detected concentrations of PFOS in groundwater at AOI 1 was below the SL. The sampled well is near the facility property 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	AASF	●	◐	◐	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

9. References

AECOM. 2018a. *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide Contract No. W912DR-12-D-0014/ W912DR17F0192*. 9 March.

AECOM. 2018b. *Final Programmatic Accident Prevention Plan, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide Contract No. W912DR-12-D-0014/W912DR17F0192.* July.

AECOM. 2019. *Final Preliminary Assessment Report, Gowen Field, Boise, Idaho*. December.

AECOM. 2021a. *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Gowen Field, Boise, Idaho, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide.* July.

AECOM. 2021b. *Final Site Safety and Health Plan, Gowen Field, Boise, Idaho, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide*. March.

Assistant Secretary of Defense. 2022. *Investigation Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program*. United States Department of Defense. 6 July.

DA. 2018. *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances.* 4 September.

DoD. 2019a. *Department of Defense (DoD), Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3*.

DoD. 2019b. *General Data Validation Guidelines. Environmental Data Quality Workgroup*. 4 November.

Guelfo, J.L. and Higgins, C.P. 2013. *Subsurface Transport Potential of Perfluoroalkyl Acids at Aqueous Film-Forming Foam (AFFF)-Impacted Sites.* Environmental Science and Technology 47(9): 4164-71.

Higgins, C.P., and Luthy, R.G. 2006. *Sorption of perfluorinated surfactants on sediments*. Environmental Science and Technology 40 (23): 7251-7256.

IDWR. 2019. *Map and GIS Data Hub.* Accessed March 2019 at https://data-idwr.opendata.arcgis.com/pages/popular-maps.

Idaho National Guard. 2019. *Our History*. Accessed March 2019 at https://imd.idaho.gov/idaho-national-guard/our-history/.

ITRC. 2018. *Environmental Fate ant Transport for Per- and Polyfluoroalkyl Substances*. March.

Leidos. 2014. *Preliminary Assessment/Site Inspection for Eleven Areas of Concern at Idaho Air National Guard, Gowen Field, Boise, ID*. May.

Leidos. 2019. *Final Site Inspection Report for Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Gowen Field Boise, Idaho*. February.

National Oceanic and Atmospheric Administration (NOAA), 2020. *National Centers for Environmental Information Data*. Accessed September 2022 at https://www.ncdc.noaa.gov/cdo-web/datatools/normals.

Othberg, Kurt L. 1994. *Geology and Geomorphology of the Boise Valley and Adjoining Areas, Western Snake River Plain, Idaho*. January 1994.

Petrich, Christian R. 2004. *Simulation of Ground Water Flow in the Lower Boise River Basin*. Idaho Water Resources Research Institute and Idaho Department of Water Resources. February 2004. Available at https://idwr.idaho.gov/files/projects/treasure-valley/TVHP-Model.pdf.

Petrich, Christian R. and Urban, Scott M. 2004. *Characterization of Ground Water Flow in the Lower Boise River Basin.* Idaho water Resources Research Institute and Idaho Department of Water Resources. February. Available at https://idwr.idaho.gov/files/projects/treasure-valley/TVHP-Characterization.pdf.

USACE. 2016. *Technical Project Planning Process*, EM-200-1-2. 26 February.

USEPA. 1980. *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*.

USEPA. 1994. *National Oil and Hazardous Substances Pollution Contingency Plan (Final Rule)*. 40 CFR Part 300; 59 Federal Register 47384. September.

USEPA. 2001. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)*. December.

USEPA. 2017. *National Functional Guidelines for Organic Superfund Data Review*. OLEM 9355.0-136, EPA-540-R-2017-002. Office of Superfund Remediation and Technology Innovation. January.

USFWS. 2021. *Species by County Report, County: Ada, Idaho.* Environmental Conservation Online System. Accessed 16 December 2021 at https://ecos.fws.gov/ecp/report/species-listings-by-current-range-county?fips=16001.

Wood, Spencer H. and Clemens, Drew M. 2002. *Geologic and Tectonic History of the Western Snake River Plain, Idaho and Oregon*.

Xiao, F., Simcik, M. F., Halbach, T. R., and Gulliver, J. S. 2015, *Perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in soils and groundwater of a U.S. metropolitan area: Migration and implications for human exposure.* Water Research 72: 64-74.