FINAL
Preliminary Assessment Report
Camp Edwards
Joint Base Cape Cod, Massachusetts

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

November 2020

Prepared for:

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

UNCLASSIFIED

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Acronyms and Abbreviations

°F	degrees Fahrenheit
µg/L	micrograms per liter
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFCEC	Air Force Civil Engineer Center
AFFF	aqueous film forming foam
amsl	above mean sea level
ANG	Air National Guard
AOI	area of interest
ARNG	Army National Guard
bgs	below ground surface
CAFS	compressed air foam fire suppression
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
ft	feet
ft/day	feet per day
FTA	fire training area
FTA-1	Former Fire Training Area #1
GAC	granular activated carbon
GIS	Geographic Information System
HA	Health Advisory
IAGWSP	Impact Area Groundwater Study Program
IRP	Installation Restoration Program
JBCC	Joint Base Cape Cod
LF-1	Landfill #1
HA	Health Advisory
IRP	Installation Restoration Program
MAARNG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection

MMR	Massachusetts Military Reservation
NGB	National Guard Bureau
NGWA	National Ground Water Association
NOAA	National Oceanic and Atmospheric Administration
OB/OD	Open Burn Open Detonation
OWS	oil-water separator
PA	Preliminary Assessment
PAVE-PAWS	Precision Acquisition Vehicle Entry – Phased Array Warning System
PFAS	per- and poly-fluoroalkyl substance(s)
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
RI	remedial investigation
SDWA	Safe Drinking Water Act
SI	site inspection
U.S.	United States
UCMR3	Unregulated Contaminant Monitoring Rule 3
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
WR	wash rack
WWTP	waste water treatment plant

Executive Summary

The Army National Guard (ARNG) is performing *Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) Impacted Sites at ARNG Facilities Nationwide*. A PA for per- and polyfluoroalkyl substances (PFAS)-containing materials was completed for Camp Edwards, located on Joint Base Cape Cod (JBCC), Massachusetts. The goal of the PA is to ensure that any potential PFAS release areas and exposure pathways to receptors are appropriately addressed.

The Joint Base Cape Cod (JBCC) is a 22,000-acre military training facility home to three Department of Defense (DoD) Agencies and one Homeland Security Agency: Cape Cod Air Force Station (United States [U.S.] Air Force), Otis Air National Guard Base (Air National Guard), Camp Edwards (Army National Guard) and the U.S. Coast Guard Air Station Cape Cod, respectfully.

In 1989, the installation was listed on the National Priority List (NPL) as a superfund site. There are two separate environmental cleanup programs still active at JBCC. The U.S. Air Force Civil Engineer Center (AFCEC) manages the Installation Restoration Program (IRP) for both the Army and the Air Force, using environmental restoration funds from both Army and Air Force accounts. In 1996, the Army National Guard Bureau (NGB) established the Impact Area Groundwater Study Program (IAGWSP) to examine the impacts of military training and defense contractor testing activities at the installation on the environment, specifically the groundwater. The IRP cleanup is regulated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the IAGWSP cleanup is regulated under the Safe Drinking Water Act (SDWA). The IAGWSP and AFCEC closely coordinate all activities to ensure, to the extent possible, the programs take a common approach on technical issues, management processes and interaction with the regulators, the public and other stakeholders.

Any potential future actions related to sites identified under this PA will be addressed by these established cleanup programs at JBCC.

Potential release areas identified on JBCC and the contiguous area surrounding Camp Edwards are described in this PA as adjacent sources along with other adjacent sources outside of the JBCC facility.

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and public records to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, and environmental compliance actions in the area surrounding the facility;
- AECOM conducted a site visit on 13 September 2018 and completed visual site inspections at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Collaborative interviews have been conducted with current Camp Edwards personnel for the impact area groundwater study program, AFCEC personnel, and ARNG environmental managers and operations staff;
- Identified Area(s) of Interest (AOIs) and developed a preliminary conceptual site model (CSM) to summarize potential source-pathway-receptor linkages of potential PFAS in soil, groundwater, surface water, and sediment for each AOI.

Six AOIs related to a PFAS release were identified at Camp Edwards during the PA. The AOIs are shown on **Figure ES-1** and **Figure ES-2** and are described below:

Table ES-1. Camp Edwards Areas of Interest

Area of Interest	Name	Used By	Potential Release Dates
AOI 1	Hangar 2816 and Building 2814	MAARNG	1970s to 2013
AOI 2	Landfill #1 (LF-1)	JBCC	1970s to 1984
AOI 3	Wastewater Treatment Plant (WWTP) Sand Infiltration Beds	JBCC	1995 to Present
AOI 4	Fire Station Building 3132 and Drainage Ditch #1	JBCC	Ongoing; 25 March 2015 and other unspecified release dates
AOI 5	Utilidor Fire	MAARNG	Late 1980s
AOI 6	Open Burn Open Detonation (OB/OD) Sites (J1, J2, J3, and Demolition Area 1)	MAARNG and a Department of Defense Contractor	Mid-1970s to late 1980s

The AFCEC IRP is performing ongoing PFAS-related activities at AOI 1 through AOI 5; future actions at these AOIs will continue to be managed by the AFCEC IRP. Any future investigations related to PFAS at AOI 6 will be managed by the IAGWSP.

Based on documented and potential PFAS releases at these AOIs, there is potential for exposure to PFAS contamination in media at or near the facility. Actual and potential off-facility aqueous film forming foam (AFFF) releases exist in the area, which have a potential effect on Camp Edwards. The preliminary CSM for Camp Edwards's AOIs is shown on **Figure ES-3**.

CLIENT	ARNG			
PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA			
REVISED	7/21/2020	GIS BY	MS	7/21/2020
SCALE	1:14,400	CHK BY	DC	7/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	7/21/2020

- Area of Interest
- Potential PFAS Release
- JBCC Facility Boundary
- Water Body
- Wetland

N

Camp Edwards North Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure ES-1

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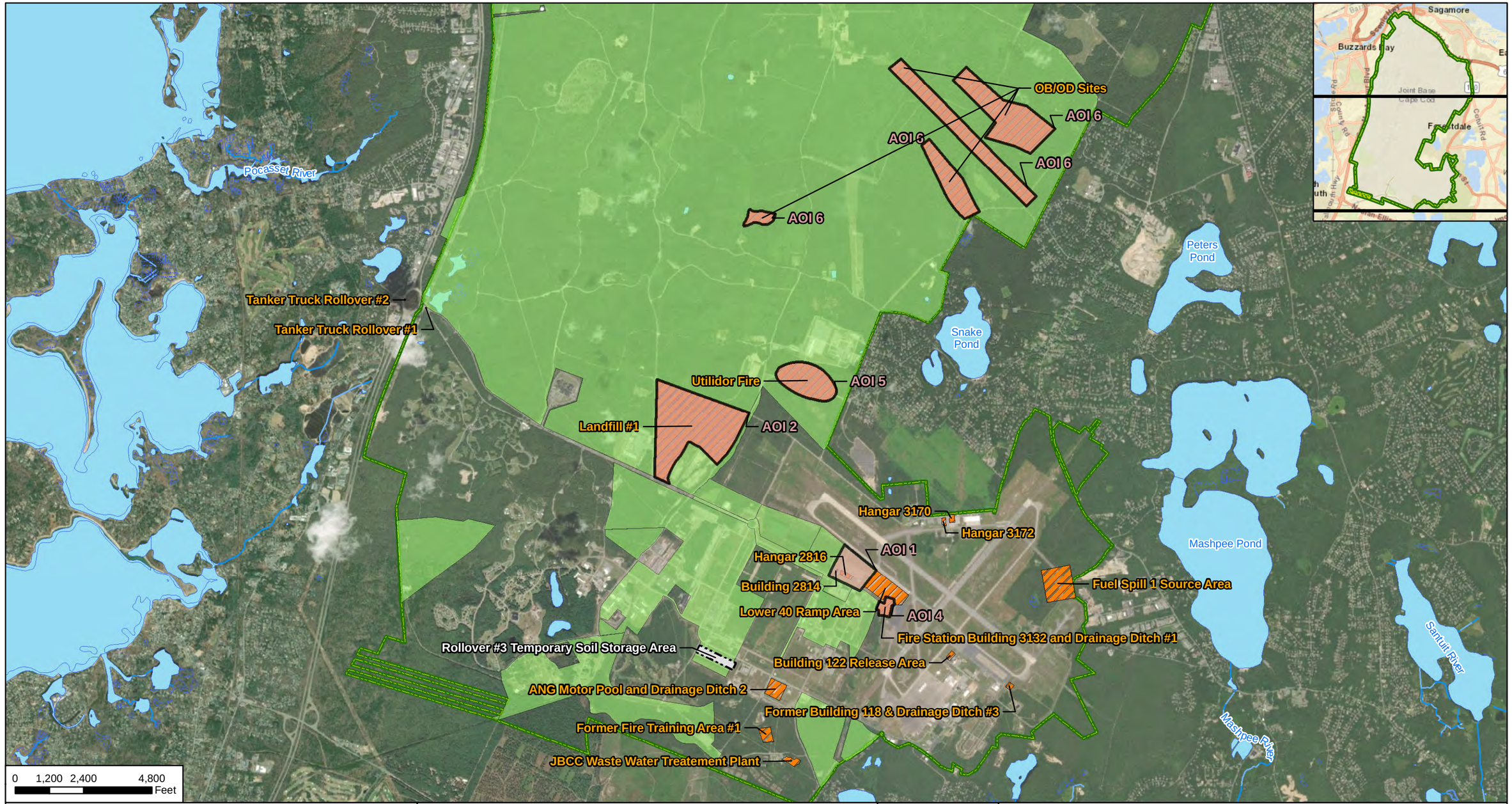

