Final
Site Inspection Report
Fort Indiantown Gap, PA

Perfluorooctane Sulfonic Acid (PFOS) and
Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

April 2021

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Acronyms and Abbreviations

6:2 FTS	6:2 Fluorotelomer sulfonate
8:2 FTS	8:2 Fluorotelomer sulfonate
µg/kg	micrograms per kilogram
°F	degrees Fahrenheit
%	percent
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
CACTF	Combined Arms Collective Training Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain-of-custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DPT	Direct-Push Technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIS	Extraction Internal Standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineering Manual
FTA	Fire Training Area
FTIG	Fort Indiantown Gap
HA	Health Advisory
HDPE	high-density polyethylene
IDW	Investigation Derived Waste
ISC	Instrument Sensitivity Check
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOQ	Level of Quantitation
MAAF	Muir Army Air Field
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
ng/L	nanograms per liter
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
NPDES	National Pollution Discharge Elimination System

OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PAARNG	Pennsylvania Army National Guard
PADEP	Pennsylvania Department of Environmental Protection
PADMVA	Pennsylvania Department of Military and Veterans Affairs
PAGS	Pennsylvania Geological Survey
PFAS	Per- and polyfluoroalkyl substances
PFBA	Perfluorobutanoic acid
PFBS	Perfluorobutanesulfonic acid
PFCs	Perfluorinated compounds
PFDA	Perfluorodecanoic acid
PFDoA	Perfluorododecanoic acid
PFHpA	Perfluoroheptanoic acid
PFHxA	Perfluorohexanoic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PFPeA	Perfluoropentanoic acid
PFTeDA	Perfluorotetradecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFUdA	Perfluoroundecanoic acid
PID	photoionization detector
PQAPP	Programmatic UFP-QAPP
PVC	poly-vinyl chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	relative percent differences
RSL	Risk-based Screening Level
SI	Site Inspection
SL	screening level
SW/SD	Surface Water/Sediment
TOC	Total organic carbon
TPP	Technical Project Planning
UCMR3	Unregulated Contaminant Rule 3
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
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service

WWTP	wastewater treatment plant

Executive Summary

The Army National Guard (ARNG) G9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at per- and polyfluoroalkyl substances (PFAS)-impacted sites at ARNG facilities nationwide. The objective of the SI at each facility is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutanesulfonic acid (PFBS) at or above screening levels (SLs). An SI was completed at Fort Indiantown Gap (FTIG; also referred to as the "facility" throughout this document).

FTIG is located in Lebanon and Dauphin Counties in south-central Pennsylvania, near Annville, approximately 26 miles northeast of Harrisburg. FTIG is an active National Guard Training Center and serves as headquarters for the Pennsylvania Department of Military and Veterans Affairs (PADMVA) and the Pennsylvania ARNG (PAARNG) in Annville, Pennsylvania. FTIG is located within the Appalachian Plateau, at the junction of two sections of the Valley and Ridge Physiographic Province: the Appalachian Mountain Section and the Great Valley Section (Ogden, 2001). The total facility is currently in excess of 18,000 acres and comprises a cantonment area that includes the Muir Army Air Field (MAAF), heavy and light vehicle maintenance, army helicopter training and maintenance, small arms ranges, and a training corridor that includes bombing and strafing ranges and maneuver training. The training corridor lies to the north, between the Blue and Second Mountains within the Appalachian Mountain Section, while the small arms ranges and the cantonment area lie to the south in the Great Valley Section. During the PA for FTIG, 13 potential PFAS release areas were grouped into six AOIs and identified as AOI 1 through AOI 6. Each of these areas were investigated during the SI. The SI field activities were conducted from 28 May 2019 to 20 June 2019 and included soil, groundwater, surface water, and sediment sampling.

To fulfill the project Data Quality Objectives (DQOs) set forth in the approved SI Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2019), samples were collected and analyzed for a subset of 18 PFAS via liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with DoD Quality Systems Manual (QSM) 5.1 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.9** of this report.

The Department of Defense (DoD) has adopted a policy to retain facilities in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 October 2019 (Assistant Secretary of Defense, 2019). The ARNG PFAS SIs follow this DoD policy and, when the maximum site concentration for sampled media exceed the SLs, the AOI will proceed to a Remedial Investigation (RI), the next phase under CERCLA. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table ES-1**. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil, groundwater, sediment, and surface water contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

Sample chemical analytical concentrations were compared against the project SLs as described in **Table ES-1**. A summary of the results of the SI data relative to the SLs is as follows:

- PFOA and PFOS were detected in groundwater at AOI 1: Combined Arms Collective Training Facility at concentrations below the SLs. PFBS was not detected in any of the groundwater samples. Based on the results of the SI, further evaluation of AOI 1 is not warranted in the RI.
- PFOA and PFOS in groundwater at AOI 2 exceeded the SLs of 40 nanograms per liter (ng/L), with maximum concentrations of 44 ng/L and 280 ng/L, respectively. No detections of PFBS exceeded the SL of 40,000 ng/L at AOI 2. Concentrations in groundwater

exceeded the SLs at AOI 2: West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and the Current Fire Station. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

- PFOS was detected in groundwater at AOI 2: Crash Site at concentrations below the SLs. PFOA, PFOS, and PFBS were not detected in groundwater at AOI 2: Simulated Emergency Event. Additionally, no groundwater samples were collected at AOI 2: Accidental Tank Spill. Based on the results of the SI, further evaluation of these source areas is not warranted in the RI.
- PFOS was detected in groundwater at AOI 3: Johnson Trail at concentrations below the SLs. PFOA and PFBS were not detected in groundwater at this location. Based on the results of the SI, further evaluation of AOI 3 is not warranted in the RI.
- PFOA, PFOS, and PFBS were not detected in groundwater at AOI 4: Fire Pit Area #19 and AOI 6: Biosolid Area. Groundwater at AOI 5: First Street was not sampled. Based on the results of the SI, further evaluation of these AOIs is not warranted in the RI.
- The detected concentrations of PFOA, PFOS, and PFBS in soil samples from AOIs 1, 2, 3, and 6 were below the SLs. PFOA, PFOS, and PFBS were not detected in AOI 5 and soil samples were not collected at AOI 4.

Table ES-2 summarizes the SI results for soil and groundwater. Based on the conceptual site models (CSMs) developed and revised based on SI findings, there are potential pathways for exposure to receptors from release sites at AOI 1, AOI 2, AOI 3, and AOI 6.

Table ES-3 summarizes the rationale used to determine if the AOI should be considered for further action under CERCLA and undergo an RI. Based on the results of this SI, further evaluation is warranted in the RI for AOI 2: the West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and the Current Fire Station.

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

Analyte	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	130	1,600	40
PFOS	130	1,600	40
PFBS	130,000	1,600,000	40,000

Notes:

a.) Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. HQ=0.1. 15 October 2019.

Table ES-2: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area
1	Combined Arms Collective Training Facility	◐	◐
2	West Ramp Fire Pit Training Area	◐	●
2	East Ramp Fire Pit Training Area	◐	●
2	Building 019-101 Ramp	◐	●
2	Current Fire Station (Building 5-117)	◐	●
2	Crash Site	◐	◐
2	Simulated Emergency Event	◐	○
2	Accidental Tank Spill	○	N/A
3	Johnson Trail	◐	◐
4	Fire Pit Area #19	N/A	○
5	First Street	○	N/A
6	Biosolid Area	◐	○

Legend:

N/A = Not applicable

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ **= not detected**

Table ES-3: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Combined Arms Collective Training Facility	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action
2	West Ramp Fire Pit Training Areas	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	East Ramp Fire Pit Training Area	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Building 019-101 Ramp	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Current Fire Station (Building 5-117)	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Crash Site	Detections in groundwater but no exceedances in SLs. No exceedances of SLs in soil.	No further action
2	Simulated Emergency Event	No detections in groundwater at the source area. No exceedances of SLs in soil.	No further action
2	Accidental Tank Spill	No groundwater samples were collected. No detections in soil.	No further action
3	Johnson Trail	Detections in groundwater but no exceedances in SLs. No exceedances of SLs in soil.	No further action
4	Fire Pit Area #19	No detections in groundwater at the source area. No soil samples were collected.	No further action
5	First Street	No groundwater samples were collected. No detections in soil.	No further action
6	Biosolid Area	No detections in groundwater at the source area. No exceedances of SLs in soil.	No further action

1. Introduction

1.1 Project Authorization

The Army National Guard (ARNG) G9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites, ARNG Installations, Nationwide. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor, AECOM Technical Services, Inc. (AECOM), under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017. The ARNG performed this SI at Fort Indiantown Gap (FTIG; also referred to as the "facility") in Pennsylvania.

The SI project elements were performed by AECOM in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 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 Department of the Army (DA) requirements and guidance for field investigations, including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and poly-fluoroalkyl substances (PFAS). The term PFAS will be used throughout this report to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

1.2 SI Purpose

A PA was performed at FTIG (AECOM, 2018c) that identified thirteen potential PFAS release areas at FTIG which were grouped into six Areas of Interest (AOIs). The objective of the SI is to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA, 2005), an SI has five goals:

1) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
2) Determine the potential need for a removal action.
3) Collect or develop data to evaluate potential release.
4) Collect data to better characterize the release for more effective and rapid initiation of a Remedial Investigation (RI).
5) Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD)

In addition to the USEPA-identified goals of an SI, the ARNG SI also identifies whether there are potential off-facility PFAS sources.

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2. Site Background

2.1 Site Location and Description

FTIG is located in Lebanon and Dauphin Counties in south-central Pennsylvania, near Annville, approximately 26 miles northeast of Harrisburg. FTIG is an active National Guard Training Center and serves as headquarters for the Pennsylvania Department of Military and Veterans Affairs (PADMVA) and the Pennsylvania ARNG (PAARNG).

The total facility is currently in excess of 18,000 acres and comprises a cantonment area that includes the Muir Army Air Field (MAAF), heavy and light vehicle maintenance, army helicopter training and maintenance, bombing and strafing ranges, small arms ranges, and maneuver training. The facility location and layout are shown on **Figure 2-1**.

2.2 Facility Environmental Setting

FTIG is located within the Appalachian Plateau, at the junction of two sections of the Valley and Ridge Physiographic Province: the Appalachian Mountain Section and the Great Valley Section (Ogden, 2001). The training corridor (50 caliber munitions and larger) and small arms ranges (50 caliber munitions or smaller) lie between Blue and Second Mountains within the Appalachian Mountain Section, while the cantonment area and the small arms ranges lie to the south in the Great Valley Section. The Appalachian Mountain Section is composed of ridges and valleys. The mountain ridges reach elevations of 1,200 to 1,440 feet above mean sea level (amsl). The valley between the Blue and Second Mountains is approximately 600 to 700 feet amsl, and the cantonment area lies at 400 to 500 feet amsl.

The facility topography and surface water features are shown on **Figure 2-2**. The regional surface water features and drainage basins are shown on **Figure 2-3.** The regional geology and groundwater features are shown on **Figure 2-4.**

2.2.1 Geology

The valley and ridge topography at FTIG are characteristic of folding and faulting of Paleozoic sedimentary rocks. The facility is underlain by an arm of one of the folds, resulting in a sequence of rock that becomes progressively younger from southeast (in the cantonment area) to northwest (in the training corridor) (Berg et al., 1980).

The cantonment area is primarily underlain by shale and siltstone of the Hamburg and Martinsburg sequences. The Tuscarora Formation quartzite and quartzitic sandstone forms the Blue Mountain ridgeline, while shales of the Clinton Group, Bloomsburg Formation, and Hamilton Group form the northern slope. The valley between Blue and Second Mountains is formed by the siltstones and mudstones of the Trimmers Rock Formation and the Irish Valley and Sherman Creek members of the Catskill Formation. The backbone of Second Mountain is supported by the sandstones in the Catskill Formation (the Clarks Ferry and Duncannon members) as well as the Spechty Kopf Formation and the Pocono Formation.

Soil borings completed during SI activities indicated that the subsurface soil was composed of fine-grained sediment, ranging from silt to lean clay. In AOI 1, the sediment is underlain by siltstone, whereas at all other AOIs where bedrock was encountered, the sediment is underlain by weathered shale.

Bedrock is typically found within 6 feet of the ground surface, although it is often at shallower depths (AMEC, 2006). Some of the bedrock units at the facility reportedly contain thin interbeds of limestone and other calcareous components (Greyer et al., 1958); however, no karst features

have been identified in the vicinity of FTIG. The regional geologic and groundwater features are shown on **Figure 2-4**.

2.2.2 Hydrogeology

The US Geological Survey (USGS) has developed a generalized conceptual groundwater model based on several assumptions for the facility (USGS, 2010) that indicates shallow groundwater flow is in the direction of adjacent surface water bodies. Streams throughout the facility are gaining, even during dry periods, indicating that shallow groundwater discharges to surface water streams over much of FTIG. Within the training corridor, topography and facility conditions appear to also favor localized shallow groundwater flow, with discharge to adjacent streams rather than a significant portion of recharge reaching the deeper groundwater flow system. However, due to the fractured nature of bedrock at FTIG, a fraction of infiltrating water may enter a deeper groundwater flow system, bypass the perennial streams, and continue underground.

Structural deformation has extensively impacted the bedrock formations in the FTIG area. The shale and sandstone bedrock formations have low permeability; therefore, the secondary permeability resulting from faulting and fracturing provides the conduit for groundwater infiltration and migration through these units (Ogden, 2001). Productive aquifers are found in both the carbonate and sandstone formations, as evidenced by the number of public and private groundwater wells located near the southern facility boundary (Pennsylvania Geological Survey [PAGS], 2006). The most productive aquifers are formed primarily in the carbonate rocks of the Martinsburg and Hamburg formations; however, there are a number of wells located to the northeast and southwest of the facility that are installed in the siltstone and mudstone units that form the valley between the Blue and Second Mountains. Most drinking water wells in Lebanon and Dauphin counties are installed at a depth of 165 to 170 feet, with most wells installed at a depth of less than 200 feet (PAGS, 2006). The regional geologic and groundwater features are shown on **Figure 2-4**.

On 19 June 2019, groundwater elevations at FTIG were measured at existing wells and SI monitoring wells. Groundwater contours constructed from these elevation measurements indicate groundwater flows from the monitoring wells toward downgradient perennial streams and surface water bodies. This groundwater flow direction is consistent with previous USGS modeling. A groundwater contour map of the cantonment area based on the synoptic groundwater gauging event conducted in June 2019 is presented in **Figure 2-5**.

2.2.3 Hydrology

FTIG is located within the Susquehanna River and Swatara Creek drainage basins and is drained by the watersheds of Manada Creek, Bow Creek, Reeds Creek, and Swatara Creek (Ogden, 2001). Approximately 6.5 stream miles of Manada Creek lie within FTIG boundaries and drain the western portion of the facility. Approximately 6 stream miles of Indiantown Run drain the central portion of FTIG, emptying first into Marquette Lake before flowing further downstream into Memorial Lake. After flowing from Memorial Lake, Indiantown Run is joined by 2 stream miles of Vesle Run, which drains the western edge of the cantonment area. Indiantown Run then flows approximately 1 mile before its confluence with Swatara Creek. Approximately 2 stream miles of Aires Run and Qureg Run drain the eastern portion of FTIG within the Reeds Run watershed, including most of the cantonment area. After Aires Run and Qureg Run converge, the stream continues 0.5 miles as Aires Run to the FTIG boundary. Aires Run confluences with Reeds Creek off-facility before joining Swatara Creek approximately 2 miles downstream. Unnamed tributaries of Trout Run and Forge Creek, each less than 0.5 miles long, drain small parcels of land at FTIG's easternmost boundaries. The entirety of FTIG drains into Swatara Creek, and a portion of Swatara Creek has been designated by the State of Pennsylvania as a Warmwater Fishery stream (AMEC, 2006). Both Manada Creek and Swatara Creek are stocked trout streams.

Surface water resources at FTIG include streams, open water features, and wetlands (PADMVA, 2016). All streams originate on facility property and are perennial, with the exception of the upper reaches of some smaller tributaries. Two named springs exist on FTIG: Russian Spring, located south of Blue Mountain, flows into Qureg Run, and St. Joseph Spring, located north of Blue Mountain, flows into Indiantown Run. Several small, unnamed springs also exist, mostly on steep mountainsides. In addition, there are numerous acres of wetlands within the boundaries of FTIG.

There are no natural ponds or lakes on-facility; however, there are two manmade lakes located on the non-operational cantonment area of the facility. Marquette Lake is a 15-acre surface water impoundment of Indiantown Run located in the south-central portion of the facility, within the cantonment area. Shuey Lake, a 5.5-acre impoundment of Qureg Run, is located near the southeastern facility boundary.

Another surface water impoundment, Memorial Lake, exists along Indiantown Run and is located downstream from Marquette Lake. Memorial Lake is an 80-acre lake that is contained within the 230-acre Memorial Lake State Park, an inholding at FTIG, and is adjacent to the southern post boundary (PADMVA, 2002). Memorial Lake is classified as a Warmwater Fishery by the State of Pennsylvania, and the portion of Indiantown Run from and including St. Joseph Springs to Memorial Lake is open for public fishing. Trout in Memorial Lake are raised from Pennsylvania Fish and Boat Commission-provided fingerlings; therefore, they must be made available to the public upon release, and any stocked water must be publicly fishable. Shuey and Marquette Lakes are also stocked annually. There is no public boating on facility waters, but the FTIG Fish and Game Conservation Club is allowed to use some small, un-motorized rowboats on Marquette Lake (PADMVA, 2016).

The potable water supply is provided by the City of Lebanon. Several potable wells are used to supply water to isolated, limited-use facilities within FTIG. In 2017, six drinking water sources at FTIG were tested for PFAS, and all PFAS results were less than the USEPA Health Advisory (HA) of 70 nanograms per liter (ng/L). Lebanon Water Company serves approximately 57,000 customers, including FTIG, and draws water from Swatara Creek, downstream of Forge Creek (Ogden, 2001). The Pennsylvania American Water Company also maintains a surface water intake located at the confluence of Swatara Creek and Manada Creek, approximately 10 miles downstream of the facility. The regional surface water features are presented on **Figure 2-3**.

Based on the USEPA's Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, PFOS was detected in a public water system above the HA within 20 miles of the facility near the City of Harrisburg (USEPA, 2017a). The HA is 70 ng/L for PFOS and PFOA, individually or combined. PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

2.2.4 Climate

The climate in the area of FTIG is moderate, with an average temperature of 53.5 degrees Fahrenheit (°F). Seasonally, temperatures vary from average summer highs of 86 °F to average winter lows of 23 °F (World Climate, 2019). Precipitation is relatively evenly distributed throughout the year, with an average of 42 inches of rain and 35 inches of snow. The prevailing wind is typically from the west at 8 miles per hour, but topography influences the wind conditions (Ogden, 2001).

2.2.5 Current and Future Land Use

FTIG is currently an open facility with public roads; however, ranges have controlled access for safety reasons. As previously stated, 17 privately held residential properties exist within the facility boundary, some of which have private drinking water wells (**Figure 2-4**). Based on a 25-year

development strategy, the FTIG Master Plan includes a comprehensive implementation plan to meet developing facility and training program needs in alignment with inevitable mission changes and growth. New facilities to house several additional Unmanned Aerial Systems platoons with expanded runways for the ARNG are being planned (PADMVA, 2016).

The southern, eastern, and western boundaries of FTIG are abutted by primarily conservation, rural residential, and agricultural land uses. The lands directly to the north of the facility are owned and operated by the Pennsylvania Game Commission and used for public recreation. Future land use around the facility is projected to remain conservation, rural residential, and agricultural, with some parcels becoming commercial and industrial. A light, industrial park is located to the east of the facility, in Union Township. The closest urban environments are located approximately 13 miles from the facility in Hershey to the southwest and Lebanon to the southeast, and the closest major city is Harrisburg, located 26 miles to the southwest (PADMVA, 2016).

2.2.6 Critical Habitat and Threatened/ Endangered Species

According to the US Fish and Wildlife Service (USFWS), there are four federally threatened or endangered species found in Lebanon County and/or Dauphin County (USFWS, 2019).

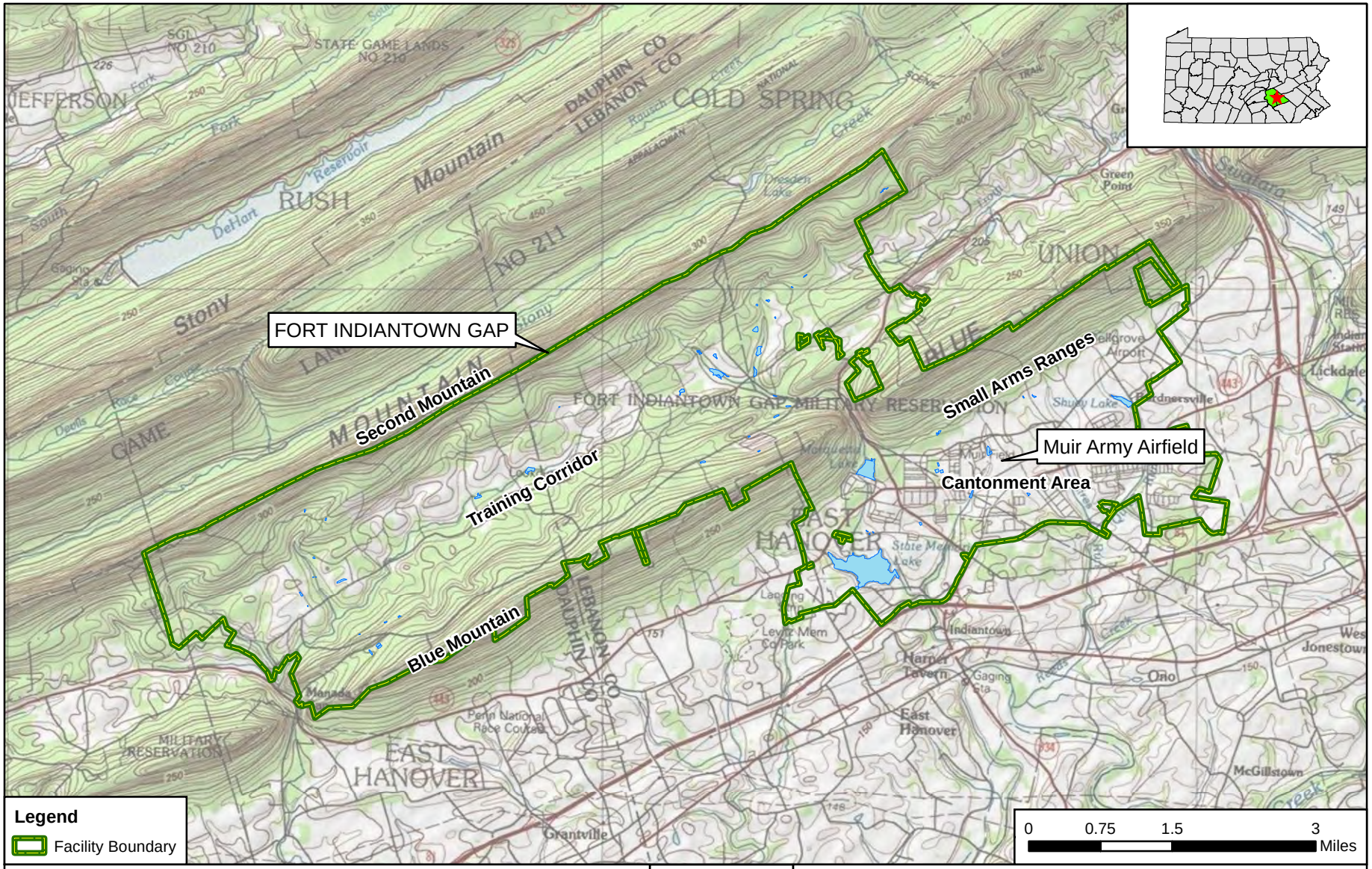
- **Mammals:** northern long-eared bat, *Myotis septentrionalis* (Threatened) and Indiana bat, *Myotis sodalist* (Endangered)
- **Reptiles:** bog turtle, *Clemmys muhlenbergii* (Threatened)
- **Plants:** Northeastern bulrush, *Scirpus ancistrochaetus*l (Endangered)

2.3 History of AFFF Use

A common military source of PFAS was the use of aqueous film forming foam (AFFF), a firefighting agent used by the DoD, to extinguish petroleum fires in response actions and to train firefighters to respond to petroleum fires or suppression of fires in uncontained areas. Military use of AFFF began in the 1970s and was most widely used at DoD installations with airfields. Thirteen potential PFAS release areas where AFFF may have been used or released historically were identified at FTIG during the PA (AECOM, 2018c). The potential PFAS release areas were grouped into six AOIs (AOI 1 through 6) based on proximity to one another and presumed groundwater flow. A description of each AOI is presented in **Section 3**.

2.4 Historical PFAS Investigations

In 2017, six drinking water well sources for small, inaccessible structures at FTIG were sampled for PFOS and PFOA (Tetra Tech, 2017). The drinking water samples were collected from the first access point (i.e. sample port, spigot, or faucet) downstream from the functioning supply well following a purge of water from each well. Water softening systems were present in the water flow path prior to five of the six access points. It is not known whether the systems have affected the results. PFOA and PFOS were detected at concentrations greater than the laboratory level of detection in one sample and a duplicate sample, at concentrations of 0.717J ng/L and 1.6J ng/L, respectively. The J in the numeric result indicates the concentrations are estimated as a result of the detections below the laboratory quantification limit. The reported concentrations are less than the HA of 70 ng/L for PFOA and PFOS. The locations of the six sampled drinking water well sources along with one additional well in the northwestern portion training corridor are shown on **Figure 2-4**.