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PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA			
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SCALE	1:40,800	CHK BY	DC	9/25/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	9/25/2020

- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Camp Edwards
- JBCC Facility Boundary
- Water Body
- Wetland
- River/Stream
- Canal/Ditch

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Camp Edwards South Summary of Findings

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Figure ES-2

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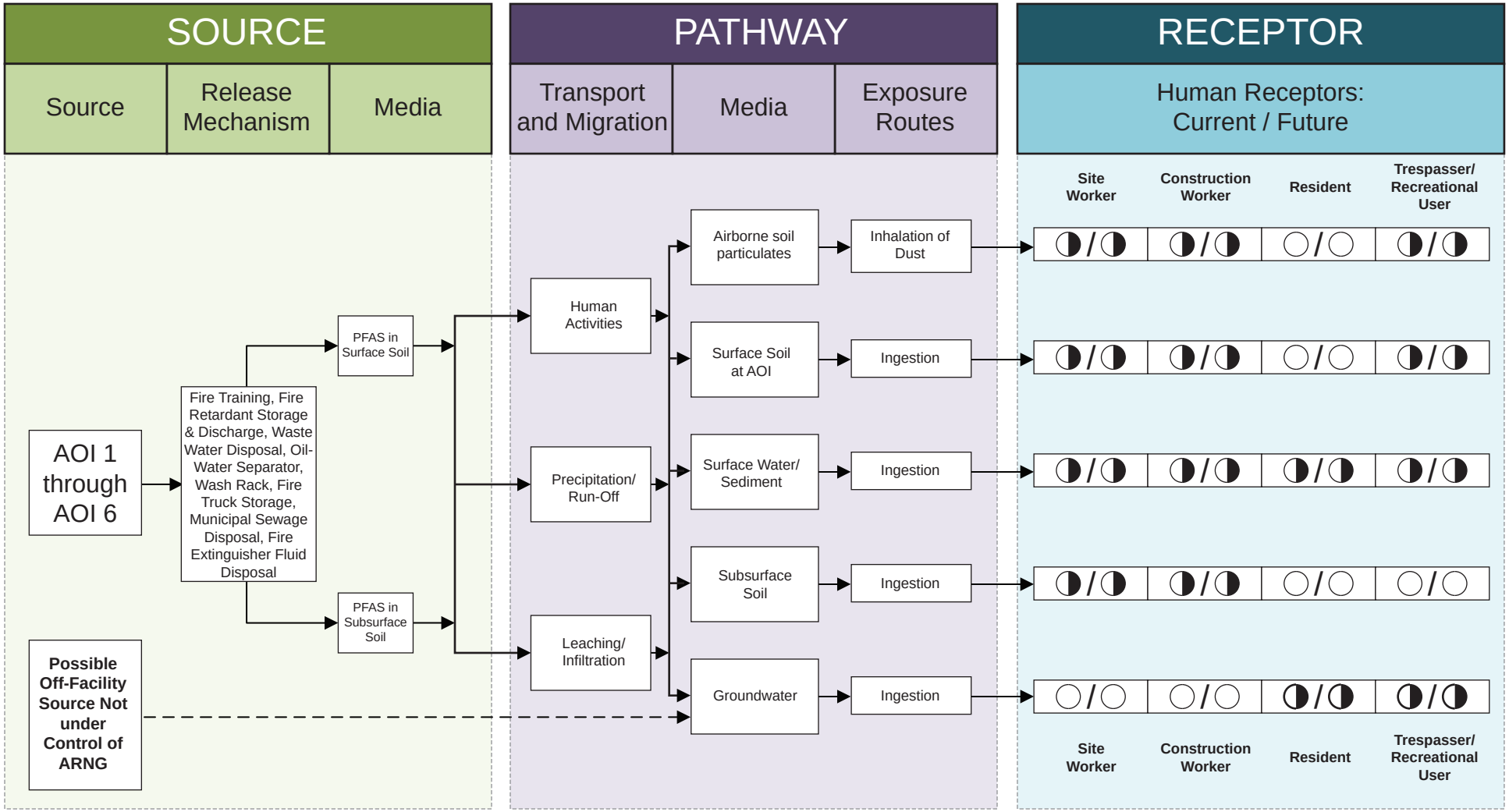


LEGEND

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

Figure ES-3

Preliminary Conceptual Site Model
Camp Edwards - Summary

1. Introduction

1.1 Authority and Purpose

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 at ARNG Facilities Nationwide*. This work is supported by the United States (U.S.) 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 is assessing potential effects on human health related to processes at facilities that used per- and poly-fluoroalkyl substances (PFAS), primarily in the form of aqueous film forming foam (AFFF) released as part of firefighting activities, although other PFAS sources are possible. In addition, the ARNG is assessing businesses or operations adjacent to the ARNG facility (not under the control of ARNG) that could potentially be responsible for a PFAS release.

PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. PFAS formulations contain highly diverse mixtures of compounds. Thus, the fate of PFAS in the environment varies. The regulatory framework at both federal and state levels continues to evolve. The U.S. Environmental Protection Agency (USEPA) issued Lifetime Drinking Water Health Advisories (HAs) for PFOA and PFOS in May 2016, but there are currently no promulgated national standards regulating PFAS in drinking water. The HA is 0.07 micrograms per liter (µg/L) for PFOS and PFOA, individually or combined.

This report presents findings of a PA for PFAS-containing materials at Camp Edwards, located on Joint Base Cape Cod (JBCC), Massachusetts, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300), and Army requirements and guidance.

This PA documents the known release areas as well as other locations where PFAS may have been released into the environment at Camp Edwards. The term PFAS will be used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA and PFOS, which are key components of AFFF.

1.2 Preliminary Assessment Methods

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and public records to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, and environmental compliance actions in the area surrounding the facility;
- AECOM conducted a site visit on 13 September 2018 and completed visual site inspections at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Collaborative interviews have been conducted with current Camp Edwards personnel for the impact area groundwater study program, U.S. Air Force Civil Engineer Center (AFCEC) personnel, and ARNG environmental managers and operations staff;

- Identified Area(s) of Interest (AOIs) and developed a preliminary conceptual site model (CSM) to summarize potential source-pathway-receptor linkages of potential PFAS in soil, groundwater, surface water, and sediment for each AOI.

1.3 Report Organization

This report has been prepared in accordance with the USEPA *Guidance for Performing Preliminary Assessments under CERCLA* (USEPA, 1991). The report sections and descriptions of each are:

- **Section 1 – Introduction:** identifies the project purpose and authority and describes the facility location, environmental setting, and methods used to complete the PA
- **Section 2 – Fire Training Areas:** describes the fire training areas (FTAs) at the facility identified during the site visit
- **Section 3 – Non-Fire Training Areas:** describes other locations of potential PFAS releases at the facility identified during the site visit
- **Section 4 – Emergency Response Areas:** describes areas of potential PFAS release at the facility, specifically in response to emergency situations
- **Section 5 – Adjacent Sources:** describes sources of potential PFAS release adjacent to the facility that are not under the control of ARNG
- **Section 6 – Preliminary Conceptual Site Model:** describes the pathways of PFAS transport and receptors for the AOIs and the facility
- **Section 7 – Conclusions:** summarizes the data findings and presents the conclusions of the PA
- **Section 8 – References:** provides the references used to develop this document
- **Appendix A –** Data Resources
- **Appendix B –** Preliminary Assessment Documentation
- **Appendix C –** Photographic Log

1.4 Facility Location and Description

Camp Edwards is located on JBCC (**Figure 1-1**) in Barnstable County, Massachusetts, approximately 60 miles south of Boston. The facility is located in the upper portion of Cape Cod, with Cape Cod Bay to the north, Nantucket Sound to the south, and Buzzards Bay to the west. The Cape Cod Canal connects Cape Cod Bay and Buzzards Bay to the north of JBCC. The northeastern corner of JBCC is adjacent to the Shawme-Crowell State Forest, and the south and southwest portions of JBCC are bounded by the Frances Crane Wildlife Management Area, the Ashumet Pond Sanctuary, and the Johns Pond Park Conservation Area.

JBCC occupies approximately 22,000 acres (34 square miles) within the towns of Bourne, Falmouth, Mashpee, and Sandwich, and is divided into two distinct areas: the Training Range and Impact Area and the Cantonment Area. Camp Edwards occupies 14,433 acres within the Training Range and Impact Area, which consists of 22 maneuver training areas, Chemical Spill 10 (Former BOMARC Site), small arms ranges, and the impact area and its buffers. The remainder of the Training Range and Impact Area is occupied by the U.S. Coast Guard (USCG) Transmitter Site, the U.S. Air Force (USAF) Precision Acquisition Vehicle Entry – Phased Array Warning System (PAVE-PAWS) Radar Site, former Landfill #1 (LF-1), Barnstable County Correctional Facility, two former demolition areas, the former Otis Fish and Game Club, the Upper Cape Regional Water

Cooperative, a wastewater infiltration bed, and various utility easements (Massachusetts ARNG [MAARNG], 2009).

Camp Edwards occupies 697 acres of the Cantonment Area, making up 12 percent of the total Cantonment Area. The Camp Edwards facilities within the Cantonment Area include ARNG Training Support Facilities, ARNG Aviation (helicopter) Facilities, the Regional Training Institute, Bachelor Officer's Quarters, Billeting (housing assignment office), and grassland management areas. The remainder of the Cantonment Area is occupied by Otis Air National Guard (ANG) Base, USCG Air Station Cape Cod, Veteran's Affairs National Cemetery, Bourne School System, a portion of the Crane Wildlife Management Area, and the remainder of the grassland management area (MAARNG, 2009).

1.5 Facility Environmental Setting

Camp Edwards is located in the northwestern portion of Cape Cod, between Buzzards Bay and Cape Cod Bay. The elevation of the facility is approximately 125 feet (ft) above mean sea level (amsl). The terrain is gently sloping to the south, with hummocky topography characterized by rolling hills and deep kettle holes with slopes ranging from 0 to 15 percent. The highest point on Cape Cod, Pine Hill (318 ft amsl), is located in the western part of Camp Edwards (AFCEC, 2017).

1.5.1 Geology

JBCC is located in the Seaboard Lowlands section of the New England Physiographic Province in the Appalachian Highlands physiographic region. The Seaboard Lowlands represent the areas that were submerged by the ocean and large proglacial lakes during the Late Wisconsinan glacial retreat (Stone and Borns, 1986).

Camp Edwards is situated on the Wisconsinan-age glacial deposits of Cape Cod, as shown on **Figure 1-2**. The northern and western portions of Camp Edwards are occupied by the Sandwich and Buzzards Bay moraines. These two glaciotectonic moraines are composed of ablation till, with unsorted material ranging from boulders to clay overlying reworked basal till; these moraines are approximately 100 ft thick. The remainder of Camp Edwards is located on the Mashpee pitted outwash plain, consisting of sandy sediments that were deposited in a delta that prograded to the southeast (Fitts, 2013). Foreset beds are composed of coarser sand, gravel, and cobble sediments, whereas bottomset beds are composed of fine sand and silt. The thickness of the Mashpee pitted outwash plain ranges from approximately 175 ft in the northwest to approximately 250 ft near Nantucket Sound in the south. The moraine and outwash deposits overlie fine-grained proglacial lake and ground moraine deposits composed of dense silt and clay (Fitts, 2013). The outwash plain also contains many glacial collapse structures formed from the melting of buried blocks of remnant glacial ice that form topographic depressions that commonly contain kettle-hole ponds (Walter et al., 2002).

1.5.2 Hydrogeology

Camp Edwards is located over the Sagamore Lens of the Upper Cape Cod Aquifer, which has been designated a sole source aquifer by the USEPA (MAARNG, 2009). This aquifer is unconfined, with areal recharge from precipitation as the sole source of water to the aquifer. The lateral boundaries of the aquifer are saltwater from Buzzards Bay, Cape Cod Bay, and Nantucket Sound, and the vertical boundary is formed by the impermeable bedrock below the aquifer. Groundwater flow is radial from a water-table mound located in the eastern portion of Camp Edwards, to the north of Snake Pond, where the maximum hydraulic-head altitude is approximately 70 ft amsl (Walter et al., 2002). Depths to the water table are typically 0-100 ft below ground surface (bgs). Groundwater at Camp Edwards generally flows to the south in the

southern portion, to the west in the western portion, and to the north in the northern portion (**Figure 1-2**).

Hydraulic conductivities in the aquifer range from 10 ft per day (ft/day) to 290 ft/day, with hydraulic conductivity generally decreasing with depth. The horizontal-to-vertical hydraulic conductivity ratios range from 3:1 in the outwash deposits up to 100:1 in the lacustrine deposits (Walter et al., 2002). The effective porosities of the aquifer generally range from 0.32 to 0.42.

Surface water bodies are generally hydraulically connected to groundwater (groundwater flow-through ponds), with groundwater flowing into the pond on the upgradient side and out of the pond on the downgradient side. As a result, groundwater gradients are usually highest near the shore of the pond (Walter et al., 2002).

Using additional resources, such as state and local Geographic Information System (GIS) databases, wells were researched to a 4-mile radius of the facility. Multiple community and non-community drinking water supply wells are located on and within a mile of the property and downgradient from the water table mound observed in the eastern portion of Camp Edwards (**Figure 1-2**). Community wells are defined as wells associated with public water systems that supply potable water to the same residential population year-round. Non-community wells are associated with public water systems designed to supply drinking water to locations that have their own water systems and that either support at least 25 people at least 6 months per year (non-transient; e.g., schools, factories, office buildings, hospitals), or that are not designed to support the same people for long periods of time (transient; e.g., service stations, campgrounds) (USEPA, 2017).

In 2014, drinking water samples were collected from eight wells on base and within one mile of Camp Edwards as part of the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR3) program. The purpose of the UCMR3 is to collect data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the Safe Drinking Water Act (SDWA). Collected drinking water samples were analyzed for various PFAS, including PFOS, PFOA, perfluorononanoic acid (PFNA), perfluorobutanesulfonic acid (PFBS), perfluoroheptanoic acid (PFHpA), and perfluorohexanesulfonic acid (PFHxS). None of the analytes were detected in the eight sampled wells (USEPA, 2012). PFAS analyses performed in 2014 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.

1.5.3 Hydrology

No surface water currently enters Camp Edwards. There are no large lakes, rivers, or streams on the JBCC property (MAARNG, 2009). Numerous small (less than 1 acre) wetlands and ponds are located on Camp Edwards. The wetlands are characterized as palustrine, emergent wetlands, bogs, and swamps. Some of the ponds and wetlands are groundwater flow-through kettle holes with little surface drainage, whereas others are perched water features on localized, relatively impermeable deposits. Due to the highly permeable nature of the soils at Camp Edwards, surface water flow is negligible. Overland flow is primarily controlled by a stormwater drainage system.

There are numerous surface water features near Camp Edwards, as shown on **Figure 1-3**. The Shawme Lakes are located near the northeast boundary of Camp Edwards and are drained by Mill Creek, which flows into salt marshes and discharges to Cape Cod Bay. To the east are Snake, Peters, Wakeby, and Mashpee Ponds. Ashumet, Johns, and Moody Ponds, as wells as the Quashnet River and Bog System, are located generally to the south of Camp Edwards. To the west, several small ponds and rivers drain westward into Buzzards Bay. The Cape Cod Canal is located on the northern boundary of Camp Edwards and connects Buzzards Bay to Cape Cod Bay.