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SCALE	1:95,040	CHK BY	JZ	8/22/2018
Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RH	8/22/2018

TITLE

Site Location and Facility Layout

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

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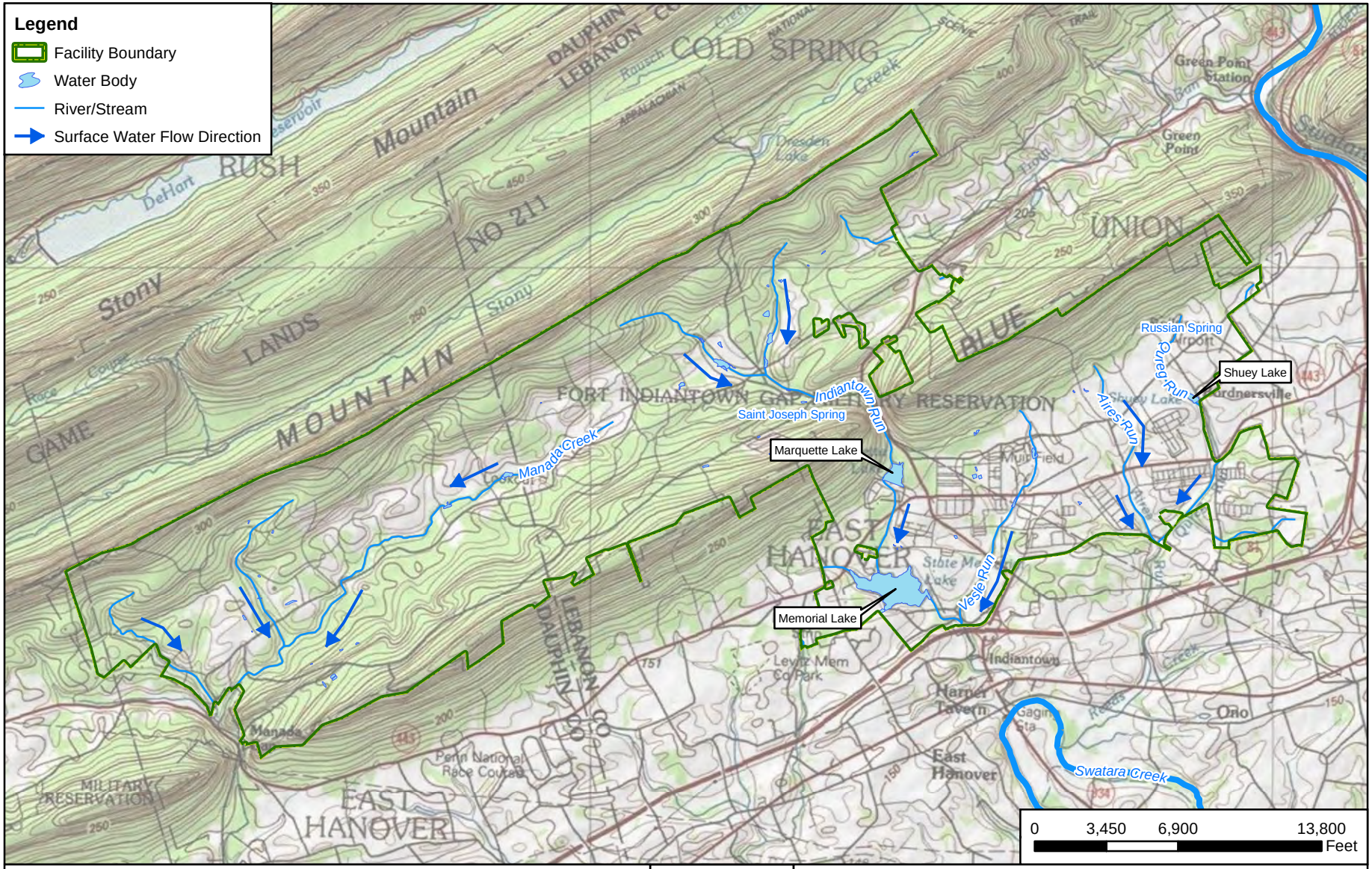

CLIENT	ARNG			
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SCALE	1:82,800	CHK BY	JZ	8/22/2018
Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RG	8/22/2018

TITLE

Site Topography and Surface Water Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2

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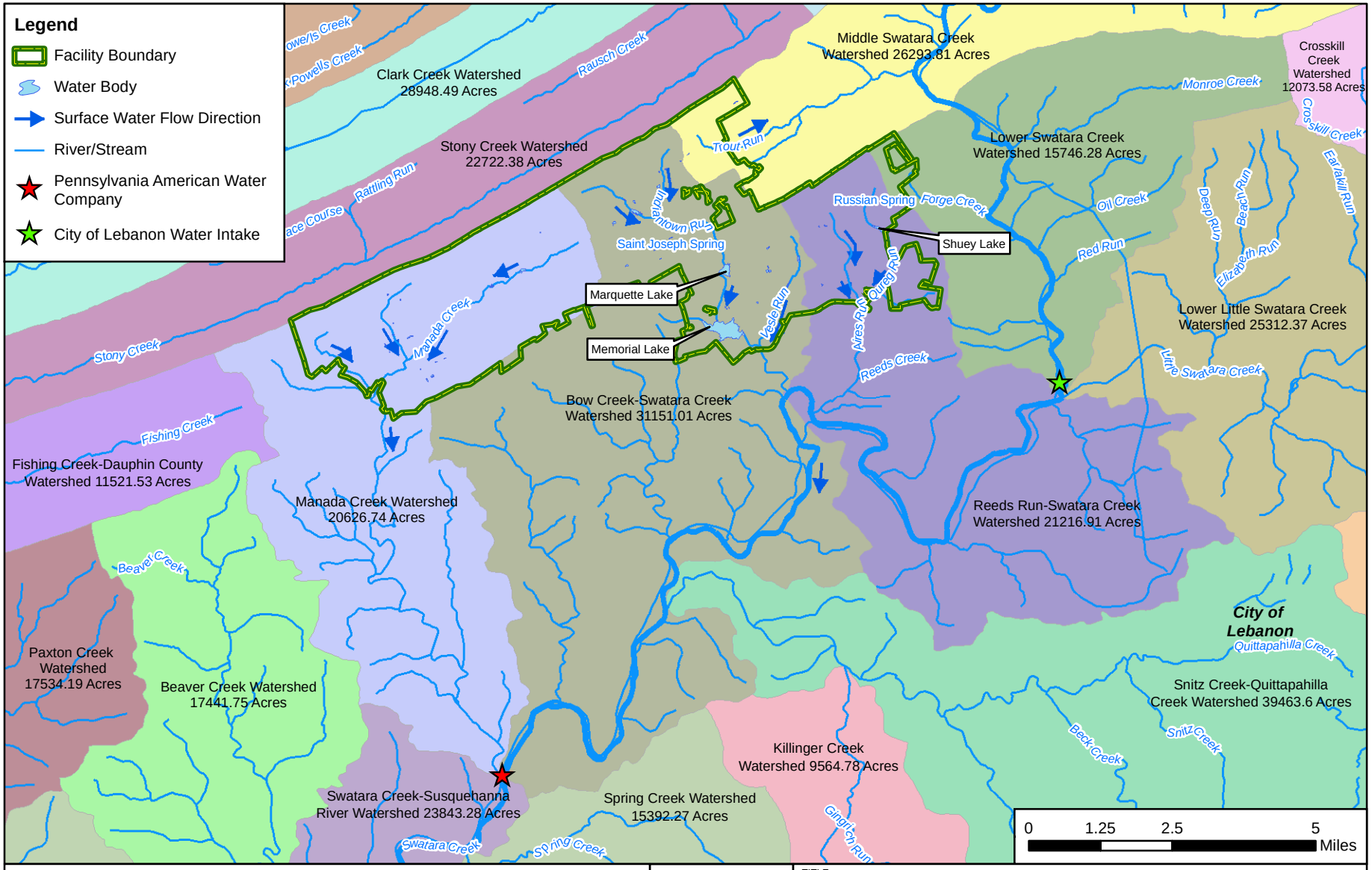


CLIENT	ARNG			
PROJECT	Site Investigation for PFAS at Fort Indiantown Gap, PA			
REVISED	2/28/2019	GIS BY	MS	2/28/2019
SCALE	1:158,400	CHK BY	BM	2/28/2019
		PM	RG	2/28/2019

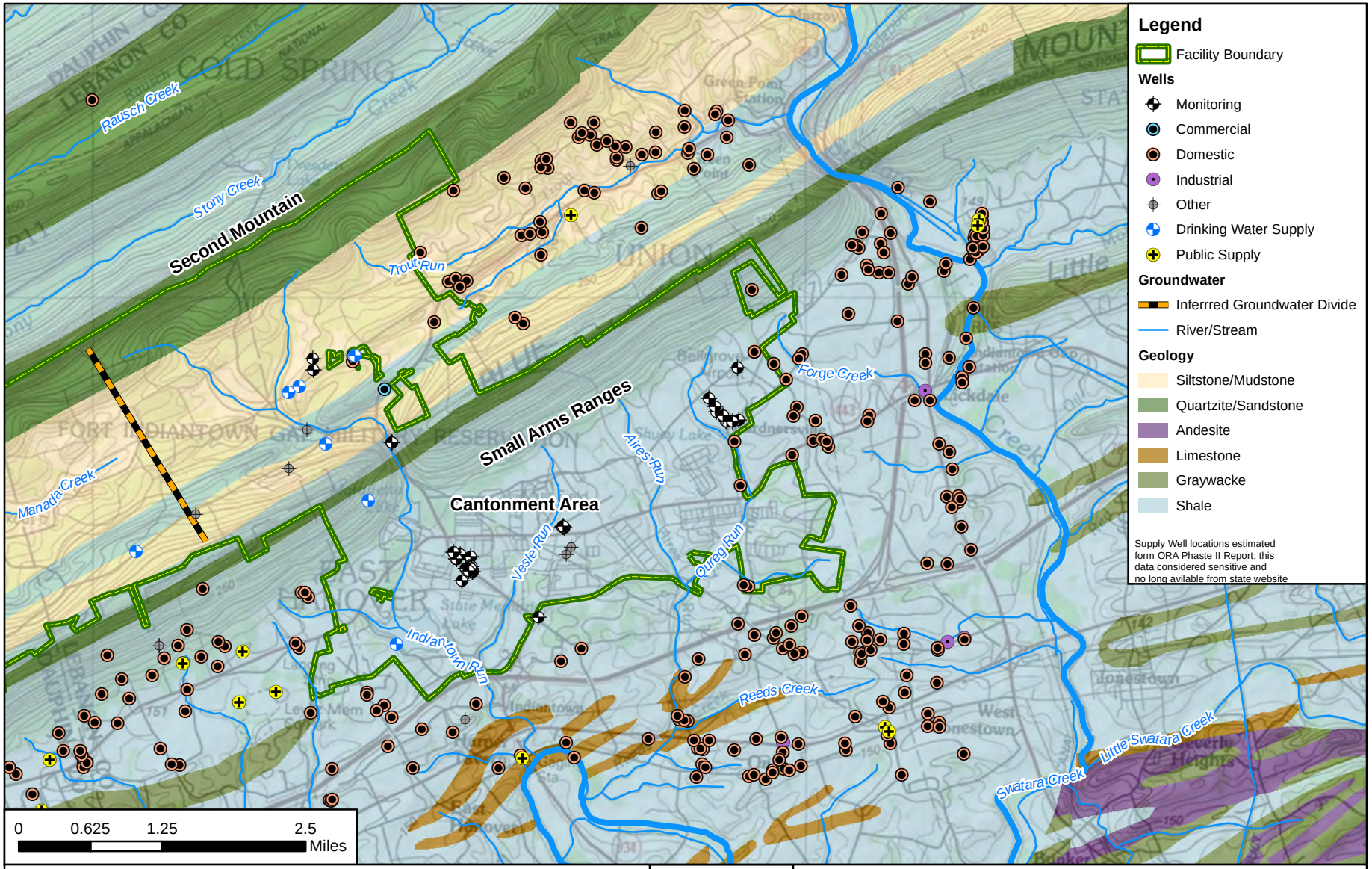
TITLE

Regional Surface Water Features

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 2-3

Q:\Projects\ENV\GEARS\GEO\MAES 2012 Unrestricted\Fort Meade\E. Data Management\GIS\MXDs\Chisholm_6th\March2017\ Fig_10-3_Regional_Surfacewater_Features.mxd



CLIENT	ARNG			
PROJECT	Site Investigation for PFAS at Fort Indiantown Gap, PA			
REVISED	3/25/2020	GIS BY	MS	3/25/2020
SCALE	1:79,200	CHK BY	JZ	3/25/2020
Base Map: Copyright:© 2013 National Geographic Society, i-cubed Well data: PAGWIS, PAARNG		PM	RG	3/25/2020

TITLE

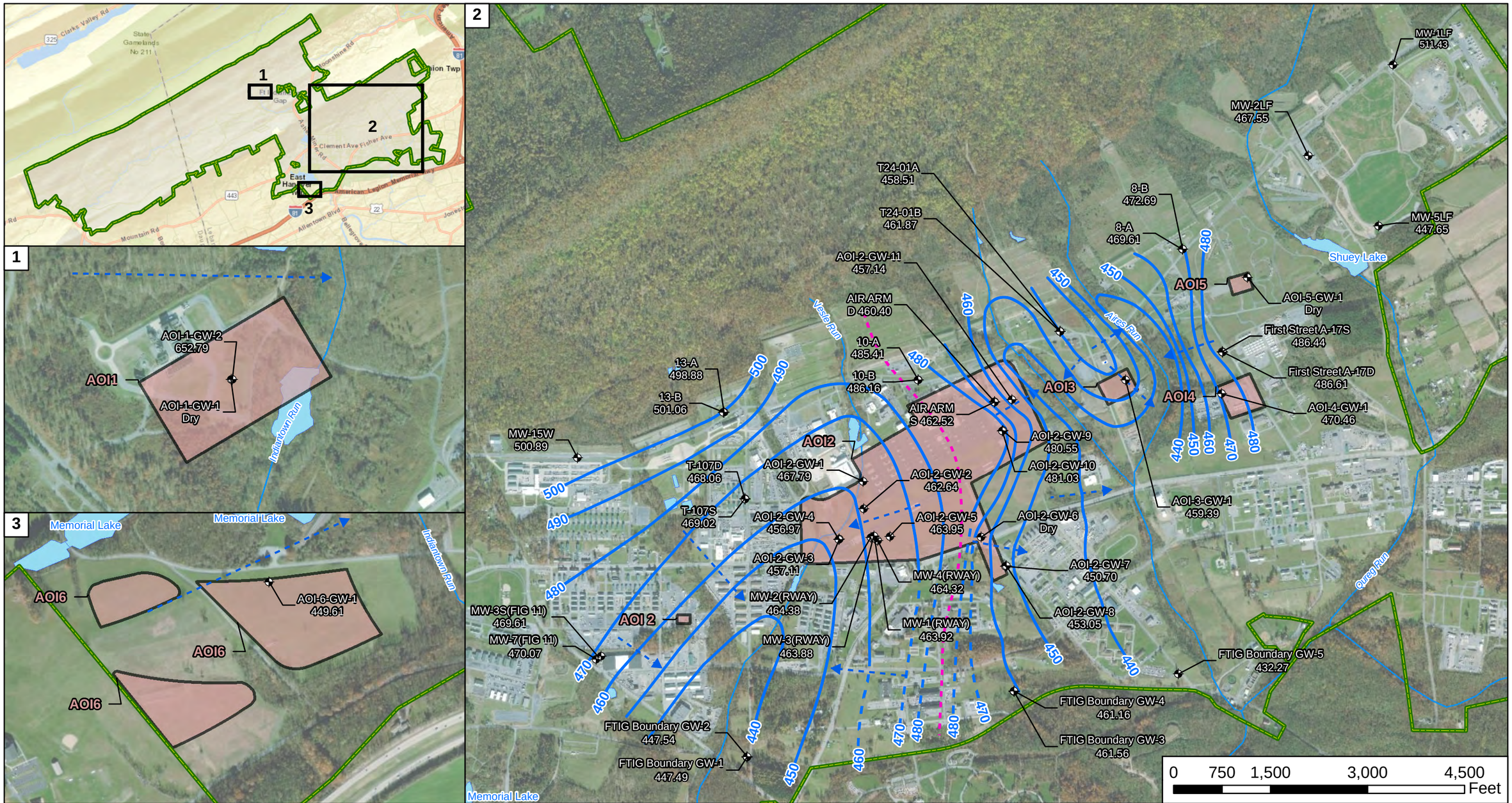
Groundwater Features

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4

Q:\Projects\ENV\GEARS\GEO\MAES 2012 Unrestricted\Fort Meade\E. Data Management\GIS\MXDs\Chisholm_6th\March2017\ Fig_2-4_FTIG_SI_Groundwater_Features.mxd



CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	3/25/2020	GIS BY	MS	3/25/2020
SCALE	1:18,000	CHK BY	JH	3/25/2020
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	RG	3/25/2020

- Area of Interest
- Facility Boundary
- Water Body
- River/Stream
- Monitoring Well/Piezometer
- Groundwater Contour
- Extrapolated Contour
- Groundwater Divide
- Groundwater Flow Direction

Ground Water Contours and Elevations in Feet above Mean Sea Level

N

Groundwater Contours for Fort Indiantown Gap

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

In the PA, the potential PFAS release areas were grouped into six AOIs based on proximity and direction of groundwater flow. A summary of each AOI is presented below. The locations of the AOIs are shown on **Figure 3-1**.

3.1 AOI 1

3.1.1 Combined Arms Collective Training Facility

The Combined Arms Collective Training Facility (CACTF) is located northeast of the intersection of Cold Springs Road and Tomstown Road, in the north-central portion of FTIG. The CACTF is in the training corridor, and access to the area is only granted through permission from Range Control.

The CACTF is an active, 1-square-kilometer, replicated urban environment with an assortment of mock facilities and buildings including residences, office buildings, a church, a gas station, stores, streets, and sidewalks. The CACTF was constructed in 2009, and training exercises began in 2010. Range Facility Management Support System documents fire training activities at the CACTF conducted by the PAARNG Fire Department in 2010, 2012, 2013, 2015, and 2016. According to the current PAARNG Assistant Fire Chief, only water was used during fire training activities at this location, with the exception of the 2012 training event described below.

In November 2012, AFFF was discharged by the PAARNG Fire Department during fire training activities at the mock gas station in the southeast corner of the CACTF. AFFF fire training activities were conducted by the PAARNG on 18, 19, 26, and 29 November 2012, and, in total, involved the discharge of approximately 20 gallons of 3 percent (%) AFFF concentrate. On the last day of the training event, AFFF accumulated at the mock gas station and breached the storm drains, which outfall to an earthen, bermed retention pond on the southeast corner of the CACTF lot. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this location was used only once for AFFF training activities by the PAARNG. No PFAS remediation activities have occurred at this location.

3.2 AOI 2

3.2.1 West and East Ramp Fire Pit Training Areas

During an interview with the former PAARNG Fire Chief, two additional fire pit training areas, reportedly used for coordinated exercises with the PAARNG and US Army Fire Departments, were identified on either side of the MAAF ramp (**Figure 3-1**; east end and west end).

One fire training pit was located at the east end of the MAAF ramp. At this location, a rotary-winged aircraft was ignited using jet fuel and solvents at least once annually from the late 1980s to the early 1990s and then extinguished with AFFF by the PAARNG and the US Army Fire Departments. The area is currently a paved parking lot adjacent to the nearby Army Aviation Brigade Armory (Building-19-119) built in 1995. The terrain around the area was once level with the MAAF, but the area was excavated and lowered with an embankment during construction of the Brigade Armory parking lot. The soil from the excavation of the area may possibly still be on-facility; however, the exact fate of the soil could not be determined during the facility visit.

A second fire training pit was located at the west end of the MAAF ramp. At this location, a rotary-winged aircraft was ignited using jet fuel during a one-time event in the early 1990s and then extinguished with AFFF by the PAARNG and the US Army Fire Departments. This area is co-located with the newly constructed Building 019-177 (EAATS hangar). The soil from the fire

training pit location was scrapped and hauled away prior to construction of Building 019-177. No information was available on the final disposition location of the excavated soil.

3.2.2 Building 019-101

Building 019-101 is the Army Aviation Support Facility (AASF) hangar on the MAAF and is operated by the PAARNG. The MAAF is bordered on the north by Range Road, on the east by Johnson Trail, on the south by Fisher Avenue, and on the west by Utility Road.

Building 019-101 was constructed in 1973 and began operation in 1974. In 1988, the building was retrofitted with an AFFF fire suppression system that is supplied by two 1,000-gallon tanks of 3% AFFF concentrate. Following installation of the fire suppression system, the west end of the hangar was separated from the east end by a temporary curtain and filled with AFFF to test the system. Once the test was complete, the majority of the AFFF was squeegeed out of the west end of the hangar and onto the MAAF ramp by the PAARNG and allowed to dissipate. A small amount of foam was contained in the hangar trench drain that flows to an oil-water separator and then to the Wastewater Treatment Plant (WWTP). The former PAARNG Fire Chief and Air Traffic Control Tower Chief recall the foam persisting outdoors on the MAAF ramp and adjacent grass for about two days.

The former PAARNG Fire Chief also indicated that from 1988 until 2011, occasional false alarms caused the fire suppression system to dispense approximately 5 to 10 gallons of AFFF per incident in the hangar. Per the facility maintenance manager, sensor interactions between a beam within the holding tank, temperature systems, and heat were the causes of the false alarms. These false alarm releases occurred approximately 20 times, and most recently in 2011. Each time AFFF was dispensed during a false alarm, the pipes of Building 019-101 were flushed, and the foam was squeegeed out on to the ramp, washed into the adjacent grass, and allowed to dissipate outdoors. In 2015, the AASF underwent an upgrade to retrofit the building with new sensors, lasers, and pipe liners. The existing AFFF was drained from the fire suppression system by Vector Fire Technology and disposed by Cycle Chem, Inc. at Modern Landfill in York, Pennsylvania. There have been no accidental releases of AFFF since the building was retrofitted in 2015.

3.2.3 Building 019-101 Ramp

The Building 019-101 Ramp lies between Building 019-101 and the runway and serves as an area for rotary-winged aircraft pre-flight activities (**Figure 3-1**).

According to the former PAARNG Fire Chief, the ramp was “washed” repeatedly from approximately 1974 until 2011 with 3% AFFF concentrate by the PAARNG because AFFF acted as a detergent for spilled fuels. In addition, 3% AFFF concentrate that was dispensed intentionally or accidentally from the Building 019-101 hangar was squeegeed out of the hangar and onto the ramp. No remediation activities have occurred at this location.

The Air Traffic Control Tower Chief also recalled a potential PFAS release in the slingload area, which is just north of the ramp and Building 019-135. No other interviewees recalled this potential PFAS release event.

3.2.4 Current Fire Station (Building 5-117)

The current fire station (Building 5-117) is located at the southwest corner of Fisher Avenue and Smathers Road, south of the MAAF (**Figure 3-1**). Based on historical aerial imagery, the Fire Station was built sometime between 1937 and 1948.

Prior to 1998, the current fire station was operated by the US Army Fire Department. Following base realignment in 1998, the PAARNG Fire Department and US Army Fire Department were combined. The PAARNG now operates the current fire station (Building 5-117) on-facility (the

former US Army Fire Station) and responds to fires of all types. The current fire staff consists of 12 state firefighters, three federal status technicians, and the federally employed PAARNG Fire Chief.

AFFF is stored by the PAARNG Fire Department in two 250-gallon totes inside of the current fire station and is transferred to the firetrucks, as needed, via a pump. No known spills or leaks of AFFF were identified during the PA; however, the National Fire Protection Agency requires annual testing of the proportioning valves on the firetrucks, and from 1998 until the present, the PAARNG Fire Department has tested the valves by discharging approximately 5 gallons of 3% AFFF concentrate onto the ground and testing the mixture using a hand-held refractometer. The valves have been tested in two locations: in the field immediately south of the current fire station, behind a dumpster, and in the field on the north side of Fisher Avenue, immediately south of MAAF; the latter area was recently paved. No remediation activities have occurred at either potential release area, and no information was available on the US Army Fire Department's storage or use of AFFF at the current fire station.

3.2.5 Crash Site

In the early 1990s, a rotary-winged aircraft clipped a tree during landing and crashed on the west end of MAAF, south of Runway 7 (**Figure 3-1**). The PAARNG Fire Department responded to the crash and extinguished the fire with AFFF. No information was available on the concentration or amount of AFFF used during the emergency response. This was the only crash site identified during the site visit.

3.2.6 Simulated Emergency Event

In 1991, the PAARNG Fire Department conducted a simulated emergency event using water at the western end of MAAF (**Figure 3-1**). The US Army Fire Department, which was not aware of the scheduled simulated emergency event, responded to the event and dispensed AFFF. No information was available on the concentration or amount of AFFF dispensed by the US Army Fire Department. The PAARNG Fire Department did not dispense AFFF during this event.

3.2.7 Accidental Tank Spill

In 2019, a firetruck was inadvertently charged with AFFF solution. The unwanted AFFF solution was removed from the firetruck and placed into a temporary, above ground, unused storage tank. The storage tank was observed to leak AFFF, and the leak was sealed; however, some AFFF solution was released to the ground near the tank.

3.3 AOI 3

3.3.1 Johnson Trail

The Johnson Trail Fire Training Area (FTA) is located on the east side of Johnson Trail, to the south of Hartranft Road, and just north of the wood chip area at the crest in the road (**Figure 3-1**).

The Johnson Trail FTA is an earthen, bermed stockpile area for soil originating from projects at the FTIG facility. AFFF fire training activities were conducted by the PAARNG Fire Department on 30 and 31 March, and 1 and 6 April, in 2015. In total, the training involved the discharge of approximately 20 gallons of 1% AFFF concentrate, which were created by diluting 3% AFFF concentrate. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this location was used only once for AFFF training activities by the PAARNG. No remediation activities have occurred at this location.

3.4 AOI 4

3.4.1 Fire Pit Area #19

Fire Pit Area #19 is located on the west side of First Street, north of B Street, and south of C Street (**Figure 3-1**).

According to the Base Realignment and Closure 1997 Environmental Baseline Survey Report, Fire Pit Area #19 was constructed in 1975 by excavating an area 40 feet in diameter to a depth of approximately 1.5 feet and constructing a 1-foot high earthen berm around the perimeter of the pit (Woodward-Clyde, 1997). The fire pit was then lined with fire brick. The PAARNG Fire Department conducted coordinated fire training exercises with the US Army Fire Department on an average of two times annually at this location from 1975 to 1986. According to the former PAARNG Fire Chief, fuel was ignited, and the fire was extinguished with AFFF by both the PAARNG and the US Army during these training exercises. No information was available on the concentration or amount of AFFF used during the training; however, approximately 3,000 gallons of used petroleum, oil, and lubricants generated in the AASF were burned in the fire training pit per year.

The fire training pit was closed in 1990, and a limited SI was conducted. The results of the SI defined an area of soil contaminated with petroleum hydrocarbons (Weston, 1992). The PAARNG excavated the petroleum hydrocarbon-contaminated soil and disposed of it an unknown location (Woodward-Clyde, 1997). In 2003, a site-specific RI was completed at Fire Pit Area #19 that identified contamination of volatile organic compounds and semi-volatile organic compounds in concentrations below the non-residential statewide health standard and the site-specific standard. The Pennsylvania Department of Environmental Protection (PADEP) issued a Relief of Liability letter, dated 27 May 2003, to the PAARNG. The Medical Battalion Training facility was constructed at this location in 2007.