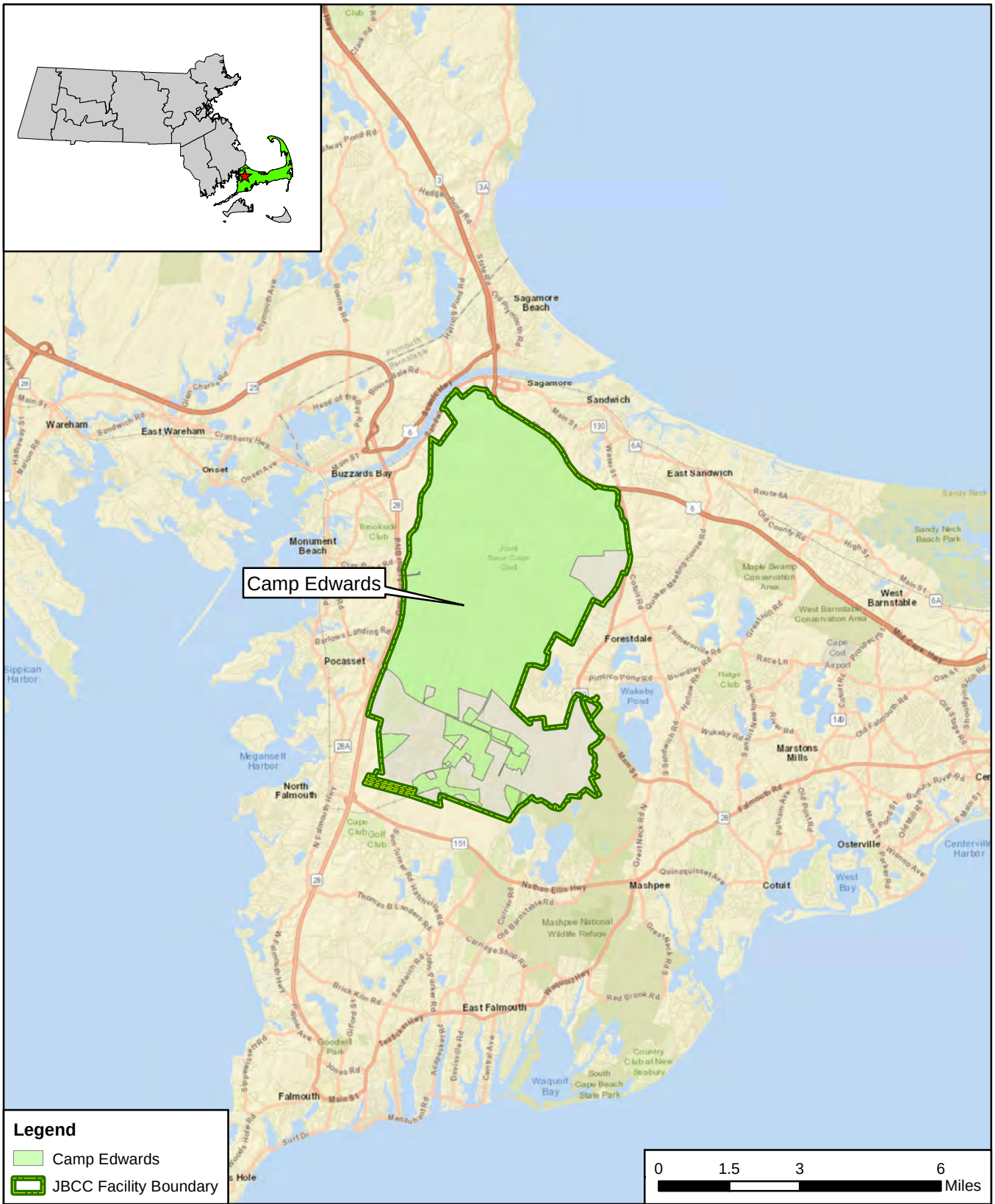
1.5.4 Climate

The climate at Camp Edwards is humid continental, with warm summers and cold, snowy winters. The climate is influenced by proximity to the Atlantic Ocean, with generally cooler summers and warmer winters than inland locations. The average temperature is 49.4 degrees Fahrenheit (°F), with summer highs of 76.4 °F and winter lows of 23.9 °F (National Oceanic and Atmospheric Administration [NOAA], 2018). Average annual precipitation is 45.16 inches.

1.5.5 Current and Future Land Use

Current Camp Edwards property is located in the Training Range and Impact Area. The Training Range and Impact Area is used for military and public safety operations. Maneuvers, bivouac, and range use are the most common activities in this location. The Cantonment Area is used jointly by Otis ANG Base, USCG Air Station Cape Cod, Six-Missile Warning Squadron, and Camp Edwards. The Cantonment Area is used primarily for military and public safety operations, including administrative, operational, maintenance, and housing facilities. No changes in land use are currently planned for Camp Edwards.

There are currently two environmental cleanup programs that are addressing PFAS at JBCC. In 1996, the Army National Guard Bureau (NGB) established the Impact Area Groundwater Study Program (IAGWSP) to examine the impacts of military training and defense contractor testing activities at the installation on the environment, specifically the groundwater. The AFCEC Installation Restoration Program (IRP) has also conducted a PA and SI for PFAS at JBCC, primarily in the Cantonment Area, and is currently conducting Remedial Investigations (RIs) and an expanded SI for PFAS at JBCC. The AFCEC IRP has also conducted a time-critical removal action treatment and is incidentally treating several groundwater plumes for PFAS as well as other actions (AFCEC, 2018d).



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Base Map: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI,		PM	RG	3/11/2019

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

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NOTES	Preliminary Assessment for PFAS at Camp Edwards, MA			
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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	3/20/2019

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Groundwater Features

AECOM
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Germantown, MD 20876

Figure 1-2

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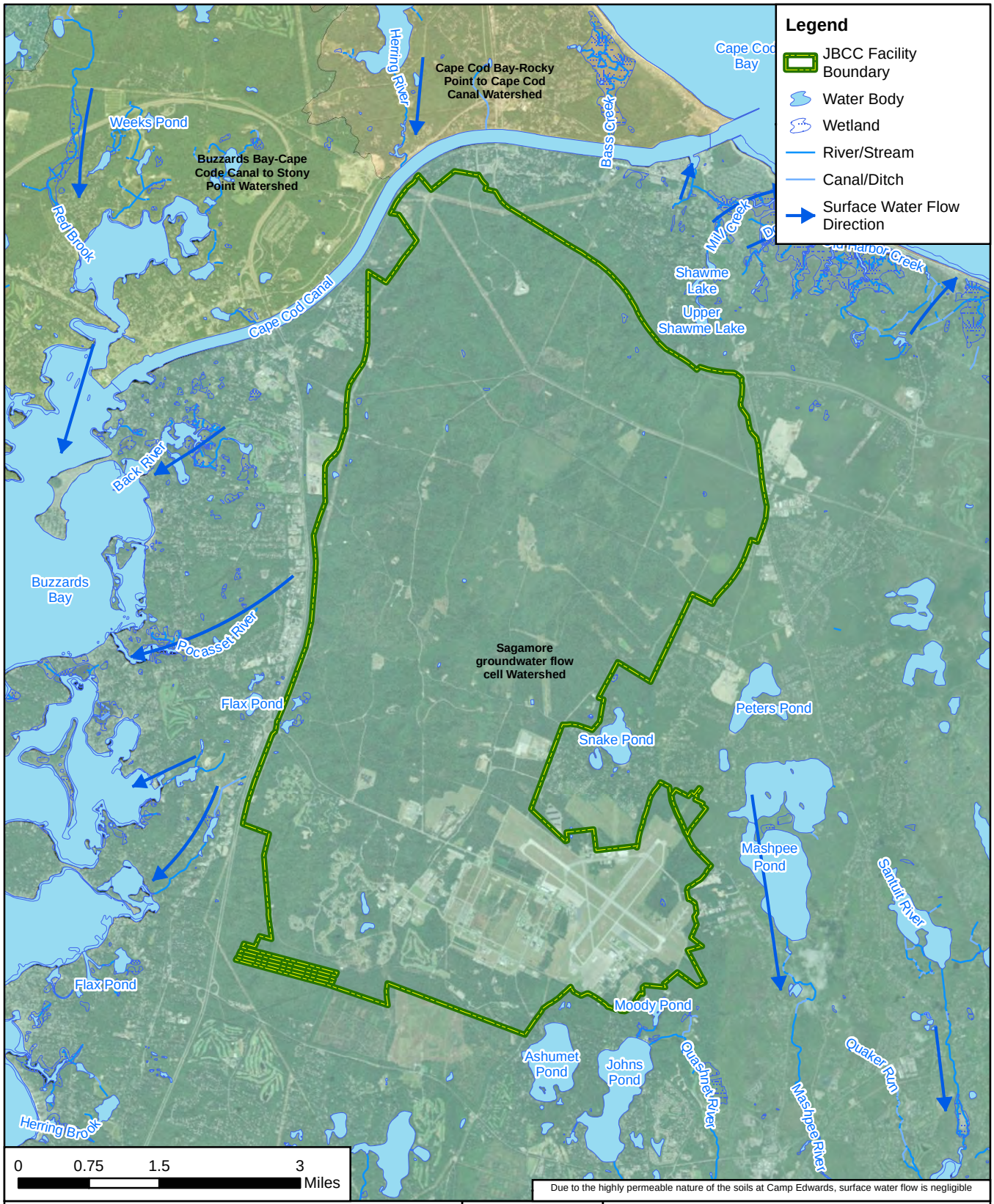

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	11/8/2019

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Surface Water Features

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Figure 1-3

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2. Fire Training Areas

No FTAs were identified within the Camp Edwards facility during the PA through interviews or the administrative record. Interview knowledge (1976 to 2019) and facility records dating to 1948 covered the entire duration of Camp Edwards' operations during the period in which AFFF has been in use. Army Aviation Support Facility (AASF) personnel currently train at an offsite location. Fire training activities were conducted with AFFF on unlined fire pits on a few occasions in the mid-1980s; however, no other information, including the location of these unlined fire pits, is available. Current fire training activities are conducted without the use of AFFF. Three former FTAs were identified on JBCC adjacent to Camp Edwards property during the PA. Two of these FTAs pre-dated the use of AFFF. The remaining FTA is addressed in **Section 5**.