3.5 AOI 5

3.5.1 First Street

The First Street FTA is located to the east of First Street, between East Tank Trail and Range Road (**Figure 3-1**).

The First Street FTA consists of an open field with a rotary-winged aircraft encompassed by a circular drive. A landing area is isolated from the field by concrete barriers near the center of the field. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this area was used once for a fire training activity in March 2014, during which approximately 20 gallons of 3% AFFF concentrate were dispensed by the PAARNG. No PFAS remediation activities have occurred at this location.

3.6 AOI 6

3.6.1 Biosolid Area

The biosolids from the WWTP are applied to a parcel of land on the southeastern boundary of Memorial Lake (**Figure 3-1**).

Since 2012, FTIG has been permitted to perform land application of biosolids from the WWTP on the southeastern boundary of Memorial Lake. Hay is grown in the biosolid land application area, harvested, baled, and used for erosion and sediment control on FTIG. There are no known potential PFAS releases at AOI 6; however, potential PFAS releases have been documented

going into the drains at Building 019-101 (AOI 2), which flow to the WWTP. The last known potential release of PFAS at Building 019-101 (AOI 2) occurred in 2011, prior to the start of land application in 2012; therefore, a potential PFAS release at AOI 6 is unlikely. However, upgrades to retrofit the sensors at Building 019-101, which were the cause of accidental AFFF releases, did not occur until 2015.

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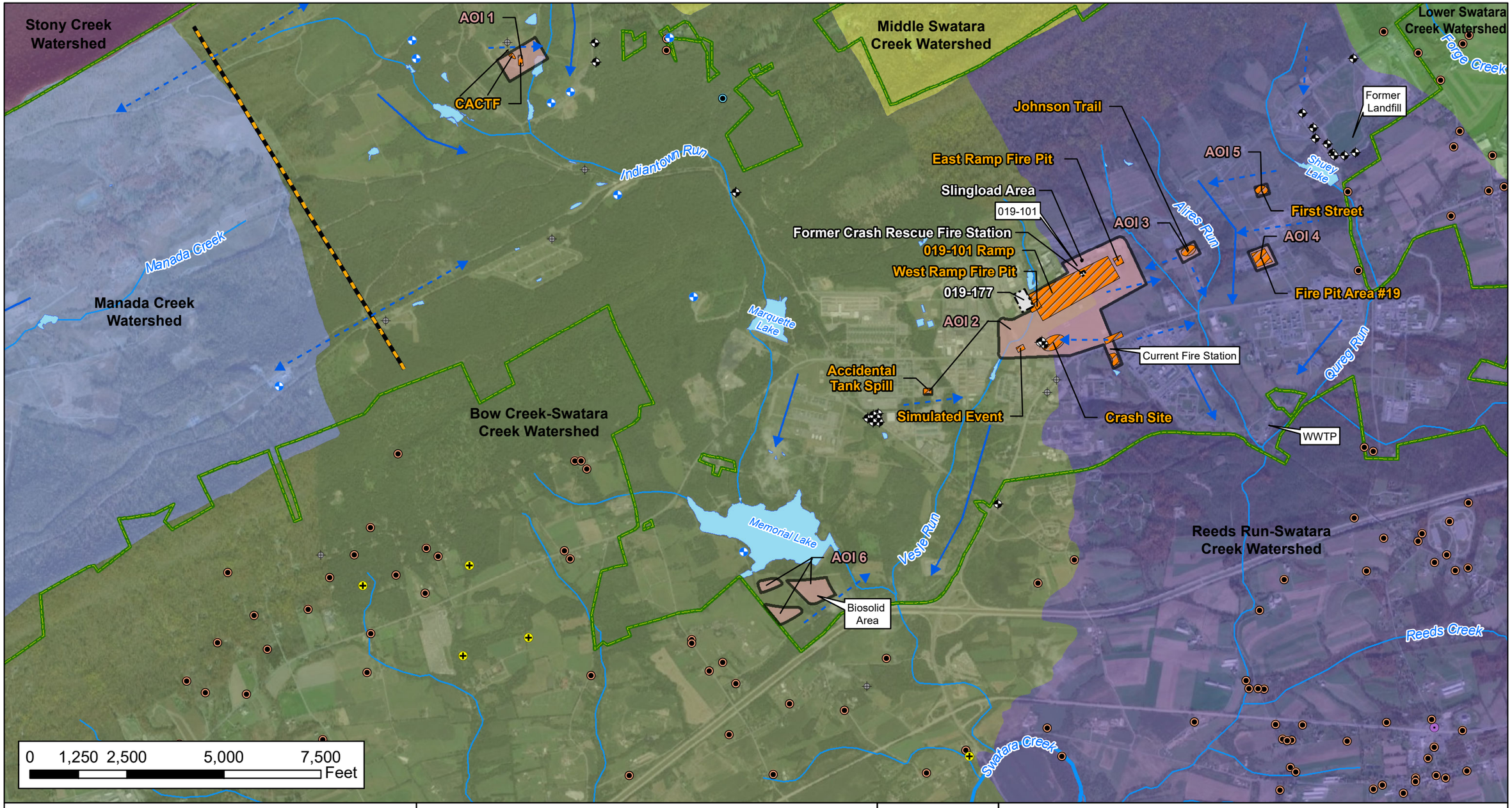

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	2/11/2021	GIS BY	MS	2/11/2021
SCALE	1:30,000	CHK BY	JZ	2/11/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	2/11/2021

- Area of Interest
- No Suspected Release
- Potential PFAS Release
- Facility Boundary
- Monitoring
- Drinking Water Supply
- Commercial
- Domestic
- Industrial
- Other
- Public Supply
- Water Body
- Inferrred Groundwater Divide
- River/Stream
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction

N

Areas of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

Project Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support project decision-making. The specific DQOs established for this facility are described below. These DQOs were developed in accordance with the USEPA's seven-step iterative process (USEPA, 2006).

4.1 Problem Statement

The following problem statement was developed during project planning:

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

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 Office of the Secretary of Defense (OSD) dated 15 October 2019 (Assistant Secretary of Defense, 2019). 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 site will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. The SLs are presented in **Section 6.1** of this report.

The following quotes from the DA policy documents form the basis for this project (DA, 2016; DA, 2018):

- "The Army will research and identify locations where PFOS and/or PFOA containing products, such as AFFF, are known or suspected to have been used. Facilities shall coordinate with Facility fire response or training offices to identify AFFF use or storage locations. The Army will consider FTAs, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas."
- "Based on a review of Site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination."
- "Identify sites where perfluorinated compounds (PFCs) are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA Health Advisory Levels" (USEPA, 2016a; USEPA, 2016b).

4.2 Goals of the Study

The following goals were established for this SI:

1) Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.
2) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
3) Determine the potential need for a removal action.

4) Collect data to better characterize the release areas for more effective and rapid initiation of a RI.

5) Identify within 4 miles of the facility other potential PFAS sources (fire stations, major manufacturers, other DoD facilities), and receptors including both groundwater and surface water receptors, to determine whether the ARNG is the likely source of PFAS, or whether there is an off-facility source of PFAS responsible for facility detections of PFAS (USEPA, 2005).

6) Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

4.3 Information Inputs:

Primary information inputs included:

- PA for FTIG, Pennsylvania (AECOM, 2018c)
- Analytical data collected at facility boundary sample locations (i.e., facility boundary groundwater sampling wells, and surface water and sediment samples).
- Groundwater, surface water, sediment, and soil samples collected in accordance with the Site Specific Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2019)
- Field data including groundwater elevation and water quality parameters measured at the time of sampling.

4.4 Study Boundaries

The scope of the SI sampling approach was focused on media immediately downgradient of AOI release areas and at the property limits of the facility (**Figure 3-1**).

4.5 Analytical Approach

All samples were analyzed by Eurofins Lancaster Laboratories Environmental, accredited under the DoD Environmental Laboratory Accreditation Program (DoD ELAP; Accreditation Number 001.01), the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 018), and a Pennsylvania State Certified Laboratory Certificate Number 018. Data were compared to applicable SLs and decision rules as defined in the Programmatic UFP-QAPP (PQAPP). Decision rules were developed for groundwater/surface water and soil/surface sediment, and they applied to all data collected. These rules governed response actions based on the results of the SI sampling effort.

The decision rules described in the **Worksheet #11** of the QAPP Addendum identify actions based on the following:

<u>Groundwater/surface water</u>:

- Is there a human receptor within 4-miles of the Site?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?
- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of potential release areas?
- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil/surface sediment:

- What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil or sediment (0 to 2 feet below ground surface [bgs])?
- What is the concentration of PFOA, PFOS, and PFBS in deep soil (i.e., capillary fringe and bedrock interface)?
- What does the CSM suggest in terms of source, pathway, and receptor?

Soil samples were collected from each of the potential PFAS release areas, with the exception of AOI 4. The ground surface in the area of AOI 4 consisted of a gravel parking area overlying shallow bedrock. The depth to groundwater was variable but typically encountered at approximately 3 to 15 feet bgs, and a sample was collected at each AOI, with the exception of AOI 5. The temporary well remained dry during the SI activities, and no groundwater was available to sample in the temporary well.

4.6 Data Usability Assessment

The Data Usability Assessment 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 facility-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, 2018a; DoD, 2018b; USEPA, 2017b).

Data Quality Indicators (DQIs) (Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity) are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this SI report are of high quality. Although the SI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The Data Validation Report (**Appendix A**) presents explanations for all qualified data in greater detail.

4.6.1 Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate relative percent differences (RPD); laboratory precision is measured with calibration verification, internal standard recoveries, laboratory control spike (LCS) and matrix spike (MS) duplicate RPD.

Extraction internal standards (EIS) were added by the laboratory during sample extraction to measure relative responses of target analytes and are used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. The positive field sample results associated with EIS area counts greater than the upper quality control (QC) limit were qualified “J-“ and should be considered usable as estimated values with a positive bias. The positive field sample results associated with EIS area counts less than the QC limit, but results greater than 20% were qualified “J+”, unless qualified due to a source water detection, while non-detects were qualified “UJ”. The qualified results should be considered usable as estimated values with a positive bias. The remaining field sample results associated with percent recoveries less than 20% were qualified “X” for positive and non-detect results. The qualified field sample results associated with EIS area counts less than 20%, but greater than 10%, are recommended for use as estimated values reported with interpreted qualifiers of “J+”

for the positive associated field sample results, and “UJ” for non-detects. Additionally, the positive field sample results associated with EIS area counts less than 10% are recommended for use as estimate values with a positive bias and reported with interpreted qualifiers of “J+”. The project team determined these non-detect results were usable for project purposes.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. A limited number of continuing calibration verifications displayed percent differences greater than the upper QC limit of 30% for 8:2 fluorotelomer sulfonic acid (8:2 FTS) and 6:2 fluorotelomer sulfonic acid (6:2 FTS). The associated field sample results were non-detect; therefore, no data qualifying action was required. The associated field sample results should be considered usable as reported.

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2019).

MS/MSD (MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5%. The MS/MSD performed on parent sample AOI5-SB1-0.5-1.0 displayed an RPD greater than the QC limit of 30% for N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA) at 52%. The associated parent sample result was non-detect; therefore, no data qualifying action was required, and the associated parent sample result should be considered usable as reported.

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2019).

4.6.2 Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogates.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis, with one exception. Several LCS/LCSD pairs displayed percent recoveries greater than the upper QC limit of 130% for N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA) and perfluorobutanoic acid (PFBA). The positive associated field sample results were qualified “J+”. The qualified field sample results should be considered usable as estimated values with a positive bias.

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested, with one exception. Several MS/MSD pairs displayed percent recoveries outside the QC limits. The positive field duplicate result associated with the positive-biased parent sample was qualified “J+” and should be considered usable as estimated values with a positive bias. The parent sample and field duplicate results associated with the negative biases were non-detect and were qualified “UJ” and should be considered usable as estimated values with a negative bias.

4.6.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately reflect Site conditions. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences.

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with DoD Quality Systems Manual (QSM) 5.1 Table B-15, including the specific preparation requirements (i.e. ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branch and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. All preservation techniques were followed by the field staff, and all technical and analytical holding times were met by the laboratory. The laboratory used approved standard methods in accordance with the QAPP Addendum (AECOM, 2019) for all analyses.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. All associated instrument blanks and method blanks were non-detect for all target analytes.

Equipment blanks and field blanks were also collected for groundwater and soil samples. All equipment blanks and field blanks were non-detect for all target analytes.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The drill rig decontamination sample, FTIG-PW-01, displayed detections for PFBA, perfluorohexanoic acid (PFHpA), perfluorohexanoic acid (PFHxA), and PFOA. The associated field sample results that displayed concentrations less than five times the concentration found in the blank were qualified “U”, and the associated numerical result was elevated to the quantitation limit. The affected field sample result concentrations initially ranged from 0.32 ng/L to 1.5 ng/L prior to the associated data qualifying actions.

Overall, the data are usable for evaluating the presence or absence of PFAS at the facility. Sufficient usable data were obtained to meet the objectives of the SI and to complete the risk assessment.

4.6.4 Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the SI and are considered comparable to ongoing investigations.

4.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per

parameter is as follows and reflects the exclusion of “X” flagged data, although the project team has retained these results in the data set:

- PFAS in groundwater via LC/MS/MS compliant with DoD QSM Table B-15 at 100%
- PFAS in soil via LC/MS/MS compliant with DoD QSM Table B-15 at 98%
- PFAS in surface water via LC/MS/MS compliant with DoD QSM Table B-15 at 94%
- PFAS in sediment via LC/MS/MS compliant with DoD QSM Table B-15 at 100%
- pH in soil by USEPA Method 9045D at 100%
- Total organic carbon (TOC) by USEPA Method 9060 at 100%

4.6.6 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. The primary sensitivity metric is the Instrument Sensitivity Check (ISC), which is required in accordance with DoD QSM 5.1 Table B-15. All ISCs were performed at the appropriate frequency by the laboratory, at concentrations equal to the level of quantitation (LOQ) and displayed percent recoveries within the established QC criteria of ±30%. Additional examples of QC measures for determining sensitivity include laboratory fortified blanks, a method detection limit (MDL) study, and calibration standards at the LOQ. In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP Addendum (AECOM, 2019). The laboratory provided the requested MDL studies and provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP Addendum (AECOM, 2019), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the MDL were reported and qualified “J” as estimated values by the laboratory.

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* dated March 2018 (AECOM, 2018a)
- *Final Programmatic Accident Prevention Plan dated July 2018 (*AECOM, 2018b*)*
- *Final Preliminary Assessment Report, Fort Indiantown Gap, Pennsylvania* dated September 2018 (AECOM, 2018c)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Fort Indiantown Gap, Pennsylvania* dated May 2019 (AECOM, 2019)
- *Final Site Safety and Health Plan, Fort Indiantown Gap, Pennsylvania* dated May 2019 (AECOM, 2019a)

SI field sampling activities were conducted from 28 May to 19 June 2019. The sampling consisted of soil, groundwater, surface water, and sediment grab sampling. Field activities were conducted in accordance with the QAPP Addendum (AECOM, 2019), except as noted in **Section 5.9**.

The following samples were collected at FTIG and analyzed for a subset of 18 PFAS via LC/MS/MS compliant with DoD QSM 5.1 Table B-15 to fulfill the project DQOs:

- 35 soil grab samples from 28 boring locations;
- 23 groundwater grab samples from 19 temporary well locations and four existing permanent monitoring well locations; and
- 12 sediment and 12 surface water samples.

Figure 5-1 provides the sample locations for all media across the Site. **Table 5-1** presents all samples collected for each media. Daily reports were completed throughout SI activities, which are provided in **Appendix B**.

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, each of which is discussed in more detail below.

5.1.1 Technical Project Planning

The USACE TPP Process, Engineering 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 quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

TPP meetings 1 and 2 were held concurrently on 20 March 2019, prior to SI field activities. Meeting minutes are provided in **Appendix C**. TPP meetings 1 and 2 were conducted in general accordance with EM 200-1-2 (USACE, 2016).

The stakeholders for this SI include the ARNG, PAARNG, USACE, PADEP, FTIG, representatives familiar with the facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods in the TPP meeting. The outcome of TPP meetings 1 and 2 were memorialized in the SI QAPP Addendum. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

Utility clearance was conducted by PADMVA Bureau of Reservation Maintenance, with input from the AECOM field team. AECOM's drilling subcontractor, Eichelbergers Drilling, contacted Pennsylvania one-call utility clearance contractor to notify them of intrusive work. Additionally, the first 5 feet of each boring location was advanced using air knife methods to verify utility clearance in shallow subsurface where utilities would typically be encountered. Soil borings were slightly offset from the air knife boring and soil samples collected using a hand auger or geoprobe methods.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

A sample from a water supply source at FTIG was collected on 7 May 2019, prior to field mobilization, and analyzed for PFAS by LC/MS/MS compliant with DoD QSM 5.1 Table B-15. The water supply source at FTIG is supplied by City of Lebanon. The results of the water supply sample are provided in **Appendix H**. A discussion of the results is presented in **Section 4.6.3**.

All materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment is provided in PQAPP Appendix C, Table 1 (AECOM, 2018a). Prior to the start of field work each day, a PFAS 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 direct-push technology (DPT), in accordance with the QAPP Addendum (AECOM, 2019). A GeoProbe® dual-tube sampling system was used to collect continuous soil cores to the target depth. Up to three discrete soil samples were collected for chemical analysis from each soil boring, dependent on the depth to shallow bedrock. A hand auger was used to collect surface soil samples from 0 to 2 feet bgs. One subsurface soil sample approximately 1 foot above the groundwater table and one subsurface soil sample at the soil and shallow bedrock interface were collected at each boring using DPT. Due to the shallow depth to bedrock encountered at several borings, soil samples were limited to the surface soil and at the shallow soil and bedrock interface.

Soil boring and surface soil locations are shown on **Figure 5-1**, and depths are provided on **Table 5-2**. The soil boring locations were selected based on the AOI information as agreed on through TPP and QAPP Addendum review.

The soil cores were continuously logged for lithological descriptions by a 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 sampling forms (**Appendix D**) 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. The boring logs are provided in **Appendix E**.

Each 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 a laboratory courier or Federal Express under standard chain-of-custody (COC) procedures to the laboratory and analyzed for PFAS (USEPA Method 537 Modified, TOC (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the QAPP Addendum (AECOM, 2019). For cases in which non-dedicated sampling equipment was used, such as a stainless-steel hand auger for the 0 to 2 feet bgs soil samples, equipment blank samples were collected and analyzed for the same parameters as the soil samples that were collected.

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. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 4 degrees Celsius during shipment.

DPT borings were converted to temporary wells. Borings were installed in grass areas or gravel areas where possible to avoid disturbing concrete or asphalt surfaces.

5.3 Temporary Well Installation and Groundwater Grab Sampling

Temporary wells were installed using a GeoProbe® dual-tube sampling system. If refusal was encountered on shallow bedrock before the desired depth of sample location, the GeoProbe® utilized an air rotary hammer to reach the desired depth in bedrock. Seven shallow bedrock wells were designed and installed to be co-located with overburden wells at select AOIs and along the facility boundary. A temporary well was constructed of 5-feet to 10-feet sections of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. One deep bedrock facility boundary well (FTIG Boundary GW5) was constructed with a 20-feet screen. Longer screen lengths were utilized where discreet groundwater bearing zones were not apparent, and it was desired to capture potential groundwater recharge from a larger water bearing zone. New PVC pipe and screen were used to avoid cross contamination between locations. The groundwater levels and screen intervals for all temporary wells are provided in **Table 5-3**.

Temporary wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, oxidation–reduction potential) were measured and recorded on the field sampling form (**Appendix D**) before each grab sample was collected. Water quality parameters were measured using a water quality meter and flow-through cell. Groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via laboratory courier or Federal Express under standard COC procedures to the laboratory and analyzed for PFAS USEPA Method 537 Modified in accordance with the QAPP Addendum (AECOM, 2019).

Groundwater grab samples were also obtained from four existing wells, including BW-3, BW-4, MW-2 (RWAY), and MW-4 (RWAY). Once the wells were purged and stabilized, the existing wells were sampled using the same methodology as temporary wells. 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. Field reagent blanks were 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 4 degrees Celsius during shipment.

A few of the wells were low-yielding and did not recover after purging and could not be sampled. These low-yielding wells include temporary wells AOI1-GW1, AOI2-GW6, and AOI5-GW1. Suggested considerations for low-yielding wells set forth by PADEP in their Groundwater

Monitoring Guidance (PADEP, 2019) were evaluated. However, even with these considerations, the low-yielding wells did not produce enough water to be sampled. The low-yielding wells were periodically revisited during SI field activities but remained too dry to sample.

At the request of PAARNG, temporary wells were not abandoned at the end of sampling activities to allow for future groundwater gauging. The wells will be abandoned in accordance with the QAPP Addendum (AECOM, 2019) by removing the PVC and backfilling the hole with bentonite chips. All temporary wells were installed in grass areas to avoid disturbing concrete or asphalt.

Installation of up to 10 permanent wells (Phase 2) based on the results of the temporary well sampling (Phase 1) was not required as discussed in Worksheet #17a-h of the FTIG SI UFP-QAPP. The temporary well network installed and sampled during Phase 1 of the SI was sufficient to meet the project DQOs.

5.4 Surface Water and Sediment Sampling

Surface water and sediment samples were collected from Indiantown Run, Vesle Run, and Aires Run. Surface water and sediment sampling in streams was initiated at the furthest downstream sample location and ended at the furthest upstream sample location. Sediment samples were co-located with surface water samples. The surface water sample was collected prior to the collection of the sediment sample. A surface water grab sample was collected from a single point in the waterbody using a dip sampler approximately two-thirds up from the bottom of the water body. Sampling was performed deliberately and methodically to minimize disturbance of bottom sediments, and as quickly as possible to ensure a representative sample was collected. The surface water sample was then transferred to appropriate sampling container. A sediment coring device was used to collect the sediment sample from the first foot of sediment. The sediment was then transferred to a stainless-steel bowl where stones in excess of 1 centimeter was removed. Surface water and sediment locations are shown on **Figure 5-1**.

General water quality parameters were collected at each sampling location (i.e., temperature, pH, conductivity, dissolved oxygen, and oxidative reduction potential) with a water quality meter. The surface water dipper, sediment coring device, and water quality probe were PFAS-free.

Each surface water and sediment sample were collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters (EPA Method 537 Modified). The sediment samples were also analyzed for TOC (EPA Method 9060A) and pH (EPA Method 9045D). All sample containers were PFAS-free. Samples were packaged on ice and transported daily via overnight commercial carrier under standard chain-of custody procedures to the laboratory.

5.5 Synoptic Water Level Measurements

A facility wide synoptic groundwater gauging event was performed on 19 June 2019 during the SI field activities. Groundwater elevation measurements were collected from the 22 new temporary SI monitoring wells and 37 existing monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map produced from the data is provided in **Figure 2-5**. Groundwater elevation data are provided in **Table 5-4**.

5.6 Surveying

A survey of the location of 46 SI sampling points that included soil borings, temporary wells, existing wells, surface water, and sediment sample locations on FTIG was conducted. The field survey work was done by Pennsylvania-Licensed land surveyors on 24, 25, and 26 June 2019. The survey data are provided in the Universal Transverse Mercator Zone 18 projection with World Geodetic System 84 datum. The surveyed well data are provided in **Appendix F**.

5.7 Investigation Derived Waste

As of the date of this report, the disposal of PFAS investigation derived waste (IDW) is not regulated. PFAS IDW generated during this project is considered a non-hazardous waste and was managed in accordance with the Worksheet #17h of the QAPP Addendum (AECOM, 2019).

Solid IDW (i.e., soil cuttings) generated during SI activities were left in place at the point of the source. The soil cuttings were distributed evenly around the borehole. If a temporary well was not installed at the borehole location, cuttings were placed back in the borehole after sample collection. Liquid IDW generated during SI activities (e.g., purge water and decontamination fluids) were discharged directly to the ground surface slightly downgradient of the source. AECOM collected GPS points around (i.e., polygon) the location of the where the IDW was placed. The polygons are included in **Appendix G**.

5.8 Laboratory Analytical Methods

Samples were analyzed for a subset of 18 PFAS using USEPA Method 537 Modified at Eurofins Lancaster Laboratories Environmental in Lancaster, Pennsylvania, a DoD ELAP and NELAP certified laboratory. The 18 PFAS analyzed as part of the ARNG SI program include the following:

- 6:2 fluorotelomer sulfonate (6:2 FTS)
- 8:2 fluorotelomer sulfonate (8:2 FTS)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Perfluorobutanoic Acid (PFBA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanoic acid (PFHxA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluoropentanoic acid (PFPeA)
- Perfluorotetradecanoic acid (PFTeDA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluoroundecanoic acid (PFUdA)

Soil samples were also analyzed for TOC using USEPA Method 9060A, and pH by USEPA Method 9045D.

5.9 Deviations from QAPP Addendum

Deviations from the QAPP Addendum occurred based on field conditions and discussion between AECOM and ARNG. Deviations from the QAPP Addendum are noted below:

- A Site walk conducted prior to field work identified an overflow discharge pipe outfall from the WWTP into Aires Run. The surface water/sediment sample (SW/SD) sample FTIG-SW/SD11 proposed location in the QAPP Addendum at the FTIG WWTP outfall was then relocated to a position upstream of the WWTP overflow pipe. This revised SW/SD location defines whether upstream AOIs (AOI 3, AOI 4, and AOI 5) are contributing PFAS to Aires Run prior to the WWTP overflow outfall. An SW/SD sample FTIG-SW/SD12 was obtained downstream of the overflow pipe outfall at the facility border as planned. Treated water from the WWTP is discharged through an underground pipe to an outfall 5 miles off-facility at Swatara Creek. This modification to the sample location was discussed and approved by USACE and documented in daily reports. The sample location is shown on **Figure 5-1**.

- No groundwater was sampled from the shallow temporary well AOI 1-GW1, which was installed to 20 feet bgs. The well was gauged periodically during SI field activities and remained dry. A co-located temporary well installed into the bedrock to 35 feet bgs yielded groundwater and was sampled. This modification to the QAPP sample collection program was discussed and approved by USACE and documented in daily reports.
- No groundwater was sampled from the shallow temporary well AOI 5-GW1. The well was installed into the bedrock interface at 8 feet bgs and gauged periodically during SI activities but remained dry. This modification to the sample collection program was discussed and approved by USACE and documented in daily reports.
- No groundwater was sampled from the shallow temporary well AOI 2-GW7 at the current fire station. During well installation, groundwater was encountered at 7 feet bgs, just below the bedrock interface. The well was periodically gauged during SI field activities but did not recharge sufficiently to sample. This modification to the sample collection program was discussed and approved by USACE and documented in daily reports.
- No groundwater was observed in borehole soils logged at the proposed shallow temporary boundary well location FTIG-Boundary-GW6, therefore a shallow well was not installed. A co-located temporary facility boundary well (FTIG-Boundary-GW5) was installed into the bedrock to 52 feet bgs, yielded groundwater, and was sampled. This modification to the sample collection program was discussed and approved by USACE and documented in daily reports.
- Due to the shallow depth to bedrock encountered at numerous soil borings, two subsurface soil samples (at the mid-point and bedrock interface) were not collected. In addition, the soil borehole at AOI 4 was located in a gravel parking lot overlying bedrock, with no soil available for sampling. This modification to the sample collection program was discussed during the TPP meeting and approved by USACE and documented in the TPP minutes.

Table 5-1
Samples by Medium
Site Inspection Report, Fort Indiantown Gap

Sample Identification	Sample Collection Date	Sample Depth (feet bgs)	PFAS (LC/MS/MS Compliant with DoD QSM 5.1)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
Soil Samples						
AOI1-SS1-0.5-1.0	5/29/2019	0.5 - 1	x	x	x	
AOI1-SS1-0.5-1.0-MS	5/29/2019	0.5 - 1	x			MS/MSD
AOI1-SS1-0.5-1.0-MSD	5/29/2019	0.5 - 1	x			MS/MSD
AOI1-SS1-0.5-1.0-DUP	5/29/2019	0.5 - 1	x			Field Duplicate
AOI1-SS2-0.5-1.0	5/29/2019	0.5 - 1	x	x	x	
AOI1-SS3-0.5-1.0	5/29/2019	0.5 - 1	x	x	x	
AOI1-SB1-0.5-1.0	5/29/2019	0.5 - 1	x	x	x	
AOI1-SB1-9.0-9.5	5/30/2019	9 - 9.5	x	x	x	
AOI1-SB1-19.5-20.0	5/30/2019	19.5 - 20	x	x	x	
AOI2-SB1-0.5-1.0	6/3/2019	0.5 - 1	x	x	x	
AOI2-SB1-8.0-10	6/4/2019	8 - 10	x	x	x	
AOI2-SB1-14.5-15	6/4/2019	14.5 - 15	x	x	x	
AOI2-SS1-0.5-1.0	6/7/2019	0.5 - 1	x	x	x	
AOI2-SB2-0.5-1.0	6/3/2019	0.5 - 1	x	x	x	
AOI2-SB2-5.5-6.0	6/4/2019	5.5 - 6	x	x	x	
AOI2-SS2-0.5-1.0	6/7/2019	0.5 - 1	x	x	x	
AOI2-SS2-0.5-1.0-MS	6/7/2019	0.5 - 1	x			MS/MSD
AOI2-SS2-0.5-1.0-MSD	6/7/2019	0.5 - 1	x			MS/MSD
AOI2-SS2-0.5-1.0-DUP	6/7/2019	0.5 - 1	x			Field Duplicate
AOI2-SB3-0.5-1.0	6/4/2019	0.5 - 1	x	x	x	
AOI2-SB3-6.5-7.0	6/4/2019	6.5 - 7	x	x	x	
AOI2-SB3-12.5-13.0	6/4/2019	12.5 - 13	x	x	x	
AOI2-SB5-0.5-1.0	6/3/2019	0.5 - 1	x	x	x	
AOI2-SB6-0.5-1.0	5/31/2019	0.5 - 1	x	x	x	
AOI2-SB6-4.0-4.5	5/31/2019	4 - 4.5	x	x	x	
AOI2-SB6-7.5-8.0	5/31/2019	7.5 - 8	x	x	x	
AOI2-SB7-0.5-1.0	6/7/2019	0.5 - 1	x	x	x	
AOI2-SB7-7.5-8.0	6/11/2019	7.5 - 8	x	x	x	
AOI2-SB9-0.5-1.0	6/3/2019	0.5 - 1	x	x	x	
AOI2-SB9-7.0-7.5	6/5/2019	7 - 7.5	x	x	x	
AOI2-SB9-9.0-9.5	6/5/2019	9 - 9.5	x	x	x	
AOI2-SB11-0.5-1.0	6/7/2019	0.5 - 1	x	x	x	
AOI2-SB11-7.5-8.0	6/11/2019	7.5 - 8	x	x	x	
AOI2-SB11-7.5-8.0-DUP	6/11/2019	7.5 - 8	x			Field Duplicate
AOI3-SB1-0.5-1.0	6/7/2019	0.5 - 1	x	x	x	
AOI3-SB1-2.5-3.0	6/10/2019	2.5 - 3	x	x	x	
AOI3-SB1-2.5-3.0-DUP	6/10/2019	2.5 - 3	x			Field Duplicate
AOI5-SB1-0.5-1.0	5/31/2019	0.5 - 1	x	x	x	
AOI5-SB1-4.0-4.5	5/31/2019	4 - 4.5	x	x	x	
AOI5-SB1-7.0-8.0	6/1/2019	7 - 8	x	x	x	
AOI6-SB1-0.5-1.0	5/28/2019	0.5 - 1	x	x	x	
AOI6-SB1-6.5-7.0	5/28/2019	6.5 - 7	x	x	x	
AOI6-SB1-13.0-13.5	5/28/2019	13 - 13.5	x	x	x	
Groundwater Samples						
AOI1-GW2	6/14/2019	35	x			
BW-3	6/12/2019	10	x			
BW-4	6/12/2019	25	x			
AOI2-GW1	6/11/2019	13.5	x			
AOI2-GW2	6/17/2019	6	x			

Table 5-1
Samples by Medium
Site Inspection Report, Fort Indiantown Gap

Sample Identification	Sample Collection Date	Sample Depth (feet bgs)	PFAS (LC/MS/MS Compliant with DoD QSM 5.1)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
AOI2-GW3	6/10/2019	11	x			
AOI2-GW3-DUP	6/10/2019	11	x			Field Duplicate
AOI2-GW4	6/10/2019	30	x			
AOI2-GW5	6/18/2019	15	x			
AOI2-GW6	6/11/2019	8	x			
AOI2-GW8	6/13/2019	25	x			
AOI2-GW8-DUP	6/13/2019	25	x			Field Duplicate
AOI2-GW9	6/11/2019	10	x			
AOI2-GW10	6/11/2019	30	x			
AOI2-GW11	6/14/2019	8	x			
AOI2-GW11-MS	6/14/2019	8	x			MS/MSD
AOI2-GW11-MSD	6/14/2019	8	x			MS/MSD
MW-2 (RWAY)	6/17/2019	14.5	x			
MW-4 (RWAY)	6/17/2019	14.7	x			
AOI3-GW1	6/18/2019	30	x			
AOI3-GW1-DUP	6/18/2019	30	x			Field Duplicate
AOI4-GW1	6/10/2019	15	x			
AOI6-GW1	6/11/2019	13.5	x			
FTIG-Boundary-GW1	6/11/2019	12.5	x			
FTIG-Boundary-GW2	6/10/2019	30	x			
FTIG-Boundary-GW3	6/19/2019	10	x			
FTIG-Boundary-GW4	6/19/2019	25	x			
FTIG-Boundary-GW5	6/18/2019	52	x			
FTIG-Boundary-GW5-MS	6/18/2019	52	x			MS/MSD
FTIG-Boundary-GW5-MSD	6/18/2019	52	x			MS/MSD
Surface Water Samples						
FTIG-SW1	6/14/2019	0 - 1	x			
FTIG-SW2	6/14/2019	0 - 1	x			
FTIG-SW3	6/19/2019	0 - 1	x			
FTIG-SW4	6/19/2019	0 - 1	x			
FTIG-SW5	6/18/2019	0 - 1	x			
FTIG-SW6	6/18/2019	0 - 1	x			
FTIG-SW7	6/19/2019	0 - 1	x			
FTIG-SW8	6/19/2019	0 - 1	x			
FTIG-SW8-DUP	6/19/2019	0 - 1	x			Field Duplicate
FTIG-SW8-MS	6/19/2019	0 - 1	x			MS/MSD
FTIG-SW8-MSD	6/19/2019	0 - 1	x			MS/MSD
FTIG-SW9	6/18/2019	0 - 1	x			
FTIG-SW10	6/18/2019	0 - 1	x			
FTIG-SW11	6/19/2019	0 - 1	x			
FTIG-SW12	6/19/2019	0 - 1	x			
Surface Sediment Samples						
FTIG-SD1-0.0-0.5	6/14/2019	0 - 0.5	x	x	x	
FTIG-SD2-0.0-0.5	6/14/2019	0 - 0.5	x	x	x	
FTIG-SD3-0-0.5	6/19/2019	0 - 0.5	x	x	x	
FTIG-SD4-0-0.5	6/19/2019	0 - 0.5	x	x	x	
FTIG-SD5-0-0.5	6/18/2019	0 - 0.5	x	x	x	
FTIG-SD6-0-0.5	6/18/2019	0 - 0.5	x	x	x	
FTIG-SD6-0-0.5-MS	6/18/2019	0 - 0.5	x			MS/MSD
FTIG-SD6-0-0.5-MSD	6/18/2019	0 - 0.5	x			MS/MSD

Table 5-1
Samples by Medium
Site Inspection Report, Fort Indiantown Gap

Sample Identification	Sample Collection Date	Sample Depth (feet bgs)	PFAS (LC/MS/MS Compliant with DoD QSM 5.1)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Comments
FTIG-SD6-0-0.5-DUP	6/18/2019	0 - 0.5	x			Field Duplicate
FTIG-SD7-0-0.5	6/19/2019	0 - 0.5	x	x	x	
FTIG-SD8-0-0.5	6/19/2019	0 - 0.5	x	x	x	
FTIG-SD9-0-0.5	6/18/2019	0 - 0.5	x	x	x	
FTIG-SD10-0-0.5	6/18/2019	0 - 0.5	x	x	x	
FTIG-SD11-0-0.5	6/19/2019	0 - 0.5	x	x	x	
FTIG-SD12-0-0.5	6/19/2019	0 - 0.5	x	x	x	
Equipment and Rinsate Blanks						
FTIG-EB01-05312019	5/31/2019	---	x			Equipment Blank
FTIG-EB02	6/11/2019	---	x			Equipment Blank
FTIG-EB03	6/12/2019	---	x			Equipment Blank
FTIG-EB04	6/13/2019	---	x			Equipment Blank
AOI1-RB01	6/12/2019	---	x			Rinsate Blank
AOI2-RB01-05312019	5/31/2019	---	x			Rinsate Blank
AOI3-RB01	6/11/2019	---	x			Rinse Blank
AOI4-RB01	6/11/2019	---	x			Rinsate Blank
AOI5-RB01-05312019	5/31/2019	---	x			Rinsate Blank
AOI6-RB0-06052019	6/5/2019	---	x			Rinsate Blank

Notes:
AOI = area of interest
DUP = duplicate
EB = equipment blank
ft = feet
FTIG = Fort Indiantown Gap
GW = groundwater
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
pH = potential for hydrogen
RB = rinsate blank
SB = soil boring
SD = surface sediment
SS = surface soil
SW = surface water
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths
Site Inspection Report, Fort Indiantown Gap

Area of Interest	Soil Boring ID	Soil Boring Depth (feet bgs)
AOI1	AOI1-SB1	20
	AOI1-SB2	35
	AOI1-SS1	1
	AOI1-SS2	1
	AOI1-SS3	1
AOI2	AOI2-SB1	15
	AOI2-SB2	8
	AOI2-SB3	15
	AOI2-SB4	30
	AOI2-SB5	15
	AOI2-SB6	8
	AOI2-SB7	8
	AOI2-SB8	25
	AOI2-SB9	9.5
	AOI2-SB10	30
	AOI2-SB11	8
	AOI2-SS1	1
	AOI2-SS2	1
AOI3	AOI3-SB1	30
AOI4	AOI4-SB1	15
AOI5	AOI5-SB1	8
AOI6	AOI6-SB1	13.5
FTIG Boundary	GW-1	12.5
	GW-2	30
	GW-3	10
	GW-4	25
	GW-5[a]	15
	GW-6	52

Notes:
[a] No groundwater was detected at FTIG Boundary GW-5 and, therefore, no well was installed. Consequently, the monitoring well at FTIG Boundary GW-6 was renamed FTIG Boundary GW-5.

AOI = area of interest
bgs = below ground surface
FTIG = Fort Indiantown Gap
ID = identification
GW = groundwater
SB = soil boring
SS = surface soil

Table 5-3
Groundwater Elevation
Site Inspection Report, Fort Indiantown Gap

Monitoring Well ID	Top of Casing Elevation (ft amsl)	Total Well Depth (ft bgs)	Screen Interval (feet bgs)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
AOI 1 GW-1	682.72	20	15 - 20	Dry	Dry
AOI 1 GW-2	682.86	35	25 - 35	30.07	652.79
BW-3	692.88	10	5 - 10	12.38	680.50
BW-4	726.38	25	20 - 25	23.69	702.69
AOI 2 GW-1	476.34	13.5	8.5 - 13.5	8.55	467.79
AOI 2 GW-2	462.74	6	3 - 6	0.10	462.64
AOI 2 GW-3	461.34	11	6 - 11	4.23	457.11
AOI 2 GW-4	461.12	30	25 - 30	4.15	456.97
AOI 2 GW-5	470.21	15	5 - 15	6.26	463.95
AOI 2 GW-6	463.74	8	4 - 8	Dry	Dry
AOI 2 GW-7	457.66	8	4 - 8	6.96	450.70
AOI 2 GW-8	458.17	25	15 - 25	5.12	453.05
AOI 2 GW-9	483.97	9.5	4.5 - 9.5	3.42	480.55
AOI 2 GW-10	484.55	30	20 - 30	3.52	481.03
AOI 2 GW-11	460.18	8	4 - 8	3.04	457.14
MW-2(RWAY)	470.23	14.5	4.5 - 14.5	5.85	464.38
MW-4(RWAY)	473.21	14.7	4.7 - 14.7	8.89	464.32
AOI 3 GW-1	467.09	30	20 - 30	7.70	459.39
AOI 4 GW-1	473.22	15	5 - 15	2.76	470.46
AOI 5 GW-1	486.37	8	4 - 8	Dry	Dry
AOI 6 GW-1	459.76	13.5	8.5 - 13.5	10.15	449.61
FTIG Boundary GW-1	450.64	12.5	7 - 12	3.15	447.49
FTIG Boundary GW-2	450.44	30	20 - 30	2.90	447.54
FTIG Boundary GW-3	469.98	10	5 - 10	8.42	461.56
FTIG Boundary GW-4	469.27	25	20 - 25	8.11	461.16
FTIG Boundary GW-5	453.72	52	32 - 52	21.45	432.27

Notes:

AOI = area of interest
amsl = above mean sea level
btoc = below top of casing
BW = base well
ft = feet
FTIG = Fort Indiantown Gap
GW = groundwater
ID = identification
RWAY = runway

Table 5-4
Synoptic Groundwater Gauging Event (June 2019)
Site Inspection Report, Fort Indiantown Gap

Well ID	Area of Interest	Elevation - Top of PVC (ft amsl)	Total Well Depth (ft bgs)	Screen Length (ft)	Depth to Bedrock (ft bgs)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
FTIG SI Wells							
AOI 1 GW-1	AOI 1	682.72	20	5	12	Dry	Dry
AOI 1 GW-2	AOI 1	682.86	35	10	13	30.07	652.79
AOI 2 GW-1	AOI 2	476.34	15	5	9.5	8.55	467.79
AOI 2 GW-2	AOI 2	462.74	8	3	5	0.1	462.64
AOI 2 GW-3	AOI 2	461.34	15	5	7	4.23	457.11
AOI 2 GW-4	AOI 2	461.12	30	5	4	4.15	456.97
AOI 2 GW-5	AOI 2	470.21	15	10	4	6.26	463.95
AOI 2 GW-6	AOI 2	463.74	8	4	5	Dry	Dry
AOI 2 GW-7	AOI 2	457.66	8	4	4	6.96	450.7
AOI 2 GW-8	AOI 2	458.17	25	10	4	5.12	453.05
AOI 2 GW-9	AOI 2	483.97	9.5	5	4	3.42	480.55
AOI 2 GW-10	AOI 2	484.55	30	10	4	3.52	481.03
AOI 2 GW-11	AOI 2	460.18	8	4	3	3.04	457.14
AOI 3 GW-1	AOI 3	467.09	30	10	2	7.7	459.39
AOI 4 GW-1	AOI 4	473.22	15	10	0.5	2.76	470.46
AOI 5 GW-1	AOI 5	486.37	8	4	3	Dry	Dry
AOI 6 GW-1	AOI 6	459.76	13.5	5	---	10.15	449.61
FTIG Boundary GW-1	---	450.64	12.5	5	11	3.15	447.49
FTIG Boundary GW-2	---	450.44	30	10	12.5	2.9	447.54
FTIG Boundary GW-3	---	469.98	10	5	7	8.42	461.56
FTIG Boundary GW-4	---	469.27	25	5	4	8.11	461.16
FTIG Boundary GW-5	---	453.72	52	20	18	21.45	432.27
FTIG Other Wells							
BW-3	---	692.88	nm	---	---	12.38	680.5
BW-4	---	726.38	nm	---	---	23.69	702.69
13-A	---	503.06	30	1	---	4.18	498.88
13-B	---	503.02	15	10	---	1.96	501.06
10-A	---	487.76	29	1	---	2.35	485.41
10-B	---	487.98	14	9	---	1.82	486.16

Table 5-4
Synoptic Groundwater Gauging Event (June 2019)
Site Inspection Report, Fort Indiantown Gap

Well ID	Area of Interest	Elevation - Top of PVC (ft amsl)	Total Well Depth (ft bgs)	Screen Length (ft)	Depth to Bedrock (ft bgs)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
T24-01A	---	467.08	24	1	---	8.57	458.51
T24-01B	---	466.69	14	9	---	4.82	461.87
8-A	---	479.6	29	1	---	9.99	469.61
8-B	---	479.69	14	9	---	*7.00	472.69
First Street A-17D	---	508.73	51	2	---	22.12	486.61
First Street A-17S	---	507.4	31	8	---	20.96	486.44
AIR ARM D	---	465.83	26	2	---	5.43	460.4
AIR ARM S	---	467.08	16	8	---	4.56	462.52
T-107D	---	482.35	31	2	---	14.29	468.06
T-107S	---	483.14	21	8	---	14.12	469.02
MW-15W	---	509.51	46	10	---	8.62	500.89
MW-1LF	---	516.15	31	25	---	4.72	511.43
MW-2LF	---	472.98	32	25	---	5.43	467.55
MW-3LF	---	465.5	32	25	---	nm	nm
MW-4LF	---	459.34	32	25	---	nm	nm
MW-5LF	---	459.81	32	25	---	12.16	447.65
MW-6LF	---	458.8	33	20	---	nm	nm
MW-8LF	---	452.96	35	30	---	nm	nm
MW-1B (FIG 11)	---	479.53	27	10	---	nm	nm
MW-1S	---	479.09	10.5	7.5	---	nm	nm
MW-2B(FIG 11)	---	470.38	15	9	---	nm	nm
MW-2S	---	470.1	4.8	4	---	nm	nm
MW-3S(FIG 11)	---	470.44	4.8	3.6	---	0.83	469.61
MW-4S(FIG 11)	---	473.34	13	11	---	nm	nm
MW-5S(FIG 11)	---	470.52	6.1	5	---	nm	nm
MW-6s(FIG 11)	---	473.4	15	10	---	nm	nm
MW-7(FIG 11)	---	470.64	5.6	4.3	---	0.57	470.07
MW-1(RWAY)	---	472.14	15.9	10	---	8.22	463.92
MW-2(RWAY)	---	470.23	14.5	10	---	5.85	464.38
MW-3(RWAY)	---	470.93	15	10	---	7.05	463.88

Table 5-4
Synoptic Groundwater Gauging Event (June 2019)
Site Inspection Report, Fort Indiantown Gap

Well ID	Area of Interest	Elevation - Top of PVC (ft amsl)	Total Well Depth (ft bgs)	Screen Length (ft)	Depth to Bedrock (ft bgs)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
MW-4(RWAY)	---	473.21	14.7	10	---	8.89	464.32

Notes:

1 - FTIG SI Wells and Other wells MW2(RWAY), MW4(RWAY), BW-3, and BW-4 sampled during the SI were surveyed by ARNG in June 2019 in Coordinate System WGS 1984 UTM Zone 18N Meters.

Other well coordinates and elevation data provided by PAARNG.

Depth to groundwater gauging conducted by AECOM and PAARNG personnel on June 19, 2019.

Acronyms and Abbreviations:

AIR ARM = airfield armory

AOI = area of interest

amsl = above mean sea level

bgs = below ground surface

btoc = below top of casing

BW = base well

ft = feet

FTIG = Fort Indiantown Gap

GW = groundwater

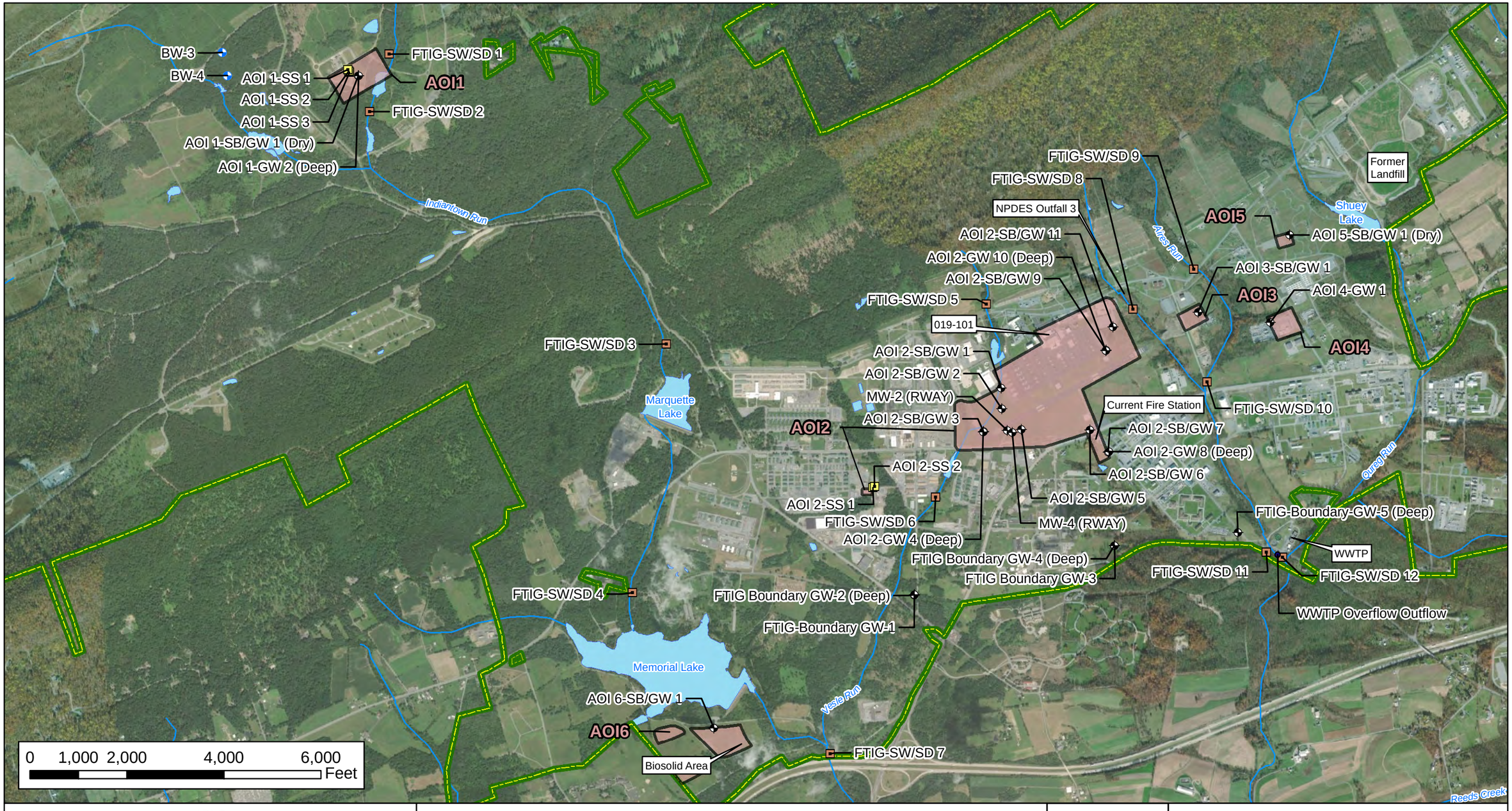
ID = identification

LF = landfill

MW = monitoring well

nm = no measurement

RWAY = runway



CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	2/8/2021	GIS BY	MS	2/8/2021
SCALE	1:24,000	CHK BY	BM	2/8/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	2/8/2021

- Area of Interest
- Facility Boundary
- Water Body
- River/Stream
- Base Supply Well
- Monitoring Well
- Surface Soil Location
- Surface Water/Sediment Location

N

Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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6. Site Inspection Results

This section presents the analytical results of the SI for each AOI. The SLs used in this evaluation are presented in **Section 6.**1. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.9**. **Table 6-2** through **Table 6-6** present PFAS results for samples with detections in soil, sediment, surface water, or groundwater; only constituents detected in one or more samples are included. Tables that contain all results are provided in **Appendix H**, and the laboratory reports are provided in **Appendix I**.

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 15 October 2019 (Assistant Secretary of Defense, 2019). 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 site will proceed to a RI, the next phase under CERCLA. The SLs apply to three compounds, PFOA, PFOS, and PFBS, for both soil and groundwater, as presented in **Table 6-1**.

All other results presented in this report are considered informational in nature and serve as an indication as to whether soil, groundwater, sediment, and surface water contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	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	130	1,600	40
PFOS	130	1,600	40
PFBS	130,000	1,600,000	40,000

Notes:

a.) Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. HQ=0.1. 15 October 2019.

6.2 Soil Physicochemical Analyses

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. According to the Interstate Technology Regulatory Council (ITRC), several important PFAS partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions and are therefore relatively mobile in groundwater (Xiao et al., 2015), but they 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 (Koc 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, which includes one PFAS release area: the CACTF. The detected compounds are presented in **Table 6-2** through **Table 6-4**. **Figures 6-1** through **6-3** present detections for PFOS and PFOA in soil and groundwater.

6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the CACTF. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA, respectively. The detected compounds in soil are summarized in **Tables 6-2** and **6-3**.