3. Non-Fire Training Areas

In addition to FTAs, the PA evaluated areas where PFAS-containing materials may have been broadly used, stored, or disposed. This may include buildings with fire suppression systems, paint booths, AFFF storage areas, and areas of compliance demonstrations. Information on these features obtained during the PA are included in **Appendices A** and **B**. AFCEC has identified five non-FTAs, and one additional non-FTA has been identified, all of which are described in the following sections. The locations of the non-FTAs are shown on **Figure 3-1**, and the photographs appear in **Appendix C**.

3.1 Hangar 2816

Hangar 2816 is located in the southeastern portion of Camp Edwards, on Richardson Road, between Generals Boulevard and East Inner Road (**Figure 3-1**). The geographic coordinates are 41.659555°N; 70.535325°W. Hangar 2816, which houses rotary-winged aircraft, was constructed in 1969 and is occupied by the MAARNG. Hangar 2816 contains a water-deluge sprinkler fire suppression system and five 125/150-pound portable Amerex fire extinguisher units containing Purple K, a dry-chemical fire suppression agent composed of potassium bicarbonate. The Hangar 2816 building includes floor drains which were previously connected to dry wells located on either end of the building. The floor drains are now self-contained. Trench drains are located on the flight line running parallel to the north side of Hangar 2816. There have not been any documented releases of AFFF at this location.

Tri-Max™ portable compressed air foam fire suppression system (CAFS) units were formerly used outside Hangar 2816. The CAFS units were kept on the flight line and parking lot. Because they were equipped with canvas covers, the CAFS units were not stored inside Hangar 2816. According to interviewees, annual training was conducted with the CAFS units intermittently from the late 1970s until approximately 2013. Only one CAFS unit was used for training during which personnel discharged the CAFS unit in the parking lot immediately south of Hangar 2816. The CAFS unit used a water and soap mixture during training exercises. The units were removed with their contents intact an estimated 3 to 5 years ago.

AFCEC performed an SI at Hangar 2816 in 2017 (AFCEC, 2017). One direct-push groundwater vertical profile boring was completed south of Hangar 2816. One groundwater sample collected from 53.5 ft bgs exceeded the USEPA HA of 0.07 µg/L, with PFOS and PFOA concentrations of 0.053 µg/L and 0.046 µg/L, respectively (AFCEC, 2017). AFCEC is also performing an ongoing expanded SI at Hangar 2816.

3.2 Building 2814

Building 2814 is located adjacent to Hangar 2816, on the southeastern portion of Camp Edwards on Richardson Road, between Generals Boulevard and East Inner Road (**Figure 3-1**). The geographic coordinates are 41.660028°N; 70.536491°W. Building 2814 is a former fire station used by MAARNG and is currently occupied by MAARNG Echo Company. There have not been any documented releases of AFFF at this location.

The MAARNG owned a class 530C fire truck that was stored at Building 2814 and carried AFFF. The fire truck was parked in various locations on the property in a motor pool on the west and north sides of Building 2814 between the late 1970s and early 1990s. Interviewees indicated that the pump unit from the fire truck was removed and stored in the parking lot on the west side of Building 2814. Additionally, approximately 20 5-gallon plastic drums of AFFF were stored in dirt near Building 2814 during this time.

While historical records do not document AFFF releases at this AOI, an interviewee indicated that the class 530C fire truck discharged AFFF foam to a grassy area on the north side of the Building 2814 motor pool in the late 1970s. A wash rack (WR) and an oil-water separator (OWS) were installed at this location in 1989. Soil was removed from the location of the potential AFFF discharge in order to build the WR/OWS pad. AFCEC is performing an ongoing investigation for PFAS at Building 2814 as part of an expanded SI for Building 2816.

3.3 Landfill #1 (LF-1)

LF-1 occupies approximately 100 acres and is located in the southern portion of Camp Edwards, bounded by Turpentine Road and Frank Perkins Road on the east and west, respectively, and Herbert Road and Connery Avenue on the north and south, respectively (**Figure 3-1**). The geographic coordinates are 41.673590°N; 70.554194°W. ARNG currently contributes 27 percent of the funding towards the LF-1 remedial action objective. Unregulated disposal activities occurred at LF-1 from approximately 1940 to 1984 in distinct areas known as the 1947 Cell, 1951 Cell, 1970 Cell, Post-1970 Cell, and Kettle Hole. Since 1984, regulated disposal activities have occurred in the Post-1970 Cell under the Massachusetts Military Reservation (MMR) Hazardous Waste Management Plan. Among the wastes believed to be included in LF-1 are municipal sewage sludge and fire extinguisher fluids (AFCEC, 2018b). The landfill was capped in 1995.

AFCEC conducted an initial presence/absence (SI equivalent) PFAS field effort for the LF-1 plume in 2016 that included sampling of existing extraction wells, influent and effluent at the associated treatment plants, and six LF-1 monitoring wells. The existing groundwater treatment system treats trichloroethene, tetrachloroethene, carbon tetrachloride, 1,1,2,2-tetrachloroethane, vinyl chloride, ethylene dibromide, and 1,4-dichlorobenzene in groundwater using a granular activated carbon (GAC) filter. PFOS was detected at concentrations exceeding the HA of 0.07 µg/L in two extraction wells and in three monitoring wells. PFOA was detected at a concentration exceeding the HA of 0.07 µg/L in one monitoring well. A Supplemental RI was conducted between September 2015 and March 2017 that included sampling of 107 monitoring wells and eight extraction wells. The sum of PFOS and PFOA were detected at concentrations exceeding the HA in nine monitoring wells and two extraction wells (AFCEC, 2018a). The Supplemental RI also included sampling of treatment plant influent and effluent ports for PFAS. PFOA/PFOS were detected at concentrations exceeding the HA in influent at one of the treatment plants, and at concentrations below the HA in influent at the second treatment plant. PFOA/PFOS were detected at concentrations below the HA in effluent at one treatment plant and were not detected in the effluent at the second treatment plant (AFCEC, 2018a).

3.4 Waste Water Treatment Plant Sand Infiltration Beds

The Waste Water Treatment Plant (WWTP) Sand Infiltration Beds are located in the northern portion of Camp Edwards, approximately 1,550 ft southwest of the intersection of Jarvis Road and Sandwich Road, adjacent to the Camp Edwards property boundary (**Figure 3-1**). The geographic coordinates are 41.764626°N; 70.562624°W. Since 1995, the wastewater treated at the JBCC WWTP has been conveyed to the Sand Infiltration Beds via underground piping. Wastewater passes through the Sand Infiltration Beds and is discharged to the Cape Cod Canal. The JBCC WWTP is addressed in **Section 5**.

AFCEC conducted an SI for PFAS at the WWTP Sand Infiltration Beds in 2015 that included sampling three existing monitoring wells, the WWTP influent and effluent, the Sand Infiltration Beds effluent, and a direct push boring near the former WWTP composting facility. PFOS and PFOA were detected at concentrations exceeding the HA of 0.07 µg/L in two monitoring wells, and PFOS was detected at concentrations exceeding the HA of 0.07 µg/L in the Sand Infiltration Beds effluent, the WWTP influent, and the WWTP effluent. PFOS and PFOA were not detected

in the upgradient monitoring well (AFCEC, 2017). Additional work was completed during the Expanded SI, which is ongoing.

3.5 Fire Station Building 3132 and Drainage Ditch #1

Fire Station Building 3132 is located in the Southeast portion of Camp Edwards, at the intersection of Richardson Road and Bradshaw Street (**Figure 3-1**). The geographic coordinates of Building 3132 are 41.656330°N; 70.529865°W. Fire Station Building 3132 was built in 2007. Drainage Ditch #1 begins approximately 440 ft west of Building 3132, along Richardson Road. The geographic coordinates of Drainage Ditch #1 are 41.656981°N; 70.531698°W. MAARNG owns 36 percent of Building 3132, which houses the JBCC Fire Department, including nine MAARNG firefighters, two MAARNG M1142 TFFT fire trucks, and two M1158 HEWATT tank trucks. The two fire trucks each house a 60-gallon tank of Class A firefighting foam and a 60-gallon tank of Class B firefighting foam. The two tank trucks each house a 50-gallon AFFF storage tank. An additional approximately 1,500 gallons of AFFF are stored at Fire Station Building 3132.

On 25 March 2015, after responding to Tanker Truck Rollover #3 (see **Section 5**), about 2 gallons of AFFF were flushed out of fire hoses to the gravel area in the northwest corner of the Fire Station. Some AFFF may have drained into a nearby storm sewer inlet that discharges to Drainage Ditch #1.

AFCEC conducted an SI for PFAS at Fire Station Building 3132 and Drainage Ditch #1 in 2015 through 2016 (AFCEC, 2017). Five monitoring wells and three direct push borings were completed as part of the Focused SI. PFOS analytical results from two monitoring wells located near Drainage Ditch #1 exceeded the HA of 0.07 µg/L. PFOS/PFOA were not detected above the HA 0.07 µg/L in any of the three direct push groundwater borings. The Expanded SI is ongoing. The AFCEC Remediation Program Manager indicated that there are likely ongoing releases at Fire Station Building 3132 and Drainage Ditch #1. The Lower 40 Ramp Area (**Section 5**) is a potential off-facility source of PFAS which also discharged AFFF to Drainage Ditch #1.

3.6 Open Burn Open Detonation Sites

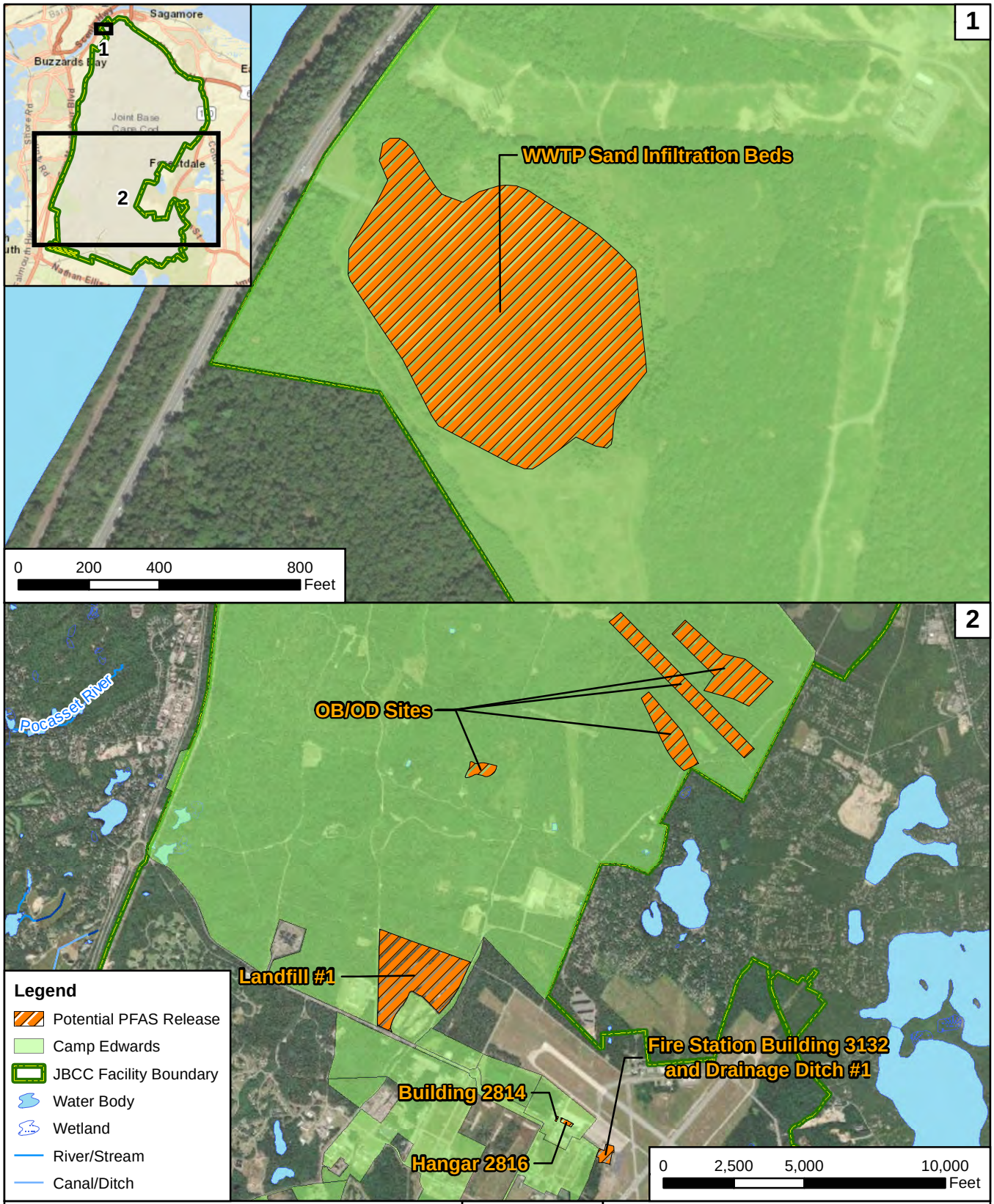
The Open Burn Open Detonation (OB/OD) Sites are four sites located in the Training Range and Impact Area of Camp Edwards (**Figure 3-1**). The four sites are Demolition Area 1, J1, J2, and J3, and the geographic coordinates of these sites are 41.694006°N, 70.546667°W; 41.701222°N, 70.519167°W; 41.703778°N, 70.514444°W; and 41.697667°N, 70.522500°W, respectively.

Demolition Area 1 is located north of Pocasset Forestdale Road, west of Turpentine Road, and east of Frank Perkins Road. The Demolition Area 1 site covers approximately 7.4 acres and is located in a kettle hole that covers approximately one acre at its base. Demolition Area 1 was used by MAARNG for the destruction of munitions and other unspecified items as well as demolition training from the mid-1970s to the late 1980s.

Sites J1, J2, and J3 are located to the northwest of Greenway Road and to the south of Wood Road. These three properties were occupied by a Department of Defense contractor.

There have been no documented releases of PFAS at the OB/OD Sites; however, according to the Environmental and Readiness Center, there is anecdotal evidence that if AFFF were used, it would have been used at an OB/OD site.

The IAGWSP, in coordination with MassDEP and USEPA, have written the *Final Sampling Work Plan for Per- and Polyfluoroalkyl Substances (PFAS)* (USACE, 2019) to address each of the four OB/OD Sites for PFAS, and the plan is currently being executed by the IAGWSP. The Camp Edwards IAGWSP program manager indicated that no HA exceedances were detected in the preliminary groundwater concentration data collected to date.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Edwards, MA			
REVISED	7/21/2020	GIS BY	MS	7/21/2020
SCALE	1:60,000	CHK BY	DC	7/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	7/21/2020

N

Non-Fire Training Areas

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Figure 3-1

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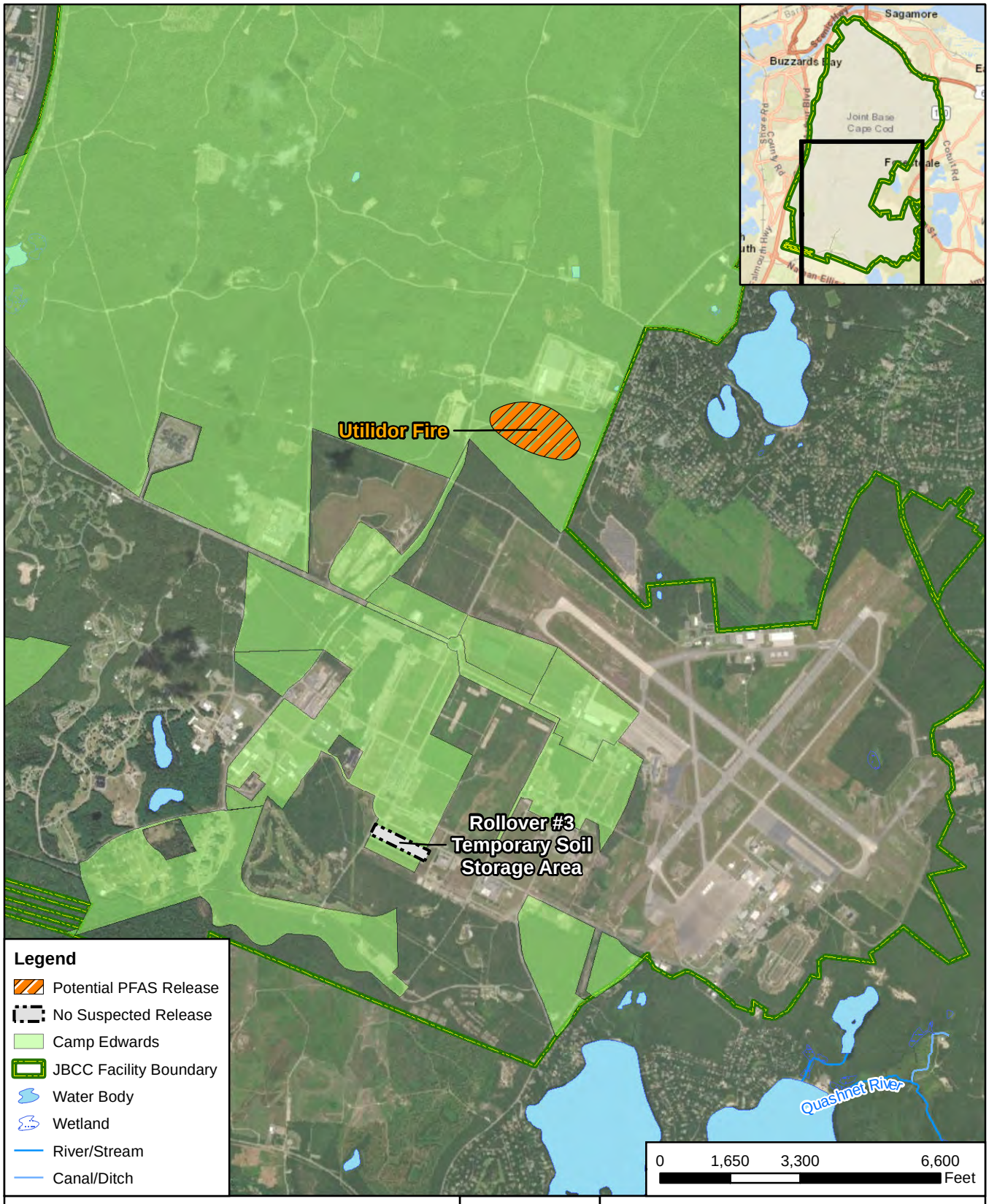
4. Emergency Response Areas