At AOI 1, soil was sampled at one boring (AOI1-SB1) and three surface soil borings (0.5 to 1 feet bgs). At AOI1-SB1, soil was sampled from shallow (0.5 to 1 feet bgs), intermediate (9 to 9.5 feet bgs), and deep (19.5 to 20 feet bgs) intervals. PFOA was detected in all four shallow surface soil samples at concentrations orders of magnitude below the SL, ranging from 0.31 J to 1.0 micrograms per kilogram (µg/Kg). PFOS was only detected at AOI1-SS1, at a concentration of 0.27 J µg/Kg. PFBS was not detected in any surface soil samples. Additionally, PFOA, PFOS, and PFBS were not detected in the intermediate and deep soil samples at AOI 1.

6.3.2 AOI 1 Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at AOI 1. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected PFAS compounds in groundwater are summarized in **Table 6-4**.

Groundwater was sampled from three locations, including the deep temporary well AOI1-GW2 and two existing wells (BW-3 and BW-4). The shallow temporary well AOI1-GW1 was installed into the bedrock interface but was dry and did not yield sufficient groundwater to sample. PFOS was detected in two of the three wells, with concentrations ranging from non-detect at BW-3 to 1.2 J ng/L at BW-4. PFOA was only detected at AOI1-GW2 with a concentration of 14 ng/L. PFBS was not detected in any of the samples.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil at AOI 1; however, the detected concentrations were several orders of magnitude lower than the soil SLs. PFOA and PFOS were also detected in groundwater in concentrations below the groundwater SLs. Therefore, further evaluation at AOI 1 is not warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater at AOI 2, which includes seven PFAS release areas: West Ramp Fire Pit Training Area; East Ramp Fire Pit Training Area; Building 019-101 Ramp; Current Fire Station (Building 5-117); Crash Site; Simulated Emergency Event; and Accidental Tank Spill. The detected compounds are presented in **Table 6-2** through **Table 6-4**. **Figures 6-1** through **6-3** present detections for PFOS and PFOA in soil and groundwater.

6.4.1 West Ramp Fire Pit Training Area

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the West Ramp Fire Pit Training Area. One soil boring (AOI2-SB1) was sampled from shallow (0.5 to 1 feet bgs), intermediate (8 to 10 feet bgs), and deep (14.5 to 15 feet bgs) intervals. PFOA and PFOS were detected in the shallow surface soil interval at concentrations of 0.88 and 51 µg/Kg, respectively. In the intermediate interval, PFOS was detected at a concentration of 8.2 µg/Kg. PFOA, PFOS and PFBS were not detected at the deep interval. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Groundwater Analytical Results

PFOA and PFOS exceeded the SLs at the West Ramp Fire Pit Training Area. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

One groundwater sample was collected from temporary well AOI2-GW1. PFOA and PFOS exceeded the SLs, with concentrations of 44 and 99 ng/L, respectively. PFBS was detected at a concentration of 12 ng/L and did not exceed the SL.

6.4.2 East Ramp Fire Pit Training Area

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the East Ramp Fire Pit Training Area. One soil boring (AOI2-SB11) was sampled from a shallow surface (0.5 to 1 feet bgs) and intermediate (7.5 to 8 feet bgs) intervals. In the shallow surface soil interval, PFOA and PFOS were detected at concentrations of 0.27 J and 5.3 µg/Kg, respectively. In the intermediate subsurface soil interval only PFOS was detected at a concentration of 0.62 J µg/Kg (the duplicate sample had a concentration of 3.1 µg/Kg). No PFBS was detected at the East Ramp Fire Pit Training Area. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Groundwater Analytical Results

PFOS exceeded the SL for groundwater at the East Ramp Fire Pit Training Area. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

One groundwater sample was collected from temporary well AOI2-GW11. PFOS exceeded the SL, with a concentration of 280 ng/L. PFOA and PFBS were also detected at concentrations of 28 and 14 ng/L, respectively, but did not exceed the SLs.

6.4.3 Building 019-101

Samples were not collected on the apron at Building 019-101 due to concerns of undermining the apron structure and interfering with base mission activities. Samples were collected downgradient at locations associated with the Building 019-101 Ramp.

6.4.4 Building 019-101 Ramp

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the soil SLs at the Building 019-101 Ramp. Two soil borings were sampled at the southwest and southeast corners of Building 019-101 Ramp (AOI2-SB2 and AOI2-SB9, respectively). **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Soil was sampled at AOI2-SB2 from shallow surface (0.5 to 1 feet bgs) and intermediate (5.5 to 6 feet bgs) intervals. No PFOA, PFOS or PFBS were detected in the surface soil and shallow subsurface soil samples collected at AOI2-SB2.

Soil was sampled at AOI2-SB9 from shallow surface (0.5 to 1 feet bgs), intermediate (7 to 7.5 feet bgs), and deep (9 to 9.5 feet bgs) intervals. PFOS was detected in the surface and intermediate subsurface soil samples at concentrations of 0.98 µg/Kg and 1.5 µg/Kg, respectively. No PFOS was detected in the deep subsurface soil sample. No PFOA or PFBS were detected in any samples.

Groundwater Analytical Results

PFOS exceeded the SL in one of the three samples collected at Building 019-101 Ramp. Samples were collected from temporary wells AOI2-GW2, AOI2-GW9, and AOI2-GW10. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

The groundwater sampled at AOI2-GW2 was collected on the southwestern corner of the ramp. PFOS was detected at a concentration of 1.7 J ng/L, whereas PFOA and PFBS were not detected.

AOI2-GW9 and AOI2-GW10 are co-located wells located on the southeastern corner of the ramp. AOI2-GW9 is the shallow well and has a depth of 9.5 feet bgs, while AOI2-GW10 is the deep well and has a depth of 30 feet bgs. At AOI2-GW9, PFOS exceeded the SL with a concentration of 59 ng/L. PFOA and PFBS were also detected with concentrations of 23 and 4.2 ng/L, respectively. PFOA, PFOS, or PFBS were not detected in the deep well at AOI2-GW10.

6.4.5 Current Fire Station (Building 5-117)

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the soil SLs at the Current Fire Station. Samples were collected from two soil borings, one on the north side of Fisher Avenue (AOI2-SB6) and one in the field south of the Current Fire Station (AOI2-SB7) **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Soil was sampled at AOI2-SB6 from shallow surface (0.5 to 1 feet bgs), intermediate (4 to 4.5 feet bgs), and deep (7.5 to 8 feet bgs) intervals. In the surface soil sample, PFOA, PFOS, and PFBS were all detected. PFOS had the highest concentration of 120 µg/Kg, whereas PFOA and PFBS had concentrations of 2.1 and 0.75 J µg/Kg, respectively. In the intermediate and deep subsurface samples, PFOS was detected at concentrations of 0.29 J and 0.34 J µg/Kg, respectively. No PFOA or PFBS were detected in either of the two subsurface samples.

Soil was sampled at AOI2-SB7 from shallow surface (0.5 to 1 feet bgs) and intermediate (7.5 to 8 feet bgs) intervals. At AOI2-SB7, PFOA and PFOS were detected in concentrations orders of magnitude below the SLs in both intervals. In the shallow surface interval, PFOA and PFOS were detected in concentrations of 0.25 J and 1.0 µg/Kg, respectively. The highest concentrations of PFOA and PFOS were detected in the intermediate subsurface interval, at 0.38 J and 2.7 µg/Kg, respectively.

Groundwater Analytical Results

PFOS exceeded the SL in one of the two sample locations at the Current Fire Station. Two groundwater samples were collected at temporary wells AOI2-GW6 and AOI2-GW8. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

The groundwater sampled at AOI2-GW6 was collected on the north side of Fisher Avenue. PFOS was detected at a concentration of 160 ng/L and exceeded the SL. PFOA and PFBS were also detected at concentrations of 38 and 26 J- ng/L, respectively.

Temporary wells AOI2-GW7 and AOI2-GW8 are co-located wells in the field south of the Current Fire Station. The shallow temporary well AOI2-GW7, which was installed in the bedrock interface, was dry and a groundwater sample was not collected. PFOA, PFOS, and PFBS were not detected in the groundwater from the deep temporary well AOI2-GW8.

6.4.6 Crash Site

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the soil SLs at the Crash Site. One soil boring was sampled at the Crash Site (AOI2-SB5). Only one interval (0.5 to 1 feet bgs) was collected because bedrock was encountered at 4 feet bgs. PFOA and PFOS were detected at concentrations of 0.40 J+ and 5.0 µg/Kg, respectively. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at the three sample locations at the Crash Site. Groundwater samples were collected at temporary well AOI2-GW5 and at two existing wells MW-2(RWAY) and MW-4(RWAY). **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

PFOS were detected in two of the three wells, with concentrations ranging from non-detect at AOI2-GW5 to 4.4 ng/L at MW-4(RWAY). PFOA and PFBS were not detected in any of the samples.

6.4.7 Simulated Emergency Event

Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the soil SLs at the Simulated Emergency Event. Soil was sampled from one soil boring (AOI2-SB3), which was sampled from shallow surface (0.5 to 1 feet bgs), intermediate (6.5 to 7 feet bgs), and deep (12.5 to 13 feet bgs) intervals. PFOA and PFOS were detected in the shallow surface soil interval at concentrations of 0.33 J and 3.2 µg/Kg, respectively. PFOA, PFOS, and PFBS were not detected in the intermediate intervals. PFOA, PFOS, and PFBS were detected in the deep interval. PFOS had the highest concentration at 92 µg/Kg. PFBS was only detected in the deep interval at a concentration of 3.9 µg/Kg. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Groundwater Analytical Results

PFOA, PFOS, and PFBS were not detected in either of the two samples collected at the Simulated Event. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

6.4.8 Accidental Tank Spill

Soil Analytical Results

PFOA, PFOS, and PFBS were not detected in either of the two surface soil samples collected at the Accidental Tank Spill area. **Figures 6-1** and **6-2** present detections in soil for PFOS and PFOA. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

Groundwater Analytical Results

No groundwater samples were collected at the Accidental Tank Spill.

6.4.9 AOI 2 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in soil at AOI 2 at concentrations below the soil SLs. The only potential source area that was sampled and did not have any detected PFOA, PFOS, or PFBS was the Accidental Tank Spill.

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in groundwater at AOI 2. PFOS was detected in groundwater at concentrations exceeding the SL of 40 ng/L in four source areas: the West Ramp Fire Pit Training Area, the East Ramp Fire Pit Training Area, Building 019-101 Ramp, and the Current Fire Station. PFOA was detected in concentrations exceeding the SL of 40 ng/L at the West Ramp Fire Pit Training Area. PFBS did not exceed the SL at any source area. The Simulated Emergency Event was the only source area where PFOA, PFOS, and PFBS were not detected. Based on the exceedances of the SLs for PFOA and PFOS in groundwater, further evaluation at AOI 2 is warranted.

6.5 AOI 3

This section presents the analytical results for soil and groundwater at AOI 3, which includes one potential PFAS release area: the Johnson Trail location. The detected compounds are presented in **Table 6-2** through **Table 6-4**. **Figures 6-1** through **6-3** present detections for PFOS and PFOA in soil and groundwater.

6.5.1 AOI 3 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at AOI 3. One boring was sampled from shallow surface (0.5 to 1 feet bgs) and intermediate (2.5 to 3 feet bgs) intervals. PFOA and PFOS were detected at concentrations orders of magnitude below the SLs in the shallow interval with concentrations of 0.33 J and 0.37 J µg/Kg, respectively. PFBS was not detected in either the shallow or intermediate intervals. Additionally, PFOA and PFOS were not detected in the intermediate interval. **Figures 6-1** and **6-2** present detections for PFOA and PFOS. The detected soil compounds are summarized in **Tables 6-2** and **6-3**.

6.5.2 AOI 3 Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at AOI 3. One groundwater sample was collected at temporary well AOI3-GW1. PFOS was detected at a concentration of 0.85 J ng/L (AOI2-GW1DUP), whereas PFOA and PFBS were not detected. **Figure 6-3** presents detections for PFOS and PFOA. The detected compounds are summarized in **Table 6-4**.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil at AOI 3; however, the detected concentrations were orders of magnitude below the soils SLs. PFOS was detected in

groundwater at concentrations below the groundwater SL; therefore, further evaluation at AOI 3 is not warranted.

6.6 AOI 4

This section presents the analytical results for groundwater at AOI 4, which includes one potential PFAS release area: Fire Pit Area #19. The detected compounds are presented in **Table 6-4**. **Figure 6-3** presents detections for PFOS and PFOA in groundwater.

6.6.1 AOI 4 Soil Analytical Results

Soil samples were not collected at AOI 4 due to the shallow depth to bedrock (0.5 feet bgs) and surface soil, which was identified as gravel fill; therefore, there are no PFAS data to present.

6.6.2 AOI 4 Groundwater Analytical Results

PFOA, PFOS, and PFBS were not detected in the groundwater sample collected at temporary well AOI4-GW1; therefore, the SLs were not exceeded at AOI 4. **Figure 6-3** present the ranges of detections for PFOS and PFOA. The detected compounds are summarized in **Table 6-4**.

6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were not detected in groundwater. Additionally, soil was not sampled at this location due to shallow bedrock; therefore, further evaluation at AOI 4 is not warranted.

6.7 AOI 5

This section presents the analytical results for soil at AOI 5, which includes one potential PFAS release area: the First Street location. The detected compounds are presented in **Tables 6-2** and **6-3**. **Figures 6-1** and **6-2** present detections for PFOS and PFOA in soil.

6.7.1 AOI 5 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at AOI 5. Soil was sampled from shallow surface (0.5 to 1 feet bgs), intermediate (4 to 4.5 feet bgs), and deep (7 to 8 feet bgs) intervals. PFOA, PFOS, and PFBS were not detected in the shallow, intermediate, or deep intervals. The detected compounds are summarized in **Table 6-4**.

6.7.2 AOI 5 Groundwater Analytical Results

The overburden was dry at AOI 5 and groundwater was not sampled; therefore, there are no PFAS data to present.

6.7.3 AOI 5 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were not detected in soil at AOI 5. Additionally, groundwater was not sampled at this location; therefore, no further evaluation at AOI 5 is warranted.

6.8 AOI 6

This section presents the analytical results for soil and groundwater at AOI 6, which includes one potential PFAS release area: the Biosolid Area. The detected compounds are presented in **Tables**

6-2 through **Table 6-4**. **Figures 6-1** through **6-3** present detections for PFOS and PFOA in soil and groundwater.

6.8.1 AOI 6 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at AOI 6. Soil was sampled from shallow surface (0.5 to 1 feet bgs), intermediate (6.5 to 7 feet bgs), and deep (13 to 13.5 feet bgs) intervals.

PFOA and PFOS were detected in the shallow surface soil interval at concentrations of 0.38 J and 0.48 J µg/Kg, respectively, which are orders of magnitude below the SLs. PFBS was not detected in the shallow, intermediate, or deep intervals. Additionally, PFOA and PFOS were not detected in the intermediate or deep intervals. **Figures 6-1** and **6-2** present detections for PFOS and PFOA. The detected compounds are summarized in **Tables 6-2** and **6-3**.

6.8.2 AOI 6 Groundwater Analytical Results

PFOA, PFOS, and PFBS were not detected in the groundwater sample collected at temporary well AOI6-GW1; therefore, the SLs were not exceeded at AOI 6. **Figure 6-3** presents the ranges of detections for PFOS and PFOA. The detected compounds are summarized in **Table 6-4**.

6.8.3 AOI 6 Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil at AOI 6; however, the detected concentrations were orders of magnitude below the soil SLs. PFOA, PFOS, and PFBS were not detected in groundwater; therefore, no further evaluation is warranted at AOI 6.

6.9 Boundary Wells

This section presents the analytical results for groundwater at the facility boundary. The detected compounds are presented in **Table 6-4**. **Figure 6-3** presents the ranges of detections for PFOS and PFOA.

6.9.1 Boundary Wells Groundwater Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs at any of the five boundary wells. **Figure 6-3** presents the ranges of detections in groundwater for PFOS and PFOA. The detected groundwater compounds are summarized in **Table 6-4**.

Five groundwater samples were collected from the six temporary boundary wells installed during the SI. No groundwater was observed in the shallow temporary well co-located with FTIG-Boundary-GW5; therefore, no sample was collected.

PFOS was detected at both FTIG-Boundary-GW3 and FTIG-Boundary-GW4, with a maximum concentration of 2.9 ng/L. PFOA and PFBS were detected in the shallow well FTIG-Boundary-GW3, with concentrations of 32 and 11 J- ng/L, respectively. No PFOA, PFOS, or PFBS were detected in the co-located boundary wells FTIG-Boundary-GW1 and FTIG-Boundary-GW2 or FTIG-Boundary-GW5.

6.9.2 Boundary Wells Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in groundwater at the southern facility boundary, in boundary wells FTIG-Boundary-GW3 and FTIG-Boundary-GW4. No exceedances of the SLs were observed.

6.10 Surface Water and Surface Sediment

This section presents the analytical results for surface water and sediment at FTIG. The results are reported by the three runs sampled within FTIG during the SI: Indiantown Run, Vesle Run, and Aires Run. There are no established SLs for sediment and surface water; therefore, these results are presented for informational purposes only. **Figures 6-4** and **6-5** present detections for PFOS and PFOA in surface water and sediment, respectively. The detected compounds are presented in **Table 6-5** and **Table 6-6**.

6.10.1 Indiantown Run

Surface Water Analytical Results

Surface water sample FTIG-SW1 was collected upstream of AOI 1, and surface water sample FTIG-SW2 was collected immediately downstream of AOI 1, in a tributary to Indiantown Run. The surface water samples FTIG-SW3 and FTIG-SW4 were taken further downstream in Indiantown Run, located upstream of Marquette Lake and upstream Memorial Lake, respectively. Surface water sample FTIG-SW7 was taken downstream of the confluence of Indiantown Run and Vesle Run at the facility boundary, which is downstream of Memorial Lake, AOI 1, AOI 2, and AOI 6.

PFOS was detected in four of the five samples, with a maximum concentration of 1.5 J+ ng/L detected at FTIG-SW7. PFOA and PFBS were not detected in any of the samples.

Sediment Analytical Results

PFOS was detected in one of the five samples, with a concentration of 0.43 J µg/Kg at FTIG-SD4. PFOA and PFBS were not detected in any of the samples.

Indiantown Run Conclusions

Based on the results of the SI, PFOS was detected in surface water and sediment within Indiantown Run. There are no established SLs for sediment and surface water; therefore, these results are presented for informational purposes only.

6.10.2 Vesle Run

Surface Water Analytical Results

Surface water sample FTIG-SW5 was collected upstream of AOI 2, and surface water sample FTIG-SW6 was collected downstream of AOI 2.

PFOS was detected in both samples, with concentrations of 1.1 J ng/L at FTIG-SW5 and 10 ng/L at FTIG-SW6. PFOA was only detected in FTIG-SW6 at a concentration of 5.4 ng/L. PFBS was not detected in either sample.

Sediment Analytical Results

PFOS was detected in one of two samples (FTIG-SD6) at a concentration of 0.50 J µg/Kg. PFOA and PFBS were not detected in any of the samples.

Vesle Run Conclusions

Based on the results of the SI, PFOA and PFOS were detected in surface water, and PFOS was detected in sediment downgradient of AOI 2, prior to the confluence of Indiantown Run and Vesle Run. There are no established SLs for sediment and surface water; therefore, these results are presented for informational purposes only.

6.10.3 Aires Run

Surface Water Analytical Results

Surface water sample FTIG-SW9 was collected upstream of AOIs 3, 4, and 5. Sample FTIG-SW10 was collected downstream of AOIs 3, 4, and 5. Sample FTIG-SW8 was collected just east of the East Ramp Fire Pit Training Area in AOI 2, within an unnamed tributary of Aires Run. Sample FTIG-SW11 was collected downstream of AOI 2 (East Ramp Fire Pit Training Area, eastern portion of Building 019-101 Ramp, and the Current Fire Station), AOI 3, AOI 4, and AOI 5. FTIG-SW12 was collected at the facility boundary and the confluence of Aires Run and Qureg Run.

PFOS was detected in all five samples and ranged in concentrations from 0.63 J at FTIG-SW9 to 250 ng/L at FTIG-SW8. PFOA was detected in four of the five samples and ranged in concentrations from non-detect at FTIG-SW9 to 37 ng/L at FTIG-SW8. PFBS was only detected at FTIG-SW8, at a concentration of 14 ng/L. PFOA and PFOS were detected at the facility boundary in FTIG-SW11 and FTIG-SW12. Concentrations for PFOA at FTIG-SW11 and FTIG-SW12 were 6.1 and 6.2 ng/L, respectively, whereas concentrations for PFOS were 25 ng/L at both sample locations. PFBS was not detected at the facility boundary.

Sediment Analytical Results

PFOS was detected in four of five samples, ranging in concentration from non-detect at FTIG-SD9 to 4.1 µg/Kg at FTIG-SD8. PFOA and PFBS were not detected in any of the samples.

Aires Run Conclusions

Based on the results of the SI, PFOA, PFOS, and PFBS were detected in surface water, and PFOS was detected in sediment. There are no established SLs for sediment and surface water; therefore, these results are presented for informational purposes only.

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Fort Indiantown Gap

Area of Interest		AOI1										AOI2									
Sample ID		AOI1-SB1-0.5-1.0		AOI1-SS1-0.5-1.0		AOI1-SS1-0.5-1.0 DUP		AOI1-SS2-0.5-1.0		AOI1-SS3-0.5-1.0		AOI2-SB1-0.5-1.0		AOI2-SB2-0.5-1.0		AOI2-SB3-0.5-1.0		AOI2-SB5-0.5-1.0		AOI2-SB6-0.5-1.0	
Sample Date		05/29/2019		05/29/2019		05/29/2019		05/29/2019		05/29/2019		06/03/2019		06/03/2019		06/04/2019		06/03/2019		05/31/2019	
Depth		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																					
6:2 FTS	-	ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND		ND	UJ	3.8	
8:2 FTS	-	ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND		ND	UJ	15	
PFBA	-	ND	UJ	ND		ND		0.77	J	ND		0.93	J+	ND		0.93	J+	1.1	J+	0.64	J
PFBS	130000	ND		ND		ND		ND		ND		ND		ND		ND		ND		0.75	J
PFDA	-	ND		ND		ND		0.98	J	0.47	J	0.43	J	ND		ND		ND	UJ	0.69	J
PFHpA	-	0.44	J	0.75	J	0.66	J	0.73	J	0.86	J	0.55	J	ND		ND		ND	UJ	1.5	
PFHxA	-	0.52	J+	0.78	J	0.71	J	0.73	J	1.0		0.76	J	ND		0.27	J	ND	UJ	2.1	
PFHxS	-	ND		ND		ND		ND		ND		1.6		ND		ND		1.0		18	
PFNA	-	ND	UJ	0.62	J	0.77	J	2.9		2.4		1.0		ND		ND		ND	UJ	0.36	J
PFOA	130	0.31	J	0.94		1.0		0.80	J	0.73	J	0.88	J	ND		0.33	J	0.40	J+	2.1	
PFOS	130	ND		0.27	J	0.27	J	ND		ND		51		ND		3.2		5.0		120	
PFPeA	-	0.60	J+	0.79	J	0.81	J	1.6		1.5		0.56	J	ND		ND		ND	UJ	1.3	
PFUnDA	-	ND		ND		ND		ND		ND		0.34	J	ND		ND		ND	UJ	0.37	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
HA	Hand auger
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
SS	Surface Soil
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Fort Indiantown Gap

Area of Interest		AOI2												AOI3		AOI5		AOI6	
Sample ID		AOI2-SB7-0.5-1.0		AOI2-SB9-0.5-1.0		AOI2-SB11-0.5-1.0		AOI2-SS1-0.5-1.0		AOI2-SS2-0.5-1.0		AOI2-SS2-0.5-1.0-DUP		AOI3-SB1-0.5-1.0		AOI5-SB1-0.5-1.0		AOI6-SB1-0.5-1.0	
Sample Date		06/07/2019		06/03/2019		06/07/2019		06/07/2019		06/07/2019		06/07/2019		06/07/2019		05/31/2019		05/28/2019	
Depth		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft		0.5 - 1 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																			
6:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	
8:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	
PFBA	-	ND		ND		0.77	J	ND		ND		ND		ND		1.2	J+	ND	
PFBS	130000	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	
PFDA	-	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	
PFHpA	-	ND		ND		0.36	J	ND		ND		0.34	J	ND		ND	UJ	ND	
PFHxA	-	ND		ND		0.32	J	ND		0.40	J	0.68	J	ND		ND	UJ	ND	
PFHxS	-	ND		ND		0.25	J	ND		ND		ND		ND		ND	UJ	ND	
PFNA	-	0.36	J	ND		0.36	J	ND		ND		ND		ND		ND	UJ	ND	
PFOA	130	0.25	J	ND		0.27	J	ND		ND		ND		0.33	J	ND	UJ	0.38	J
PFOS	130	1.0		0.98		5.3		ND		ND		ND		0.37	J	ND	UJ	0.48	J
PFPeA	-	0.24	J	ND		0.78	J	ND		ND		0.47	J+	ND		ND	UJ	ND	
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

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8:2 FTS	8:2 fluorotelomer sulfonate
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PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
HA	Hand auger
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
SS	Surface Soil
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-3
PFAS Detections in Subsurface Soil
Site Inspection Report, Fort Indiantown Gap

	Area of Interest	AOI1		AOI2																	
	Sample ID	AOI1-SB1-9.0-9.5		AOI2-SB1-8.0-10		AOI2-SB1-14.5-15		AOI2-SB2-5.5-6.0		AOI2-SB3-6.5-7.0		AOI2-SB3-12.5-13.0		AOI2-SB6-4.0-4.5		AOI2-SB6-7.5-8.0		AOI2-SB7-7.5-8.0		AOI2-SB9-7.0-7.5	
	Sample Date	05/30/2019		06/04/2019		06/04/2019		06/04/2019		06/04/2019		06/04/2019		05/31/2019		05/31/2019		06/11/2019		06/05/2019	
	Depth	9 - 9.5 ft		8 - 10 ft		14.5 - 15 ft		5.5 - 6 ft		6.5 - 7 ft		12.5 - 13 ft		4 - 4.5 ft		7.5 - 8 ft		7.5 - 8 ft		7 - 7.5 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																					
PFBA	-	0.75	J+	0.63	J+	ND		ND		0.71	J+	ND		ND		ND		ND		0.72	J+
PFBS	1600000	ND		ND		ND		ND		ND		3.9		ND		ND		ND		ND	
PFHpA	-	ND	UJ	ND		ND		ND		ND		ND		ND		ND		0.38	J	ND	UJ
PFHxA	-	ND	UJ	ND		ND		ND		ND		ND		0.48	J	0.37	J	0.34	J	ND	UJ
PFHxS	-	ND		0.24	J	ND		ND		ND		14		ND		0.23	J	0.94		0.33	J
PFNA	-	ND	UJ	ND		ND		ND		ND		ND		ND		ND		0.23	J	ND	UJ
PFOA	1600	ND	UJ	ND		ND		ND		ND		0.39	J	ND		ND		0.38	J	ND	UJ
PFOS	1600	ND		8.2		ND		ND		ND		92		0.29	J	0.34	J	2.7		1.5	
PFPeA	-	ND	UJ	ND		ND		ND		ND		ND		0.33	J	0.36	J	0.27	J	ND	UJ