AFCEC is performing investigations for PFAS at JBCC. They have identified one emergency response area where PFAS may have been released and one emergency response area where PFAS were stored. Descriptions of these areas are presented in the *AFCEC JBCC PFAS Program Summary* (**Appendix A**; AFCEC, 2020), and their locations are shown on **Figure 4-1**. AFCEC is not currently investigating the site where soil from the Tanker Truck Rollover #3 was stored. The AFCEC Remediation Program Manager indicated that the soil was only stored at the site briefly and was covered with plastic on asphalt. Interview records appear in **Appendix B**, and photographs appear in **Appendix C**.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Edwards, MA			
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SCALE	1:10,800	CHK BY	DC	9/25/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	9/25/2020

Emergency Response Areas

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Figure 4-1

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5. Adjacent Sources

AFCEC is performing investigations for PFAS at JBCC. They have identified thirteen potential sources of PFAS. A summary of AFCEC's work is presented in the *AFCEC JBCC PFAS Program Summary* (**Appendix A**; AFCEC, 2020), and the locations of these sources are shown on **Figure 5-1** except for the Ashumet Valley Plume, which is shown on Figure 1 in the *2016 Final Supplemental Remedial Investigation/Feasibility Study Work Plan for 1,4-Dioxane and Perfluorinated Compounds at Ashumet Valley, Joint Base Cape Cod, MA* presented in **Appendix A**.

1

Tanker Truck Rollover #3

0 150 300 600 Feet

2

Tanker Truck Rollover #2

Tanker Truck Rollover #1

0 150 300 600 Feet

3

Hangar 3170

Hangar 3172

Lower 40 Ramp Area

Fuel Spill 1 Source Area

Building 122 Release Area

ANG Motor Pool and Drainage Ditch 2

Former Building 118 & Drainage Ditch #3

Former Fire Training Area #1

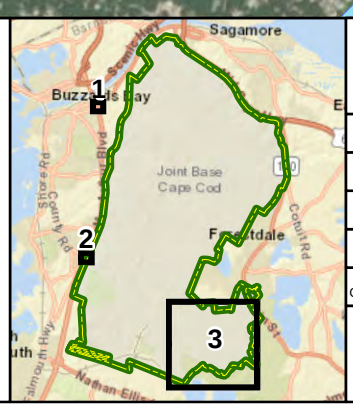
JBCC Waste Water Treatement Plant

0 650 1,300 2,600 Feet

Legend

- Potential PFAS Release
- Camp Edwards
- JBCC Facility Boundary
- Water Body
- Wetland
- River/Stream
- Canal/Ditch

N



Adjacent Sources

CLIENT	ARNG			
PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA			
REVISED	7/21/2020	GIS BY	MS	7/21/2020
SCALE	1:15,600	CHK BY	DC	7/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,		PM	RG	7/21/2020

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Figure 5-1

6. Preliminary Conceptual Site Model

Based on the PA findings, the release areas were grouped into several AOIs. The AOIs located in the north area are shown on **Figure 6-1**, and the AOIs located in the south area are shown on **Figure 6-2**. The following sections describe the CSM components and the specific preliminary CSMs developed for each AOI. The CSM identifies the three components necessary for a potentially complete exposure pathway: (1) source, (2) pathway, and (3) receptor. If any of these elements are missing, the pathway is considered incomplete.

In general, the potential PFAS exposure pathways 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 (National Ground Water Association [NGWA], 2018). Receptors at Camp Edwards include site workers (e.g., camp staff and visiting soldiers), construction workers, full-time and part-time residents outside the facility boundary, trespassers, and recreational users. The preliminary CSMs for each AOI indicate which specific receptors could potentially be exposed to PFAS.

6.1 AOI 1: Hangar 2816 and Building 2814

During the time period between the late 1970s and 2013, AFFF was stored at several locations within the boundary of AOI 1 and may have been discharged to asphalt and soil. The AOI has been identified based on preliminary data and groundwater flow directions from the AFCEC Final Focused SI (AFCEC, 2017).

Ground-disturbing activities at the AOI could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil also could result in site worker and construction worker exposure.

Given the length of time since the potential AFFF releases (i.e., greater than 30 years), the average precipitation at the facility, and high degree of soil permeability, some potential PFAS contamination at the AOI may have migrated from the soil to groundwater via infiltration. Previous investigation activities indicate that groundwater likely discharges to a wetlands area approximately 6,200 ft south from Hangar 2816, which discharges to Ashumet Pond. Groundwater passes through Ashumet Pond and continues to Johns Pond. Previous sampling activities have identified PFOS/PFOA in surface water in Ashumet Pond and Johns Pond at concentrations exceeding the HA (AFCEC, 2018c). Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for residents and recreational users of Ashumet Pond and Johns Pond (e.g., swimming and fishing).

Previous sampling activities have identified PFOS/PFOA at concentrations exceeding the HA in groundwater at Hangar 2816 and in public drinking water supply wells to the south of the AOI (AFCEC, 2018c). Therefore, the ingestion exposure pathway for groundwater is potentially complete for off-facility residents and recreational users, although the source of PFAS in drinking water to the south of the AOI is not yet identified. The preliminary CSM for Camp Edwards AOI 1 is presented on **Figure 6-3**.

6.2 AOI 2: LF-1

Unregulated disposal activities occurred at LF-1 from approximately 1940 to 1984, and regulated disposal activities have occurred there from 1984 to 1995, when the landfill was capped. Among the wastes believed to be included in LF-1 are municipal sewage sludge and fire extinguisher fluids which may contain AFFF. The AOI has been identified based on preliminary data and

groundwater flow directions from the AFCEC Final Focused SI (AFCEC, 2017). AFCEC will continue to manage LF-1 under the current IRP. The existing groundwater extraction and treatment system will be used to capture and treat the PFOS/PFOA within the AOI.

Ground-disturbing activities at the AOI could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil also could result in site worker and construction worker exposure.

Given the length of time since the potential PFAS releases (i.e., greater than 30 years), the average precipitation at the facility, and high degree of soil permeability, some potential PFAS contamination at the AOI may have migrated from the soil to groundwater via infiltration; AFCEC has mapped this plume. Previous investigation activities indicate that groundwater likely discharges to Squeteague and Red Brook Harbors in Buzzards Bay, approximately 3 miles west/southwest from LF-1. Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for residents and recreational users of Squeteague and Red Brook Harbors Harbor (e.g., swimming and fishing).

Previous sampling activities have identified PFAS in groundwater at LF-1 monitoring wells, in downgradient monitoring wells, and in extraction wells for the LF-1 treatment system. The sum of PFOS/PFOA was detected at concentrations exceeding the HA in nine monitoring wells (all located upgradient of the extraction fence) and two extraction wells. PFAS were not detected at the public water supply wells when sampled for UCMR3 by the town. AFCEC currently operates a groundwater extraction and treatment system that incidentally treats PFAS in groundwater. Therefore, the ingestion exposure pathway for groundwater will be evaluated by AFCEC. The preliminary CSM for Camp Edwards AOI 2 is presented on **Figure 6-4**.

6.3 AOI 3: WWTP Sand Infiltration Beds

During the time period between 1995 and the present, wastewater from the JBCC WWTP, which potentially contains PFAS, has been discharged to the sand infiltration beds. The AOI has been identified based on preliminary data and groundwater flow directions from the AFCEC Final Focused SI (AFCEC, 2017).

Ground-disturbing activities at the AOI could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil also could result in site worker and construction worker exposure.