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-3
PFAS Detections in Subsurface Soil
Site Inspection Report, Fort Indiantown Gap

Area of Interest		AOI2						AOI3				AOI5				AOI6			
Sample ID		AOI2-SB9-9.0-9.5		AOI2-SB11-7.5-8.0		AOI2-SB11-7.5-8.0-DUP		AOI3-SB1-2.5-3.0		AOI3-SB1-2.5-3.0-DUP		AOI5-SB1-4.0-4.5		AOI5-SB1-7.0-8.0		AOI6-SB1-6.5-7.0		AOI6-SB1-13.0-13.5	
Sample Date		06/05/2019		06/11/2019		06/11/2019		06/10/2019		06/10/2019		05/31/2019		05/31/2019		05/28/2019		05/28/2019	
Depth		9 - 9.5 ft		7.5 - 8 ft		7.5 - 8 ft		2.5 - 3 ft		2.5 - 3 ft		4 - 4.5 ft		7 - 8 ft		6.5 - 7 ft		13 - 13.5 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																			
PFBA	-	ND		ND		ND		ND		ND	UJ	0.97	J+	1.1	J+	0.82	J	ND	
PFBS	1600000	ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND	
PFHpA	-	ND		ND		ND		ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	
PFHxA	-	ND		ND		0.25	J	ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	
PFHxS	-	ND		ND		1.0		ND		ND		ND		ND		ND		ND	
PFNA	-	ND		ND		ND		ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	
PFOA	1600	ND		ND		ND		ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	
PFOS	1600	ND		0.62	J	3.1		ND		ND		ND		ND		ND		ND	
PFPeA	-	ND		ND		ND		ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
ug/Kg	micrograms per Kilogram
-	Not applicable

Table 6-4
PFAS Detections in Groundwater
Site Inspection Report, Fort Indiantown Gap

	Area of Interest	AOI1		Base Well				AOI2											
	Sample ID	AOI1-GW2		BW3		BW4		AOI2-GW1		AOI2-GW2		AOI2-GW3		AOI2-GW3-DUP		AOI2-GW4		AOI2-GW5	
	Sample Date	06/14/2019		06/12/2019		06/12/2019		06/11/2019		06/17/2019		06/10/2019		06/10/2019		06/10/2019		06/18/2019	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																			
6:2 FTS	-	ND		ND		ND		1.1	J-	1.1	J	ND		ND		ND		ND	
8:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFBA	-	45		ND		ND		91	J+	ND		ND		ND		ND		28	
PFBS	40000	ND		ND		ND		12		ND		ND		ND		ND		ND	
PFDA	-	ND		ND		ND		1.4	J	ND		ND		ND		ND		ND	
PFDoA	-	ND	UJ	ND		ND		ND		ND		ND		ND		ND		ND	
PFHpA	-	32		ND		ND		87		ND		ND		ND		ND		ND	
PFHxA	-	68		ND		ND		160		ND		ND		ND		ND		ND	
PFHxS	-	ND		ND		0.40	J	150		0.48	J	ND		ND		ND		ND	
PFNA	-	3.9		ND		ND		9.6		ND		ND		ND		ND		ND	
PFOA	40	14		ND		ND		44		ND		ND		ND		ND		ND	
PFOS	40	0.47	J	ND		1.2	J	99		1.7	J	ND		ND		ND		ND	
PFPeA	-	120		ND		ND		220		ND		ND		ND		ND		ND	
PFTeDA	-	ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND	
PFTrDA	-	ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND	
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
FTIG	Fort Indiantown Gap
GW	Groundwater
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
-	Not applicable

Table 6-4
PFAS Detections in Groundwater
Site Inspection Report, Fort Indiantown Gap

Area of Interest		AOI2												Runway				AOI3	
Sample ID		AOI2-GW6		AOI2-GW8		AOI2-GW8-DUP		AOI2-GW9		AOI2-GW10		AOI2-GW11		MW-2		MW-4		AOI3-GW1	
Sample Date		06/11/2019		06/13/2019		06/13/2019		06/11/2019		06/11/2019		06/14/2019		06/17/2019		06/17/2019		06/18/2019	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																			
6:2 FTS	-	55	J-	ND		ND		3.6		ND		11		ND		ND		ND	
8:2 FTS	-	38		ND		ND		1.4	J	ND		ND		ND		ND		ND	
PFBA	-	220	J+	2.8	J+	3.0	J+	48	J+	ND		35		2.5	J	ND		8.7	
PFBS	40000	26	J-	ND		ND		4.2		ND		14		ND		ND		ND	
PFDA	-	14		ND		ND		0.51	J	ND		0.99	J	ND		ND		ND	
PFDoA	-	2.9		ND		ND		ND		ND		ND		ND		ND		ND	
PFHpA	-	75		ND		ND		51		ND		40		ND		ND		ND	
PFHxA	-	370		ND		ND		77		ND		77		ND		ND		ND	
PFHxS	-	120		ND		ND		31		ND		140		2.3		ND		ND	
PFNA	-	7.2		ND		ND		4.6		ND		9.5		ND		ND		ND	
PFOA	40	38		ND		ND		23		ND		28		ND		ND		ND	
PFOS	40	160		ND		ND		59		ND		280		4.4		0.97	J	0.77	J
PFPeA	-	490	J-	ND		ND		110		ND		85		ND		ND		ND	
PFTeDA	-	0.69	J	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
PFTrDA	-	0.88	J	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
PFUnDA	-	2.6		ND		ND		ND		ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration
J- = Estimated concentration, biased low
J+ = Estimated concentration, biased high
UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
FTIG	Fort Indiantown Gap
GW	Groundwater
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
-	Not applicable

Table 6-4
PFAS Detections in Groundwater
Site Inspection Report, Fort Indiantown Gap

	Area of Interest	AOI3		AOI4		AOI6		FTIG Boundary									
	Sample ID	AOI3-GW1-DUP		AOI4-GW1		AOI6-GW1		FTIG-BOUNDARY-GW1		FTIG-BOUNDARY-GW2		FTIG-BOUNDARY-GW3		FTIG-BOUNDARY-GW4		FTIG-BOUNDARY-GW5	
	Sample Date	06/18/2019		06/10/2019		06/11/2019		06/11/2019		06/10/2019		06/19/2019		06/19/2019		06/18/2019	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																	
6:2 FTS	-	ND		ND		ND		ND		1.4	J	ND		ND		ND	
8:2 FTS	-	ND		ND		ND		ND		ND		ND		ND		ND	
PFBA	-	9.9		9.9	J+	2.9	J+	6.7	J+	ND		94		ND		4.3	J
PFBS	40000	ND		ND		ND		ND		ND		11	J-	ND		ND	
PFDA	-	ND		ND		ND		ND		ND		ND		ND		ND	
PFDoA	-	ND		ND		ND	UJ	ND		ND		ND	UJ	ND		ND	
PFHpA	-	ND		ND		ND		ND		ND		27		ND		ND	
PFHxA	-	ND		5.3		ND		ND		ND		56		ND		ND	
PFHxS	-	ND		0.58	J	ND		ND		ND		4.7		ND		ND	
PFNA	-	ND		ND		ND		ND		ND		2.2	J	ND		ND	
PFOA	40	ND		ND		ND		ND		ND		32		ND		ND	
PFOS	40	0.85	J	ND		ND		ND		ND		2.9		0.69	J	ND	
PFPeA	-	ND		11		ND		ND		ND		53	J-	ND		ND	
PFTeDA	-	ND		ND		ND	UJ	ND		ND		ND	UJ	ND		ND	UJ
PFTrDA	-	ND		ND		ND	UJ	ND		ND		ND	UJ	ND		ND	UJ
PFUnDA	-	ND		ND		ND		ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration
J- = Estimated concentration, biased low
J+ = Estimated concentration, biased high
UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
FTIG	Fort Indiantown Gap
GW	Groundwater
HQ	Hazard quotient
LCMSMS	Liquid Chromatography 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
-	Not applicable

Table 6-5
PFAS Detections in Sediment
Site Inspection Report, Fort Indiantown Gap

Area of Interest	FTIG Boundary																			
Sample ID	FTIG-SD1-0.0-0.5		FTIG-SD2-0.0-0.5		FTIG-SD3-0-0.5		FTIG-SD4-0-0.5		FTIG-SD5-0-0.5		FTIG-SD6-0-0.5		FTIG-SD6-0-0.5-DUP		FTIG-SD7-0-0.5		FTIG-SD8-0-0.5		FTIG-SD9-0-0.5	
Sample Date	06/14/2019		06/14/2019		06/19/2019		06/19/2019		06/18/2019		06/18/2019		06/18/2019		06/19/2019		06/19/2019		06/18/2019	
Depth	0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Sediment, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/g)																				
PFHxS	ND		ND		ND		ND		ND		ND		ND		ND		0.55	J	ND	
PFOS	ND		ND		ND		0.43	J	ND		0.50	J	0.39	J	ND		4.1		ND	
PFPeA	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Interpreted Qualifiers

J = Estimated concentration

Chemical Abbreviations

PFHxS	perfluorohexanesulfonic acid
PFOS	perfluorooctane sulfonate
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
FTIG	Fort Indiantown Gap
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SD	Sediment
ng/g	nanogram per gram

Table 6-5
PFAS Detections in Sediment
Site Inspection Report, Fort Indiantown Gap

Area of Interest	FTIG Boundary					
Sample ID	FTIG-SD10-0-0.5		FTIG-SD11-0-0.5		FTIG-SD12-0-0.5	
Sample Date	06/18/2019		06/19/2019		06/19/2019	
Depth	0 - 0.5 ft		0 - 0.5 ft		0 - 0.5 ft	
Analyte	Result	Qual	Result	Qual	Result	Qual
Sediment, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/g)						
PFHxS	ND		ND		ND	
PFOS	0.78	J	2.2		2.1	
PFPeA	0.38	J	ND		ND	

Interpreted Qualifiers
J = Estimated concentration

Chemical Abbreviations

PFHxS	perfluorohexanesulfonic acid
PFOS	perfluorooctane sulfonate
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
FTIG	Fort Indiantown Gap
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SD	Sediment
ng/g	nanogram per gram

Table 6-6
PFAS Detections in Surface Water
Site Inspection Report, Fort Indiantown Gap

Area of Interest	FTIG Boundary																			
Sample ID	FTIG-SW1		FTIG-SW2		FTIG-SW3		FTIG-SW4		FTIG-SW5		FTIG-SW6		FTIG-SW7		FTIG-SW8		FTIG-SW8-DUP		FTIG-SW9	
Sample Date	06/14/2019		06/14/2019		06/19/2019		06/19/2019		06/18/2019		06/18/2019		06/19/2019		06/19/2019		06/19/2019		06/18/2019	
Analyte	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																				
6:2 FTS	ND		ND		ND		ND	UJ	ND		ND		ND	UJ	15		15		ND	
8:2 FTS	ND		ND		ND		ND	UJ	ND		ND		ND	UJ	6.3		5.4		ND	
PFBA	ND		ND		ND		ND		ND		4.0	J	ND		39		37		ND	
PFBS	ND		ND		ND		ND		ND		ND		ND		14		14		ND	
PFDA	ND		ND		ND		ND	UJ	ND		ND		ND	UJ	3.2		3.0		ND	
PFHpA	ND		ND		ND		ND		ND		2.9		ND		49		48		ND	
PFHxA	ND		ND		ND		ND		ND		4.7		ND		81		78		ND	
PFHxS	ND		0.36	J	ND		0.38	J	ND		6.5		0.37	J	120		120		ND	
PFNA	ND		ND		ND		ND	UJ	ND		0.93	J	0.40	J+	14		13		ND	
PFOA	ND		ND		ND		ND		ND		5.4		ND		37		34		ND	
PFOS	ND		0.49	J	0.47	J	1.1	J+	1.1	J	10		1.5	J+	250		210		0.63	J
PFPeA	ND		ND		ND		ND		ND		4.7	J	ND		92		88		ND	
PFUnDA	ND		ND		ND	UJ	ND	UX	ND		ND		ND	UX	0.70	J	0.54	J	ND	

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

UX/X = The presence or absence of the analyte cannot be substantiated. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
FTIG	Fort Indiantown Gap
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SW	Surface water
ng/L	nanogram per liter

Table 6-6
PFAS Detections in Surface Water
Site Inspection Report, Fort Indiantown Gap

Area of Interest	FTIG Boundary					
Sample ID	FTIG-SW10		FTIG-SW11		FTIG-SW12	
Sample Date	06/18/2019		06/19/2019		06/19/2019	
Analyte	Result	Qual	Result	Qual	Result	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)						
6:2 FTS	2.9		1.8	J	1.8	J
8:2 FTS	ND		ND		ND	
PFBA	6.1		6.9		6.8	
PFBS	ND		ND		ND	
PFDA	ND		ND		ND	
PFHpA	5.5		7.8		7.8	
PFHxA	11		12		11	
PFHxS	2.8		12		12	
PFNA	1.4	J	2.3		2.3	
PFOA	3.2		6.1		6.2	
PFOS	6.9		25		25	
PFPeA	18		16		16	
PFUnDA	ND		ND		ND	

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

UJ = The analyte was not detected at a level greater than or equal to the adjusted DL. However, the reported adjusted DL is approximate and may be inaccurate or imprecise.

UX/X = The presence or absence of the analyte cannot be substantiated. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
FTIG	Fort Indiantown Gap
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
ND	Analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SW	Surface water
ng/L	nanogram per liter

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Shallow

AOI 1 SS-1
AOI 1 SS-2
AOI 1 SS-3
AOI 1-SB/GW 1
Indiantown Run
AOI 5-SB/GW 1
Shuey Lake
AOI 3-SB/GW 1
Aires Run
AOI 2-SB/GW 11
AOI 2-SB/GW 9
AOI 2-SB/GW 1
AOI 2-SB/GW 2
AOI 2-SB/GW 3
Marquette Lake
AOI 2-SB/GW 6
AOI 2-SB/GW 7
AOI 2-SS 2
AOI 2-SS 1
AOI 2-SB/GW 5
Queg Run
Memorial Lake
Vesle Run
AOI 6-SB/GW 1

Intermediate

AOI 1-SB/GW 1
Indiantown Run
AOI 5-SB/GW 1
Shuey Lake
AOI 3-SB/GW 1
Aires Run
AOI 2-SB/GW 11
AOI 2-SB/GW 9
AOI 2-SB/GW 1
AOI 2-SB/GW 2
AOI 2-SB/GW 3
Marquette Lake
AOI 2-SB/GW 6
AOI 2-SB/GW 7
Queg Run
Memorial Lake
Vesle Run
AOI 6-SB/GW 1

Deep

AOI 1-SB/GW 1
Indiantown Run
AOI 5-SB/GW 1
Shuey Lake
Aires Run
AOI 2-SB/GW 9
AOI 2-SB/GW 1
AOI 2-SB/GW 3
Marquette Lake
AOI 2-SB/GW 6
Queg Run
Memorial Lake
Vesle Run
AOI 6-SB/GW 1

Legend

- Facility Boundary
- Water Body
- River/Stream

PFOA Results (ng/g)

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

N

0 1,650 3,300 6,600 Feet

PFOA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	1/11/2021	GIS BY	MS	1/11/2021
SCALE	1:39,600	CHK BY	BM	1/11/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	1/11/2021

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Figure 6-1

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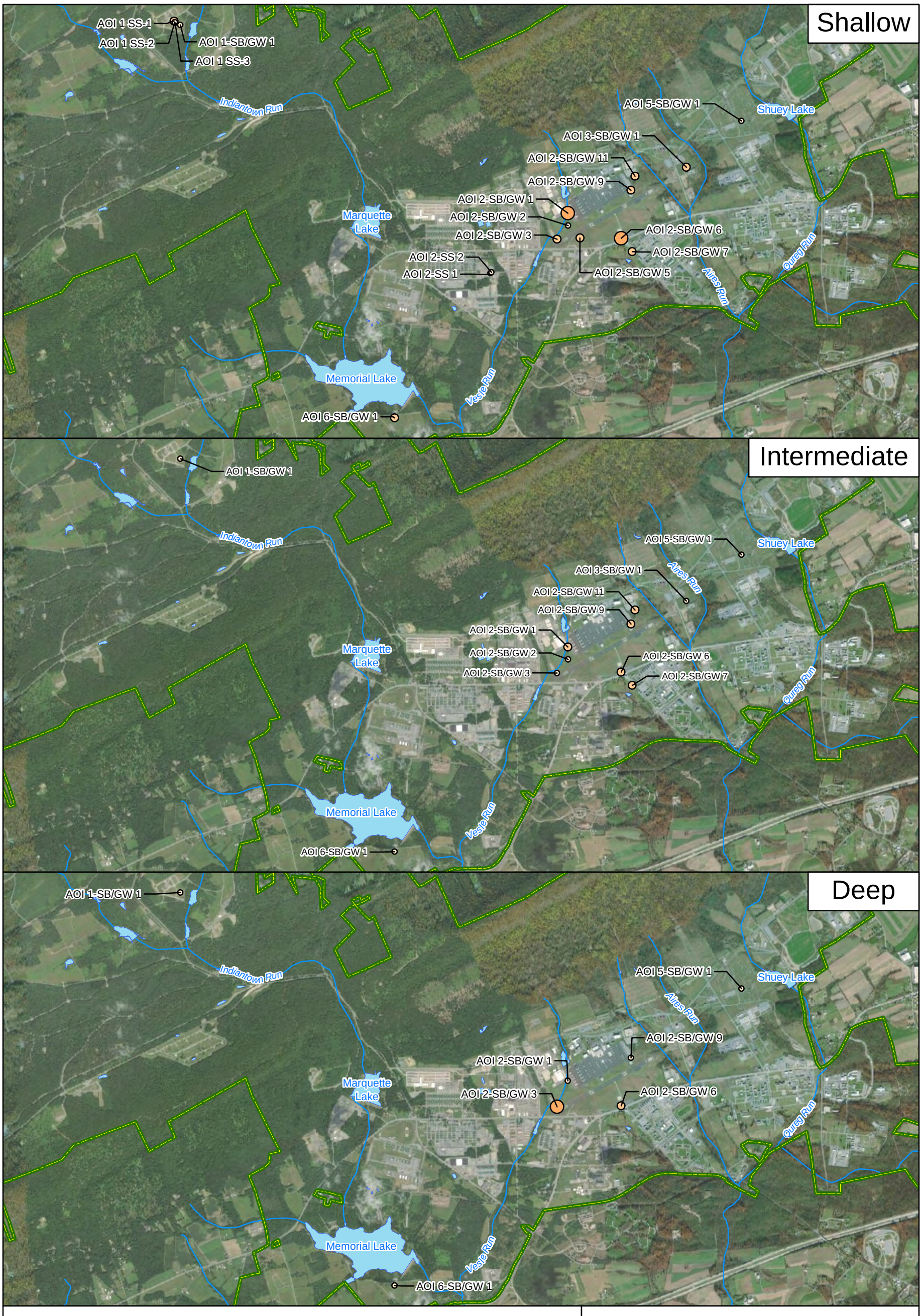

Legend

- Facility Boundary
- Water Body
- River/Stream

PFOS Results (ng/g)

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

N

0 1,650 3,300 6,600 Feet

PFOS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	1/11/2021	GIS BY	MS	1/11/2021
SCALE	1:39,600	CHK BY	BM	1/11/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	1/11/2021

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Figure 6-2

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PFOA

BW-3
BW-4
AOI 1-GW 2 (Deep)
Indiantown Run
Marquette Lake
Memorial Lake
Vesta Run
Shuey Lake
Forge Creek
Aires Run
Queq Run
Reeds Creek
AOI 2-SB/GW 11
AOI 2-GW 10 (Deep)
AOI 2-SB/GW 1
AOI 2-SB/GW 2
AOI 2-GW 4 (Deep)
AOI 2-SB/GW 3
MW-2 (RWAY)
AOI 3-SB/GW 1
AOI 4-GW 1
AOI 2-SB/GW 9
AOI 2-SB/GW 6
AOI 2-GW 8 (Deep)
AOI 2-SB/GW 5
MW-4 (RWAY)
FTIG-Boundary-GW-5 (Deep)
FTIG Boundary GW-4 (Deep)
FTIG Boundary GW-3
FTIG Boundary GW-2 (Deep)
FTIG-Boundary GW-1
AOI 6-SB/GW 1

PFOS

BW-3
BW-4
AOI 1-GW 2 (Deep)
Indiantown Run
Marquette Lake
Memorial Lake
Vesta Run
Shuey Lake
Forge Creek
Aires Run
Queq Run
Reeds Creek
AOI 2-SB/GW 11
AOI 2-SB/GW 9
AOI 2-SB/GW 1
AOI 2-SB/GW 2
AOI 2-SB/GW 3
AOI 2-GW 4 (Deep)
MW-2 (RWAY)
MW-4 (RWAY)
AOI 2-SB/GW 5
FTIG Boundary GW-2 (Deep)
FTIG-Boundary GW-1
AOI 6-SB/GW 1
AOI 3-SB/GW 1
AOI 4-GW 1
AOI 2-GW 10 (Deep)
AOI 2-SB/GW 6
AOI 2-GW 8 (Deep)
FTIG-Boundary-GW-5 (Deep)
FTIG Boundary GW-4 (Deep)
FTIG Boundary GW-3

Legend

- Facility Boundary
- Water Body
- River/Stream
- Groundwater Flow Direction

PFOA Results (ng/L)	PFOS Results (ng/L)
ND	ND
>ND - 40	>ND - 40
>40 - 70	>40 - 70
>70 - 400	>70 - 400
>400	>400

N

0 1,650 3,300 6,600 Feet

PFOA and PFOS Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	2/8/2021	GIS BY	MS	2/8/2021
SCALE	1:39,600	CHK BY	BM	2/8/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	2/8/2021

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Figure 6-3

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PFOA

FTIG-SW/SD 1
FTIG-SW/SD 2
Indiantown Run
FTIG-SW/SD 3
Marquette Lake
FTIG-SW/SD 4
Memorial Lake
Vesle Run
FTIG-SW/SD 7
FTIG-SW/SD 5
Ares Run
FTIG-SW/SD 8
FTIG-SW/SD 9
Queg Run
Shuey Lake
FTIG-SW/SD 10
FTIG-SW/SD 6
FTIG-SW/SD 11
FTIG-SW/SD 12

PFOS

FTIG-SW/SD 1
FTIG-SW/SD 2
Indiantown Run
FTIG-SW/SD 3
Marquette Lake
FTIG-SW/SD 4
Memorial Lake
Vesle Run
FTIG-SW/SD 7
FTIG-SW/SD 5
Ares Run
FTIG-SW/SD 8
FTIG-SW/SD 9
Queg Run
Shuey Lake
FTIG-SW/SD 10
FTIG-SW/SD 6
FTIG-SW/SD 11
FTIG-SW/SD 12

Legend

- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction

PFOA Results (ng/L)	PFOS Results (ng/L)
ND	ND
>ND - 1	>ND - 1
>1 - 10	>1 - 10
>10 - 100	>10 - 100
>100	>100

N

0 1,200 2,400 4,800 Feet

PFOA and PFOS Detections in Surface Water

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	2/5/2021	GIS BY	MS	2/5/2021
SCALE	1:28,800	CHK BY	BM	2/5/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	2/5/2021

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Figure 6-4

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PFOA

FTIG-SW/SD 1
FTIG-SW/SD 2
Indiantown Run
FTIG-SW/SD 3
Marquette Lake
FTIG-SW/SD 4
Memorial Lake
Vesle Run
FTIG-SW/SD 7
FTIG-SW/SD 5
FTIG-SW/SD 6
Aires Run
FTIG-SW/SD 8
FTIG-SW/SD 9
Queg Run
Shuey Lake
FTIG-SW/SD 10
FTIG-SW/SD 11
FTIG-SW/SD 12

PFOS

FTIG-SW/SD 1
FTIG-SW/SD 2
Indiantown Run
FTIG-SW/SD 3
Marquette Lake
FTIG-SW/SD 4
Memorial Lake
Vesle Run
FTIG-SW/SD 7
FTIG-SW/SD 5
FTIG-SW/SD 6
Aires Run
FTIG-SW/SD 8
FTIG-SW/SD 9
Queg Run
Shuey Lake
FTIG-SW/SD 10
FTIG-SW/SD 11
FTIG-SW/SD 12

Legend

Facility Boundary
Water Body
River/Stream

PFOA Results (ng/g)	PFOS Results (ng/g)
ND	ND
>ND - 10	>ND - 1
>10 - 130	>1 - 10
>130 - 1,600	>10 - 100
>1,600	>100

N

0 1,200 2,400 4,800 Feet

PFOA and PFOS Detections in Sediment

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Fort Indiantown Gap, PA			
REVISED	2/5/2021	GIS BY	MS	2/5/2021
SCALE	1:28,800	CHK BY	BM	2/5/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	2/5/2021

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Figure 6-5

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** through **Figure 7-9**. 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 figures use 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 PFOA, PFOS, or PFBS 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 PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway may warrant further investigation.

In general, the potential routes of exposure to PFAS 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 PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2018). Receptors at the Site include site workers (e.g., facility staff and visiting soldiers), construction workers, fulltime and part time residents outside the facility boundary, and recreational users inside and outside of the facility boundary. The CSMs for each AOI, revised based on the SI findings, are presented on **Figures 7-1** through **7-9**.

7.1 Soil Exposure Pathway

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

7.1.1 AOI 1

In November 2012, AFFF was discharged by the PAARNG during fire training activities at AOI 1. PFOA and PFOS were detected in surface soil in this area and confirm the release of PFAS to soil at AOI 1. Based on the results of the SI, ground disturbing activities completed at AOI 1 would potentially result in site worker and construction worker exposure to PFOA and PFOS via inhalation of dust and ingestion of surface soil. PFOA, PFOS, and PFBS were not detected in the subsurface soil; therefore, the subsurface soil ingestion exposure pathway is incomplete. The CSM is presented on **Figure 7-1**.

7.1.2 AOI 2

From the 1970s until the 2010s, AFFF was periodically discharged for various fire training activities and emergency response events at release areas. PFOA and PFOS were detected in soil in this area and confirm the release of PFAS to soil at AOI 2. The CSMs for AOI 2 are presented on **Figures 7-2** through **7-5**.

Based on the results of the SI, ground disturbing activities to surface soil could potentially result in site worker and construction worker exposure to PFOA, PFOS, and PFBS via inhalation of dust and ingestion of surface soil at AOI 2. Additionally, recreational users watch helicopters hover near the ground as close as 100 feet from the fence line and may be potentially exposed to PFOA and PFOS via inhalation of dust generated by this activity at the West Ramp Fire Pit Training Area; East Ramp Fire Pit Training Area; Building 019-101 Ramp; Current Fire Station (Building 5-117); Crash Site; and Simulated Emergency Event. The only source area where PFOA, PFOS, and PFBS were all not detected was the Accidental Tank Spill area. Consequently, the exposure pathways for all receptors via the inhalation and ingestion of surface soil at this location is incomplete.

Ground disturbing activities to subsurface soil would potentially result in construction worker exposure via ingestion at the West Ramp Fire Pit Training Area; East Ramp Fire Pit Training Area; Building 019-101 Ramp; Current Fire Station (Building 5-117); and Simulated Emergency Event. Subsurface soil was not collected at the Crash Site area because bedrock was encountered. Additionally, only surface soil samples were collected at the Accidental Tank Spill area. Therefore, the exposure pathway for the construction worker via ingestion to subsurface soil was not evaluated at these source areas.

7.1.3 AOI 3

In March and April 2016, AFFF was discharged during fire training activities conducted by the PAARNG. PFOA and PFOS were detected in surface soil in this area, which confirms the release of PFAS in soil at AOI 3. Based on the results of the SI, ground disturbing activities would potentially result in site worker and construction worker exposure to PFOA and PFOS via inhalation of dust and ingestion of surface soil. PFAS were not detected at deeper soil depths (2.5-3 feet bgs), suggesting the subsurface soil was not impacted by PAARNG activities. The exposure pathway for subsurface soil is therefore incomplete. The CSM is presented on **Figure 7-6**.

7.1.4 AOI 4

From 1975 to 1986, AFFF was biannually discharged at AOI 4 during fire training activities by PAARNG and the US Army. Soil samples were not collected due to the shallow depth to bedrock (0.5 feet) and because the ground surface was composed of gravel fill; therefore, no surface soil or subsurface soil exposure pathways were evaluated for inhalation or ingestion. The CSM is presented on **Figure 7-7**.

7.1.5 AOI 5

In March 2014, AFFF was dispensed by the PAARNG during a fire training activity. PFOA, PFOS, and PFBS were not detected in the surface and subsurface soils. Therefore, the exposure pathways for surface soil via inhalation and ingestion and the exposure pathway for subsurface soil via ingestion are incomplete. The CSM is presented on **Figure 7-8**.

7.1.6 AOI 6

Since 2012, FTIG has been permitted to perform land application of biosolids from the WWTP on the southeastern boundary of Memorial Lake. PFOA and PFOS were detected in surface soil in this area, which confirms the release of PFAS in AOI 6. Based on the results of the SI, ground disturbing activities would potentially result in site worker and construction worker exposure to PFOA and PFOS via inhalation of dust and ingestion of surface soil. PFOA, PFOS, and PFBS were not detected at deeper soil depths (6.5-13.5 feet), suggesting the subsurface soil was not impacted by PAARNG activities; therefore, the subsurface soil exposure pathway via ingestion is incomplete. The CSM is presented on **Figure 7-9**.

7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.2.1 AOI 1

PFOS and PFOA were detected in groundwater at concentrations that did not exceed the SLs. The ingestion exposure pathway is considered potentially complete for construction workers during trenching activities deep enough to encounter groundwater. Four potable water supply wells exist near AOI 1. Two unused groundwater supply wells, BW-3 and BW-4, were sampled during the SI. PFOS was detected in BW-4 but not detected at BW-3. Two wells supplying potable water are present downgradient of AOI 1. These two downgradient potable supply wells service small and remote buildings. Because PFOS and PFOA were detected at concentrations below the SLs at AOI 1, the groundwater exposure pathway is considered potentially complete for site workers. The groundwater at FTIG is not sourced for residential drinking water, and the exposure pathway via ingestion of groundwater is therefore incomplete. The CSM is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOS was detected in groundwater at concentrations that exceeded the SL at the West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and Current Fire Station (Building 5-117). PFOA was detected at concentrations that exceeded the SL at the West Ramp Fire Pit Training Area; therefore, the ingestion exposure pathway is considered potentially complete for construction workers during trenching activities deep enough to encounter shallow groundwater at these source areas. PFOS was detected in groundwater at concentrations that did not exceed the SL at the Crash Site area; therefore, the ingestion exposure pathway is considered potentially complete for construction workers during trenching activities deep enough to encounter shallow groundwater. PFOA, PFOS, and PFBS were not detected in groundwater at the Simulated Emergency Event area; therefore, the ingestion exposure pathway is considered incomplete. No groundwater samples were collected at the Accidental Tank Spill; therefore, the exposure pathway for groundwater was not evaluated. The groundwater at FTIG is not sourced for residential drinking water, and the exposure pathway via ingestion of groundwater is therefore incomplete. The CSMs are presented on **Figures 7-2** through **7-5**.

7.2.3 AOI 3

PFOS was detected in groundwater at concentrations that did not exceed the SL. The ingestion exposure pathway is considered potentially complete for construction workers during trenching activities deep enough to encounter groundwater. No wells supplying potable water are present

within or downgradient of AOI 3 within the facility boundary; therefore, the residential exposure pathway via ingestion of groundwater is incomplete. The CSM is presented on **Figure 7-6**.

7.2.4 AOI 4

PFOA, PFOS, and PFBS were not detected in groundwater at AOI 4. Consequently, all groundwater exposure pathways are considered incomplete for human receptors. No wells supplying potable water are present within or downgradient of AOI 4 within the facility boundary. The CSM is presented on **Figure 7-7**.

7.2.5 AOI 5

Groundwater was not collected at AOI 5 because the overburden was dry; therefore, the groundwater exposure pathway was not evaluated for ingestion. The CSM is presented on **Figure 7-8**.

7.2.6 AOI 6

PFOA, PFOS, and PFBS were not detected in groundwater; therefore, the groundwater exposure pathway is considered incomplete for all human receptors. No wells supplying potable water are present within or downgradient of AOI 6 within the facility boundary. The CSM is presented on **Figure 7-9**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in surface water and sediment were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

The hydrogeologic CSM indicates that the majority of shallow groundwater at the FTIG AOIs flows toward and discharges into surface water drainage features within the facility boundaries. Eventually, these surface waters converge into water channels and exit the facility boundaries through Indiantown Run and Aires Run. These two water channels flow downgradient into two separate watersheds, where they eventually flow into the Swatara Creek, approximately 1 mile south of the facility boundary, where there are domestic and public supply wells. Approximately 10 miles downstream, the Pennsylvania American Water Company has a surface water intake within the Swatara Creek. The surface water and sediment exposure pathways for each AOI are presented on **Figures 7-1** through **7-9**.

7.3.1 Indiantown Run

PFOS was detected in surface water and sediment in Indiantown Run. PFOS was detected in surface water at the boundary of the Site. Based on the SI results, the ingestion pathway for surface water and sediment is potentially complete for the construction worker. The Indiantown Run is used for boating and fishing, and eventually flows to residential areas off the Site. Therefore, the ingestion pathway for surface water is potentially complete for off-site residents and recreational users.

7.3.2 Vesle Run

PFOA and PFOS were detected in surface water and PFOS was detected in surface sediment in Vesle Run. Based on the SI results, the ingestion pathway for surface water and sediment is potentially complete for the construction worker. Vesle Run is used for recreational purposes, including fishing. Vesle Run eventually flows into Indiantown Run before flowing off the facility

boundary; therefore, the ingestion pathway is potentially complete for off-site residents and recreational users.

7.3.3 Aires Run

PFOA, PFOS, and PFBS were detected in surface water, and PFOS was detected in surface sediment in Aires Run and at the boundary of the facility. Based on the SI results, the ingestion pathway for surface water and sediment is potentially complete for the construction worker. The Aires Run is used for fishing and eventually flows to residential areas off-facility; therefore, the ingestion pathway for surface water is potentially complete for off-site residents and recreational users.

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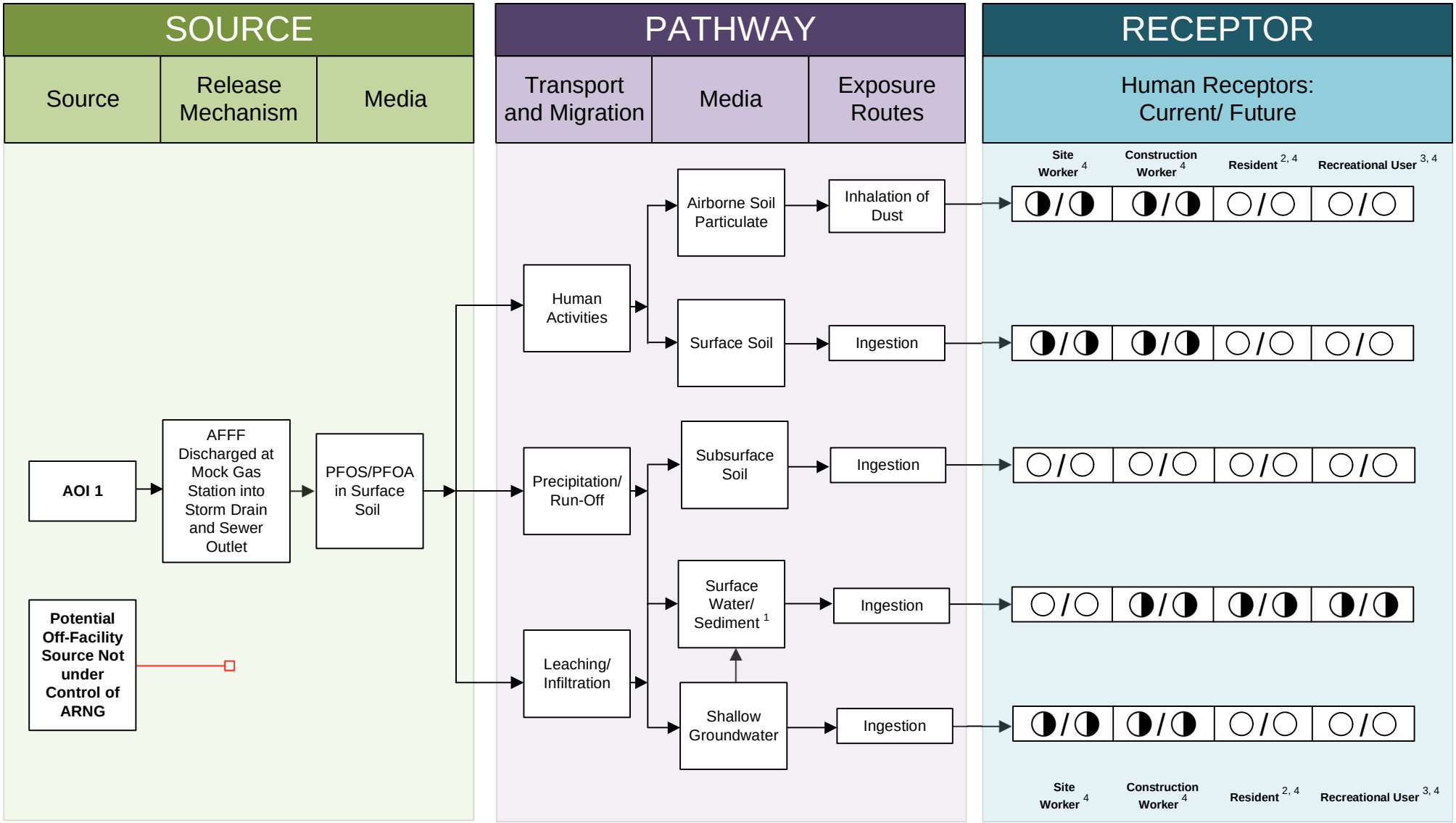


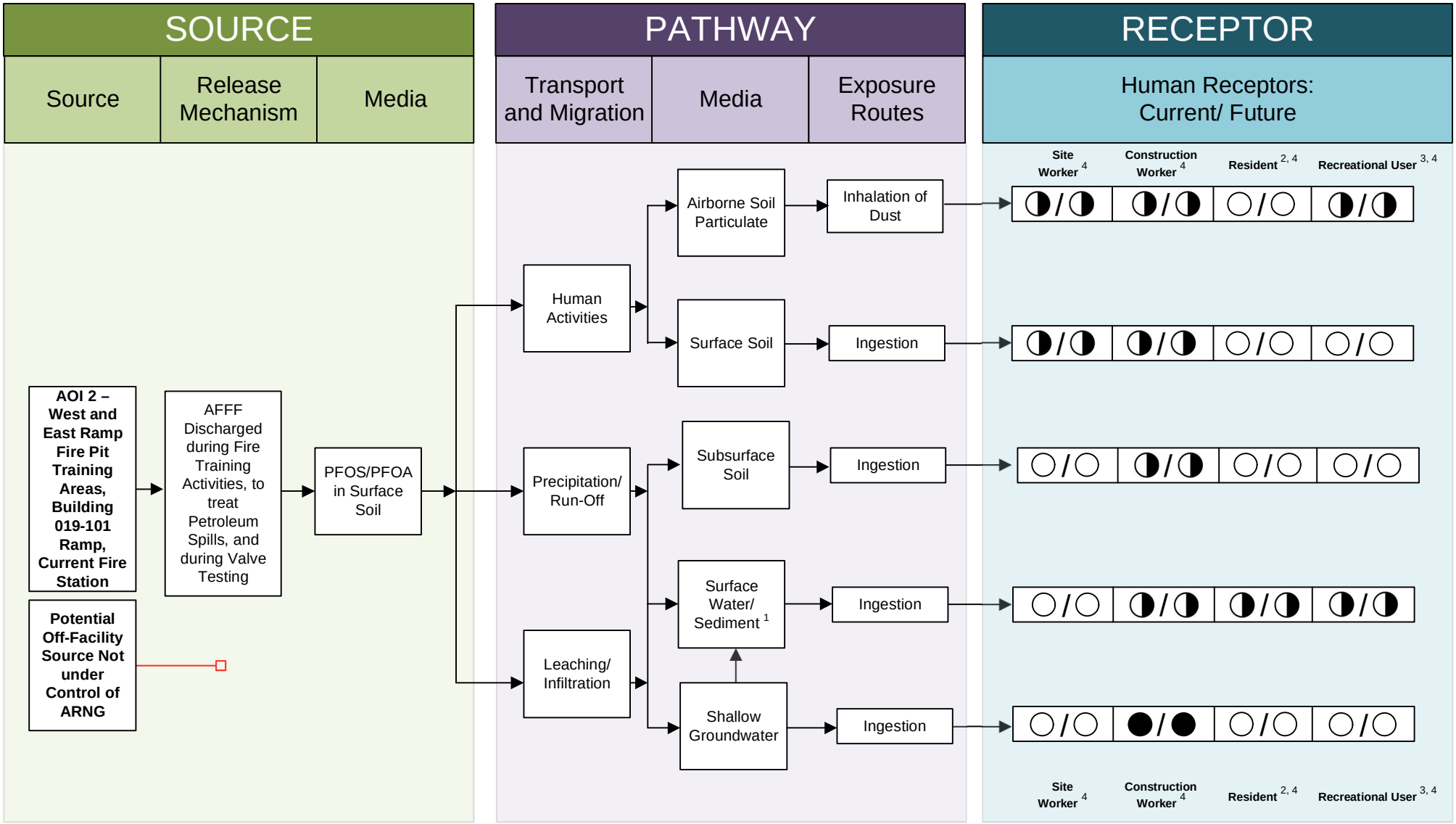
LEGEND

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

Notes:

1. Surface water/sediment data from the Indiantown Run.
2. The resident receptor refers to an off-site resident.
3. The recreational user receptor refers to both on-site and off-site users.
4. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model
AOI 1 Combined Arms Collective Training Facility



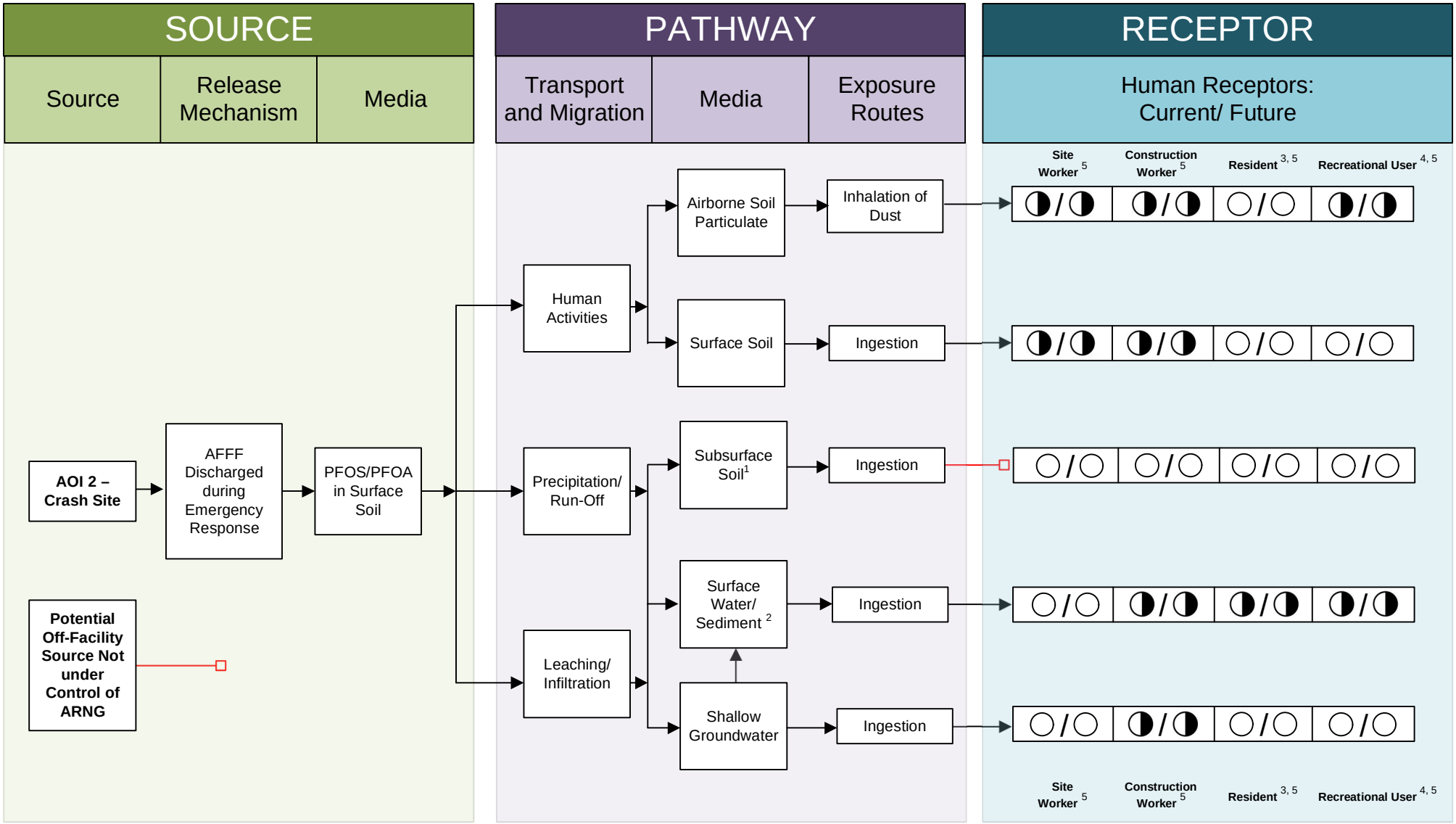
LEGEND

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

Notes:

1. Surface water/sediment data from the Vesle and Aires Runs.
2. The resident receptor refers to an off-site resident.
3. The recreational user receptor refers to both on-site and off-site users.
4. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-2
Conceptual Site Model
AOI 2 West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and Current Fire Station (Building 5-117)



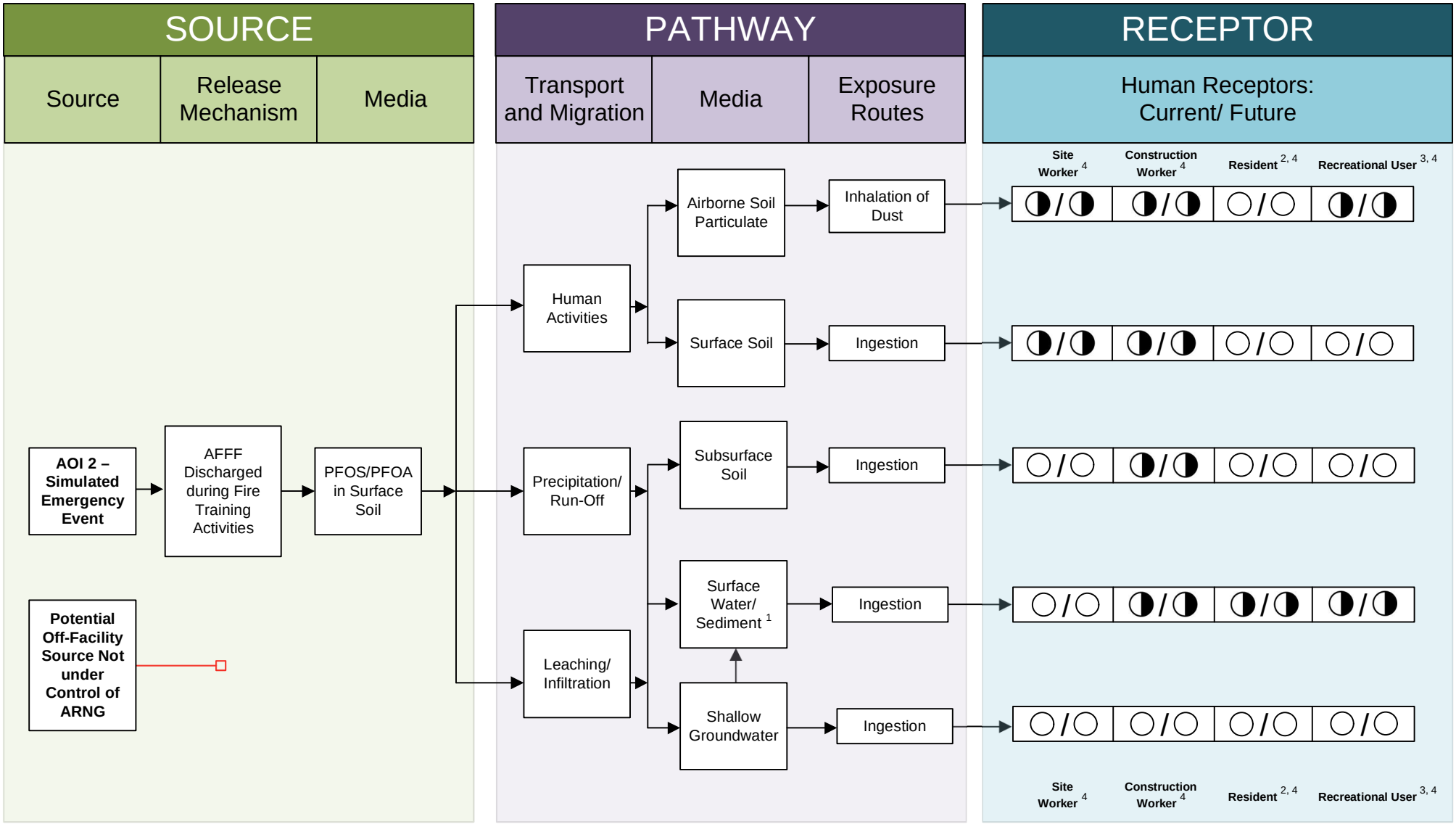
LEGEND

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

Notes:

1. No subsurface soil was sampled as bedrock was observed at 4 feet below ground surface.
2. Surface water/sediment data from the Vesle Run.
3. The resident receptor refers to an off-site resident.
4. The recreational user receptor refers to both on-site and off-site users.
5. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-3
Conceptual Site Model
AOI 2 Crash Site



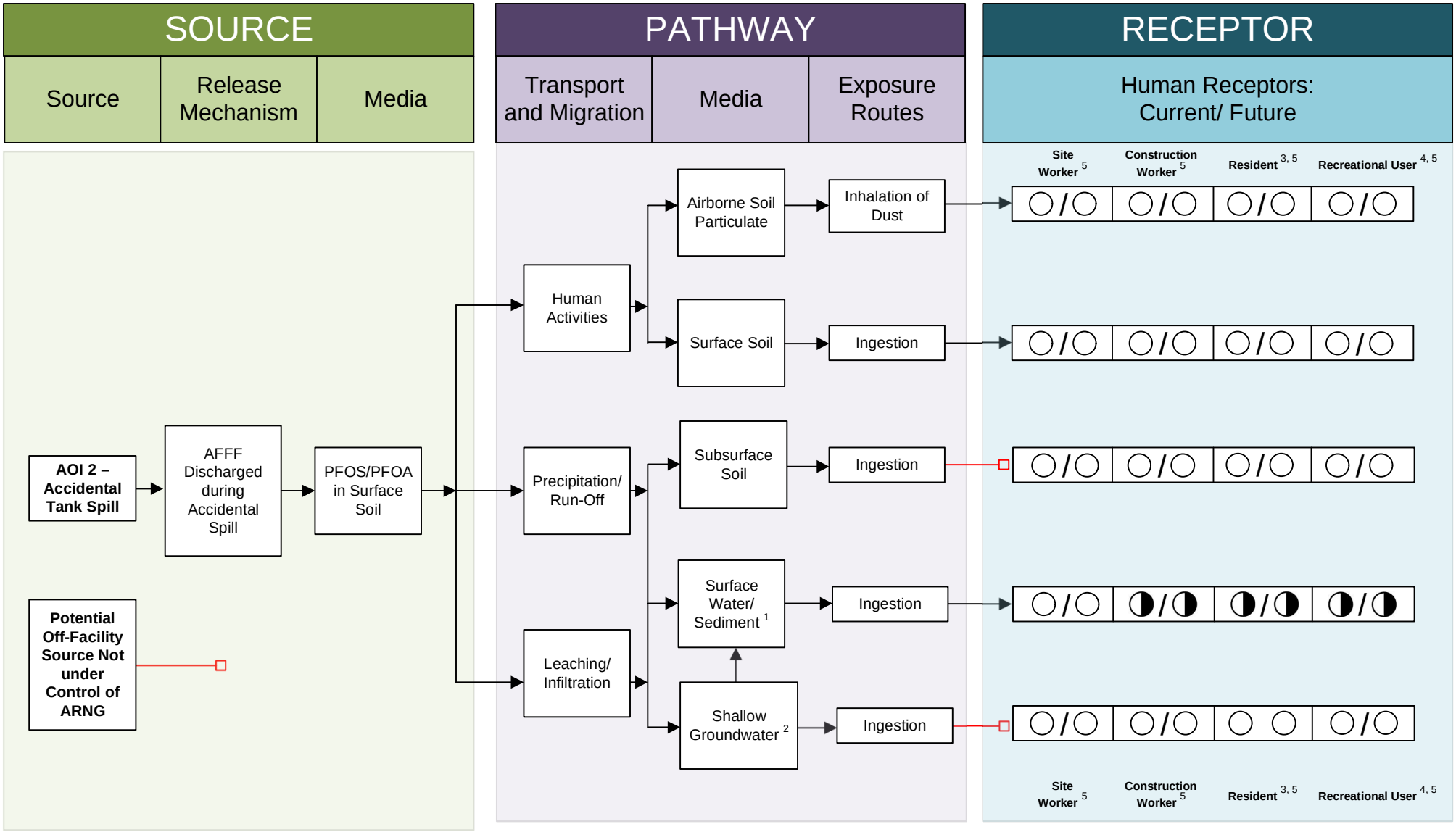
LEGEND

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

Notes:

1. Surface water/sediment data from the Vesle Run.
2. The resident receptor refers to an off-site resident.
3. The recreational user receptor refers to both on-site and off-site users.
4. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-4
Conceptual Site Model
AOI 2 Simulated Emergency Event



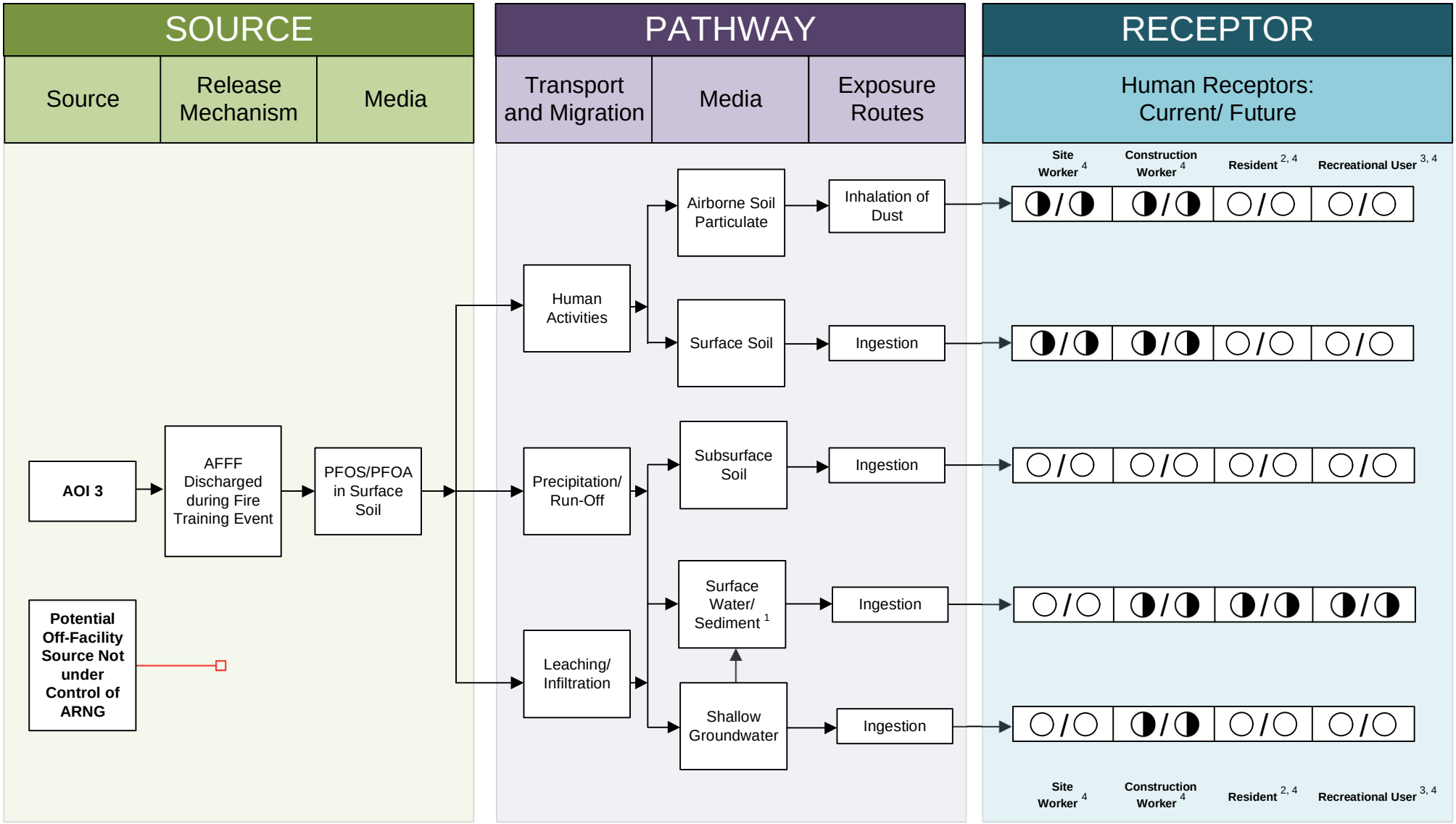
LEGEND

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

Notes:

1. Surface water/sediment data from the Vesle Run.
2. No groundwater was sampled at this location
3. The resident receptor refers to an off-site resident.
4. The recreational user receptor refers to both on-site and off-site users.
5. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-5
Conceptual Site Model
AOI 2 Accidental Tank Spill



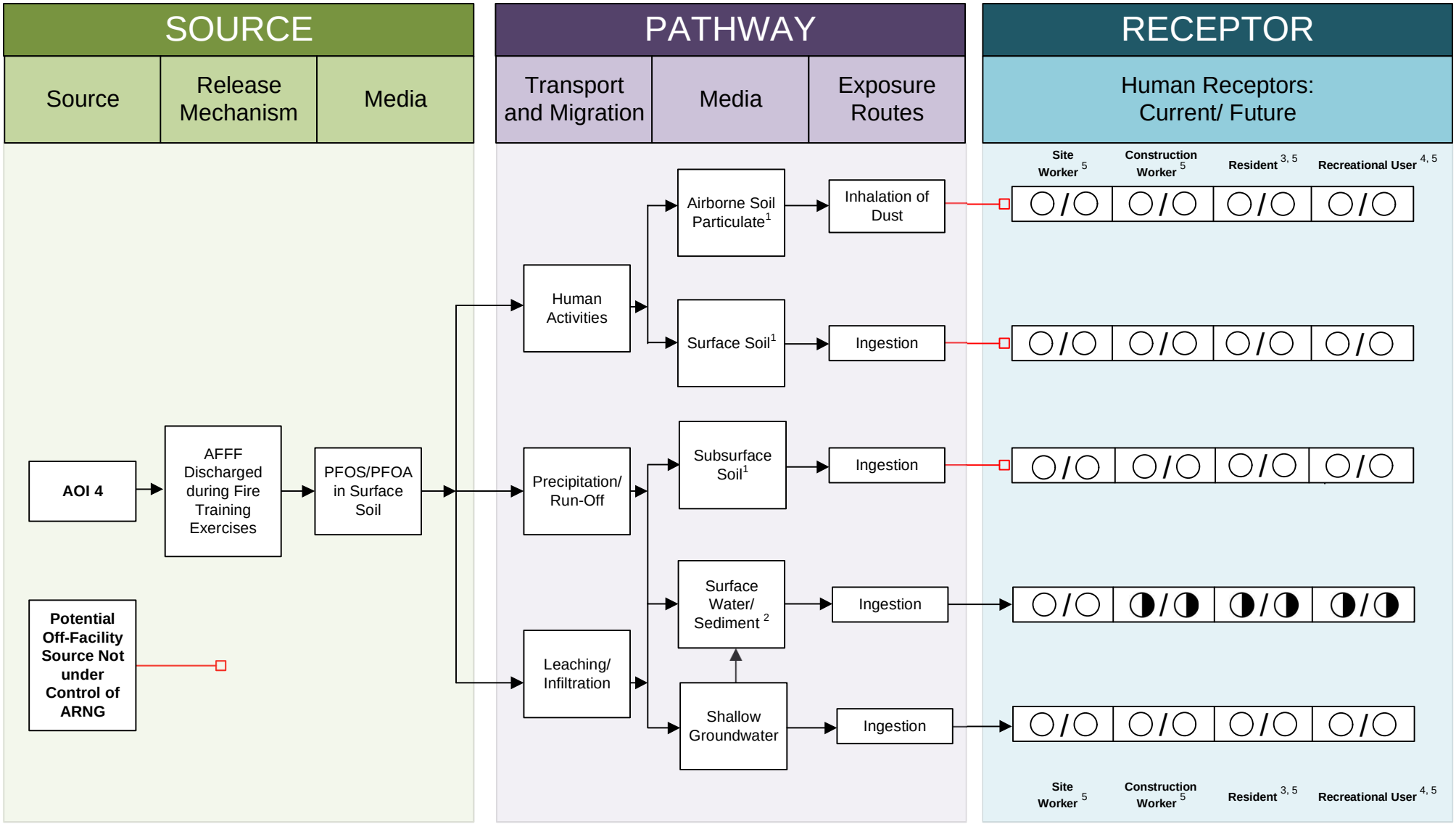
LEGEND

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

Notes:

1. Surface water/sediment data from the Aires Run.
2. The resident receptor refers to an off-site resident.
3. The recreational user receptor refers to both on-site and off-site users.
4. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-6
Conceptual Site Model
AOI 3 Johnson Trail



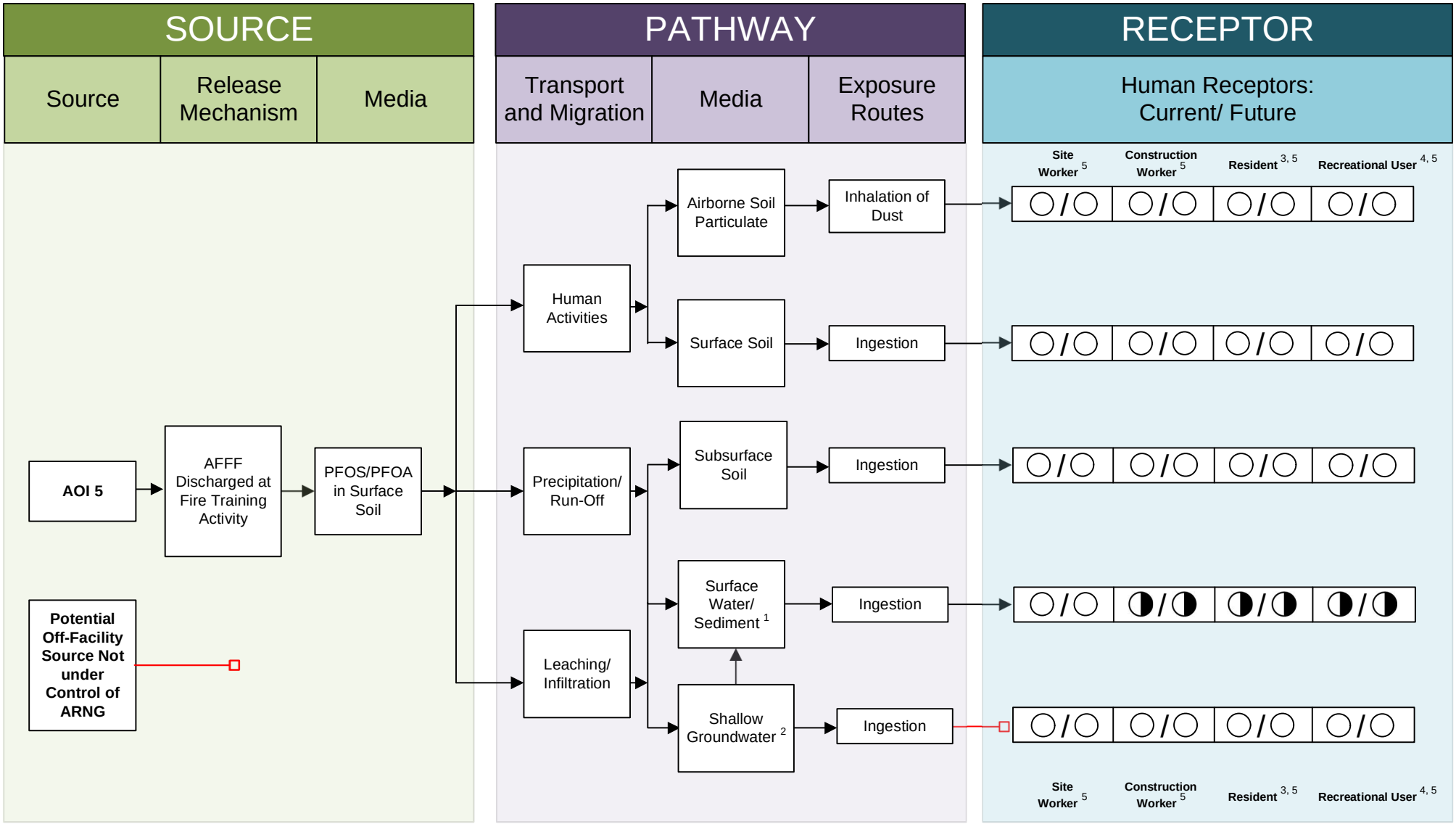
LEGEND

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

Notes:

1. Soil was not sampled because the surface soil was a gravel/fill and bedrock was encountered at 1.5 feet below ground surface.
2. Surface water/sediment data from the Aires Run.
3. The resident receptor refers to an off-site resident.
4. The recreational user receptor refers to both on-site and off-site users.
5. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-7
Conceptual Site Model
AOI 4 Fire Pit Area #19



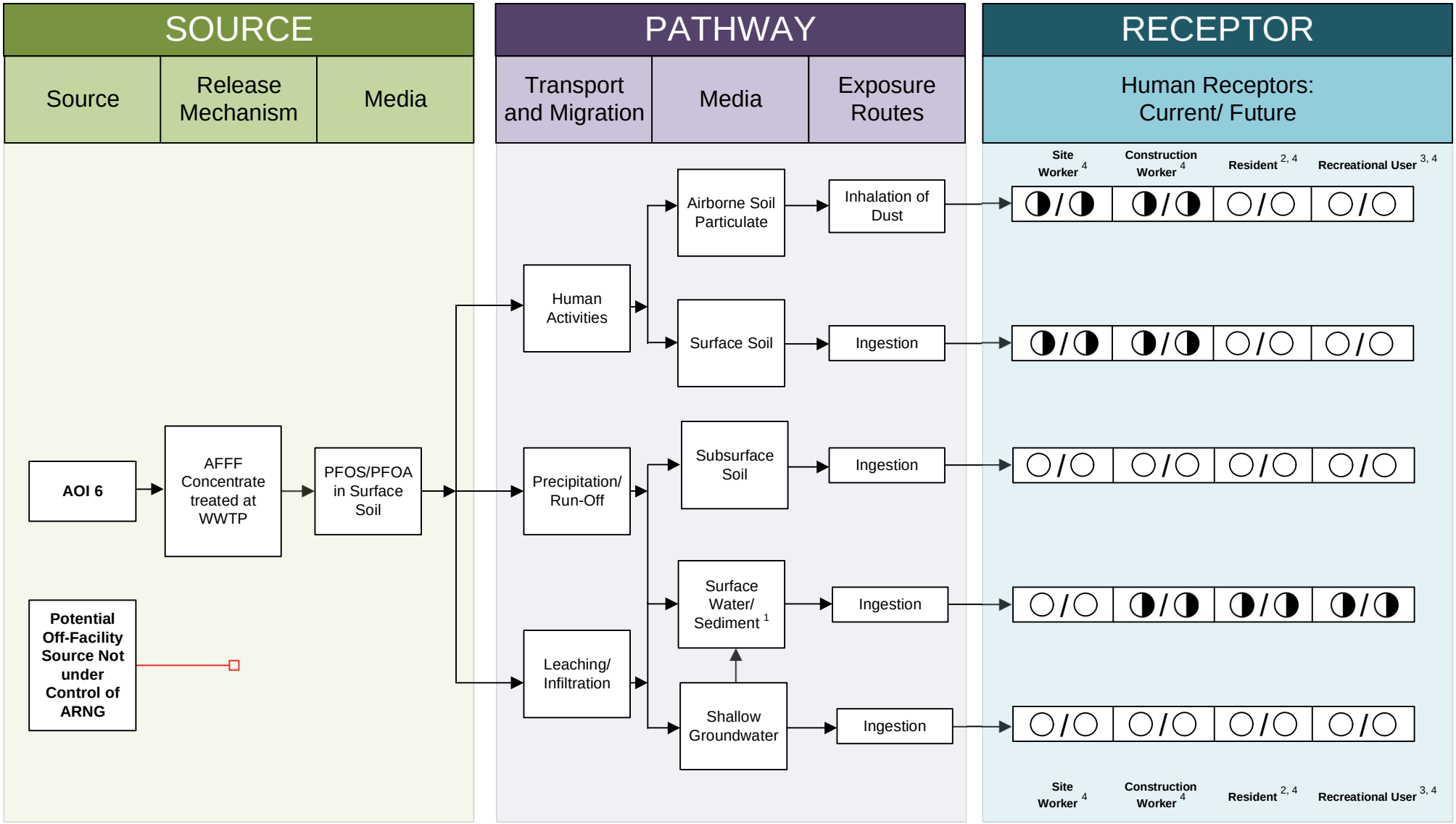
LEGEND

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

Notes:

1. Surface water/sediment data from the Aires Run.
2. Well was dry; no groundwater was sampled.
3. The resident receptor refers to an off-site resident.
4. The recreational user receptor refers to both on-site and off-site users.
5. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-8
Conceptual Site Model
AOI 5 First Street



LEGEND

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

Notes:

1. Surface water/sediment data from the Aires Run.
2. The resident receptor refers to an off-site resident.
3. The recreational user receptor refers to both on-site and off-site users.
4. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-9
Conceptual Site Model
AOI 6 Biosolid Area

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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 sampling was conducted from 28 May 2019 to 20 June 2019. The SI field sampling included soil, groundwater, surface water, and sediment. Sampling was conducted in accordance with the QAPP Addendum (AECOM, 2019), except as previously noted in **Section 5.9**.

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2019), samples were collected and analyzed for a subset of 18 PFAS via LC/MS/MS compliant with DoD QSM 5.1 Table B-15 as follows:

- 35 soil grab samples from 28 boring locations;
- 23 groundwater grab samples from 19 temporary well locations and four existing permanent monitoring well locations; and
- 12 sediment and 12 surface water samples.

The information gathered during this investigation was used to determine if PFOA, PFOS, and/or PFBS were present at or above SLs. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure to PFAS at the AOIs, which are described in **Section 7**.

8.2 SI Goals Evaluation

As described in **Section 4.2**, the SI activities were designed to achieve six main goals or DQOs. This section describes the SI goals and the conclusions that can be made for each based on the data collected during this investigation.

1) *Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs.*

PFOA, PFOS, and PFBS were detected at the Site in soil, groundwater, and surface water. PFOS was detected in the sediment. PFOA and PFOS in groundwater at AOI 2 exceeded the SLs of 40 ng/L, with maximum concentrations of 44 ng/L and 280 ng/L, respectively. The exceedances of the SLs in groundwater at AOI 2 occurred at the following source areas: West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and the Current Fire Station.

PFOA and PFOS were detected in groundwater at AOI 1: Combined Arms Collective Training Facility at concentrations below the SLs. PFOS was detected in groundwater at AOI 2: Crash Site and AOI 3 in concentrations below the SLs. Additionally, no groundwater samples were collected at AOI 2: Accidental Tank Spill. PFOA, PFOS, and PFBS were not detected in groundwater at AOI 2: Simulated Emergency Event, AOI 4, and AOI 6. Groundwater at AOI 2: Accidental Tank Spill and AOI 5 was not sampled. The detected concentrations of PFOA, PFOS and PFBS in soil samples from all AOIs were below the SLs.

2) *Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.*

Eight potential release areas were removed from further consideration based on the groundwater and soil data collected during the SI. These release areas include: CACTF in AOI 1, Accidental Tank Spill, Simulated Emergency Event, and Crash Site in AOI 2, Johnson Trail in AOI 3, Fire Pit

Area #19 in AOI 4, First Street in AOI 5, and Biosolid Area in AOI 6. PFOA, PFOA, and PFBS were not detected in groundwater and/ or soil above the SLs in any of these areas; therefore, these areas pose no significant threat to human health or the environment.

3) Determine the potential need for a removal action.

Based on the data collected during this SI, there is a potentially complete pathway between source and receptor; however, groundwater at this location is not used as drinking water, and no removal action is justified.

4) Collect data to better characterize release areas for more effective and rapid initiation of a RI.

A USGS model and groundwater gauging conducted during the SI in June 2019 (**Figure 2-5**) document that shallow groundwater flow is in the direction of adjacent surface water bodies. Streams throughout the facility are gaining, even during dry periods, indicating that shallow groundwater primarily discharges to surface water streams over much of FTIG (USGS, 2010).

A north to south groundwater divide was observed running through AOI 2 at the Building 019-101 Ramp, with groundwater generally flowing either east or west (**Figure 2-5**). This groundwater divide plays a crucial role in the fate and transport of PFAS at FTIG.

No PFOA or PFOS were detected in FTIG boundary wells downgradient of AOI 2 (FTIG-Boundary-GW1, FTIG-Boundary-GW2, and FTIG-Boundary-GW5). PFOS and PFOA were detected at FTIG-Boundary-GW3 and FTIG-Boundary-GW4 at concentrations below the SLs.

5) Identify within 4 miles of the facility other potential PFAS sources (fire stations, major manufacturers, other DoD facilities) and receptors, including both groundwater and surface water receptors, to determine whether the ARNG is the likely source of PFAS, or whether there is an off-facility source of PFAS responsible for facility detections of PFAS (USEPA, 2005).

Based upon the qualitative evaluation of soil results in combination with quantitative groundwater results and groundwater flow direction analysis, the source of PFAS contamination at FTIG is likely the result of historical DoD activities. No potential offsite PFAS source areas have been identified during the SI.

6) Determine whether a potentially complete pathway exists between the source and potential receptors and whether ARNG is the likely source of the contamination.

Detections of PFOA, PFOS, and PFBS in soil, groundwater at source areas, and in surface water and sediment downgradient of the source areas indicate there is a potentially complete pathway between source and receptor.

8.3 Outcome

Based on the CSM developed and revised based on SI findings, there is no current exposure to residential drinking water receptors from sources at the facility from AFFF releases attributable to ARNG activities. Sample chemical analytical concentrations collected during this SI were compared against the SLs for PFOS, PFOA, and PFBS in soil and groundwater, as described in **Table 6-1**. The following bullets summarize the SI results:

- PFOA and PFOS were detected in groundwater at AOI 1: Combined Arms Collective Training Facility, at concentrations below the SLs. Based on the results of the SI, further evaluation of AOI 1 is not warranted in the RI.
- PFOA and PFOS in groundwater at AOI 2 exceeded the SLs of 40 ng/L, with maximum concentrations of 44 ng/L and 280 ng/L, respectively. Concentrations in groundwater exceeded the SLs at AOI 2: West Ramp Fire Pit Training Area, East Ramp Fire Pit Training

Area, Building 019-101 Ramp, and the Current Fire Station. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

- PFOS was detected in groundwater at AOI 2: Crash Site in concentrations below the SLs. PFOA, PFOS, and PFBS were not detected in groundwater at AOI 2: Simulated Emergency Event. Additionally, no groundwater samples were collected at AOI 2: Accidental Tank Spill. Based on the results of the SI, further evaluation of these source areas is not warranted in the RI.
- PFOS was detected in groundwater at AOI 3: Johnson Trail, at concentrations below the SLs. Based on the results of the SI, further evaluation of AOI 3 is not warranted in the RI.
- PFOA, PFOS, and PFBS were not detected in groundwater at AOI 4: Fire Pit Area #19 and AOI 6: Biosolid Area. Groundwater at AOI 5: First Street was not sampled. Based on the results of the SI, further evaluation of these AOIs is not warranted in the RI.
- The detected concentrations of PFOA, PFOS, and PFBS in soil samples from all AOIs were below the SLs. PFOA, PFOS, and PFBS were not detected in AOI 5 and soil samples were not collected at AOI 4.

Table 8-1 summarizes the SI results for soil and groundwater. Based on the CSMs developed and revised in light of the SI findings, there is no potential for exposure to residential drinking receptors caused by DoD activities at or adjacent to the facility.

Table 8-2 summarizes the rationale used to determine if the AOI should be considered for further action under CERCLA and undergo an RI. Based on the findings of this SI, it is recommended that this facility proceed to an RI and, further evaluation is warranted in the RI for AOI 2: West Ramp Fire Pit Training Area, East Ramp Fire Pit Training Area, Building 019-101 Ramp, and Current Fire Station.

Table 8-1: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area
1	Combined Arms Collective Training Facility	◐	◐
2	West Ramp Fire Pit Training Area	◐	●
2	East Ramp Fire Pit Training Area	◐	●
2	Building 019-101 Ramp	◐	●
2	Current Fire Station (Building 5-117)	◐	●
2	Crash Site	◐	◐
2	Simulated Emergency Event	◐	○
2	Accidental Tank Spill	○	N/A
3	Johnson Trail	◐	◐
4	Fire Pit Area #19	N/A	○
5	First Street	○	N/A
6	Biosolid Area	◐	○

Legend:

N/A = Not applicable

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

Table 8-2: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Combined Arms Collective Training Facility	Detections in groundwater but no exceedances of SLs. No exceedances of SLs in soil.	No further action
2	West Ramp Fire Pit Training Areas	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	East Ramp Fire Pit Training Area	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Building 019-101 Ramp	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Current Fire Station (Building 5-117)	Exceedances of SLs in groundwater but no exceedances of SLs in soil.	Proceed to RI
2	Crash Site	Detections in groundwater but no exceedances in SLs. No exceedances of SLs in soil.	No further action
2	Simulated Emergency Event	No detections in groundwater at the source area. No exceedances of SLs in soil.	No further action
2	Accidental Tank Spill	No groundwater samples were collected. No detections in soil.	No further action
3	Johnson Trail	Detections in groundwater but no exceedances in SLs. No exceedances of SLs in soil.	No further action
4	Fire Pit Area #19	No detections in groundwater at the source area. No soil samples were collected.	No further action
5	First Street	No groundwater samples were collected. No detections in soil.	No further action
6	Biosolid Area	No detections in groundwater at the source area. No exceedances of SLs in soil.	No further action

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