Given the average precipitation at the facility, the wastewater discharge to groundwater, and high degree of soil permeability, some potential PFAS contamination at the AOI may have migrated from the soil and wastewater discharge to groundwater via infiltration. Previous investigation activities indicate that groundwater discharges to the Cape Cod Canal, approximately 480 ft west/northwest from the AOI. Previous sampling activities have identified PFAS in groundwater at WWTP Sand Infiltration Bed monitoring wells and in sand infiltration bed effluent at concentrations exceeding the HA (AFCEC, 2017). Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for residents and recreational users of the Cape Cod Canal.

There is currently no groundwater use downgradient of the AOI between the WWTP Sand Infiltration Beds and its discharge point at the Cape Cod Canal. Therefore, the ingestion exposure pathway for groundwater is incomplete for the WWTP Sand Infiltration Beds. The preliminary CSM for Camp Edwards AOI 3 is presented on **Figure 6-5**.

6.4 AOI 4: Fire Station Building 3132 and Drainage Ditch #1

AFFF has been stored at Fire Station Building 3132 since 2007, and AFFF potentially containing PFAS was discharged to surface soil and Drainage Ditch #1 on 25 March 2015. AFFF also went through the drains inside Fire Station Building 3132 and into an OWS, which drains to the WWTP. The AOI has been identified based on preliminary data and groundwater flow directions from the AFCEC Final Focused SI (AFCEC, 2017).

Ground-disturbing activities at the AOI could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil also could result in site worker and construction worker exposure.

Given the average precipitation at the facility and the high degree of soil permeability, some potential PFAS contamination at the AOI may have migrated from the soil to groundwater via infiltration. Previous investigation activities indicate that groundwater discharges to a wetlands area approximately 5,200 ft south from Drainage Ditch #1, which discharges to Ashumet Pond. Groundwater passes through Ashumet Pond and continues to Johns Pond. Previous sampling activities have identified PFAS in surface water in Ashumet Pond and Johns Pond at concentrations exceeding the HA. Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for residents and recreational users of Ashumet Pond and Johns Pond (e.g., swimming and fishing). These ponds are catch and release only due to a mercury advisory.

Previous and ongoing sampling activities have identified PFAS in groundwater at Fire Station Building 3132 and Drainage Ditch #1 monitoring wells at concentrations exceeding the HA, and in public drinking water supply wells and registered community and non-community water supply wells to the south of the AOI (AFCEC, 2018c). Therefore, the ingestion exposure pathway for groundwater is potentially complete for off-facility residents and recreational users. The preliminary CSM for Camp Edwards AOI 4 is presented on **Figure 6-6**.

6.5 AOI 5: Utilidor Fire

In 1988 or 1989, an unknown type and quantity of foam that potentially contained PFAS was discharged to the subsurface during an underground fire in a timber-lined tunnel (utilidor) near and south/southwest of the Chemical Spill 10 (Former BOMARC Site). The precise location is unknown. The AOI has been identified based on preliminary data and groundwater flow directions from previous investigations (AFCEC, 2018b).

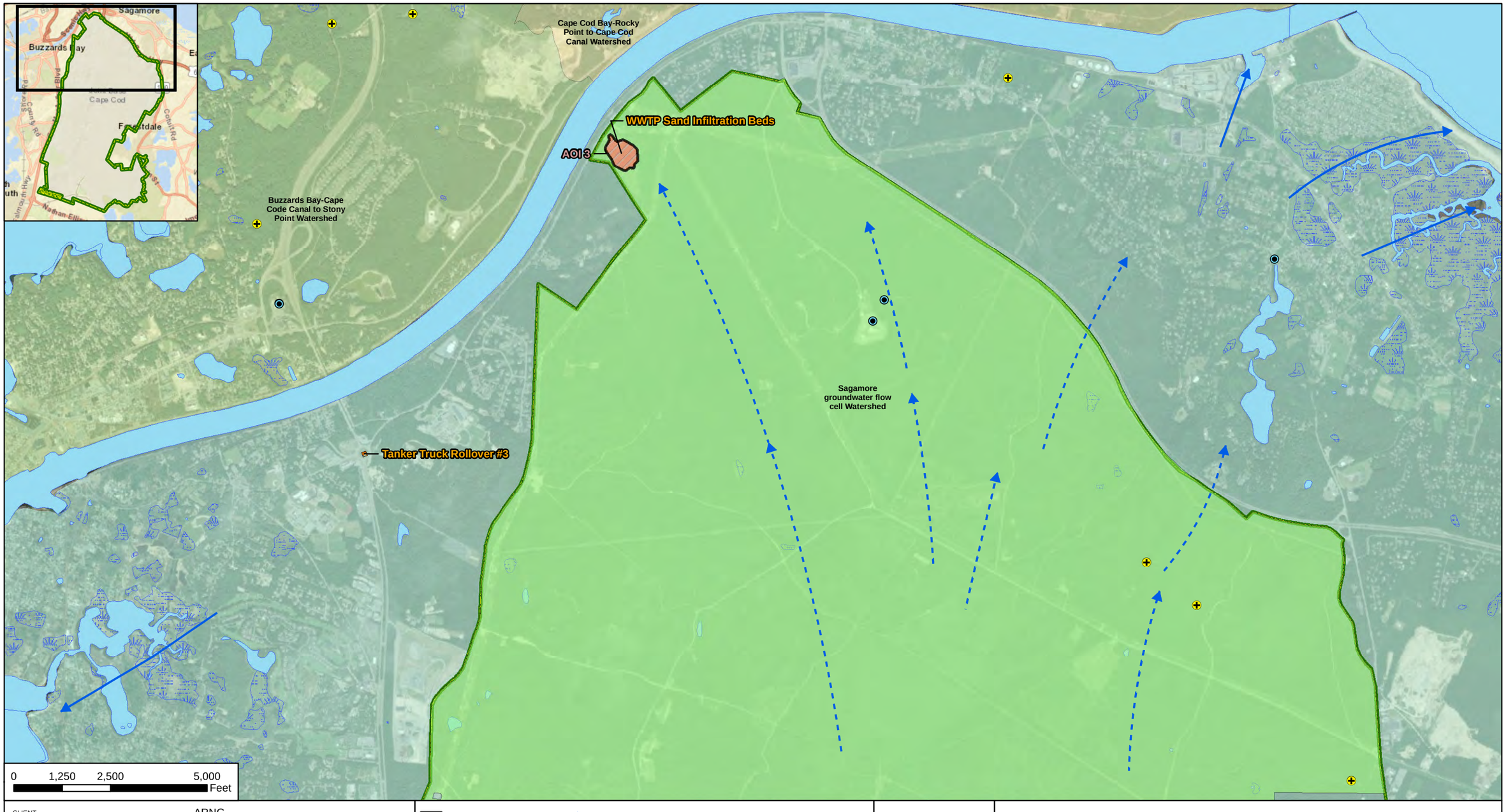
Ground-disturbing activities at the AOI could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil also could result in site worker and construction worker exposure.

Given the length of time since the foam release, the average precipitation at the facility, and the high degree of soil permeability, some potential PFAS contamination at the AOI may have migrated from the soil to groundwater via infiltration. Previous investigation activities indicate that groundwater discharges to Ashumet Pond, approximately 2.9 miles south of the Chemical Spill 10 (Former BOMARC Site). Groundwater passes through Ashumet Pond and continues to Johns Pond. Chemical Spill 10 (Former BOMARC Site) previous sampling activities have identified PFAS in surface water in Ashumet Pond and Johns Pond at concentrations exceeding the HA. Therefore, the ingestion exposure pathways for surface water and sediment are potentially complete for residents and recreational users of Ashumet Pond and Johns Pond (e.g., swimming and fishing).

The AFCEC Remediation Program Manager stated that sampling of the Chemical Spill 10 (Former BOMARC Site) has been completed and the groundwater results did not indicate any PFAS impacts. Therefore, it is unlikely that the foam used in emergency response at the utilidor fire contained PFAS. However, previous sampling activities have identified PFAS in groundwater at downgradient monitoring wells as well as in public drinking water supply wells and registered community and non-community water supply wells to the south of the utilidor fire (AFCEC, 2018c). Therefore, the ingestion exposure pathway for groundwater is potentially complete for off-facility residents and recreational users. The preliminary CSM for Camp Edwards AOI 5 is presented on **Figure 6-7**.

6.6 AOI 6: OB/OD Sites

Though there is no direct evidence of AFFF usage documented. However, there has been suggested anecdotal evidence that if AFFF were used, it would have been used at an OB/OD Site (USACE, 2019). The Camp Edwards IAGWSP is conducting an ongoing PFAS investigation at the OB/OD Sites, which will evaluate the presence of PFAS compounds as well as potential exposure pathways. The preliminary CSM for Camp Edwards AOI 6 is presented on **Figure 6-8**.



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SCALE	1:30,000	CHK BY	DC	7/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	7/21/2020

- Area of Interest
- Potential PFAS Release
- Camp Edwards
- JBCC Facility Boundary
- Water Body
- Wetland
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Community Groundwater Source
- Non-Community Groundwater Source

N

Camp Edwards North Areas of Interest

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Figure 6-1

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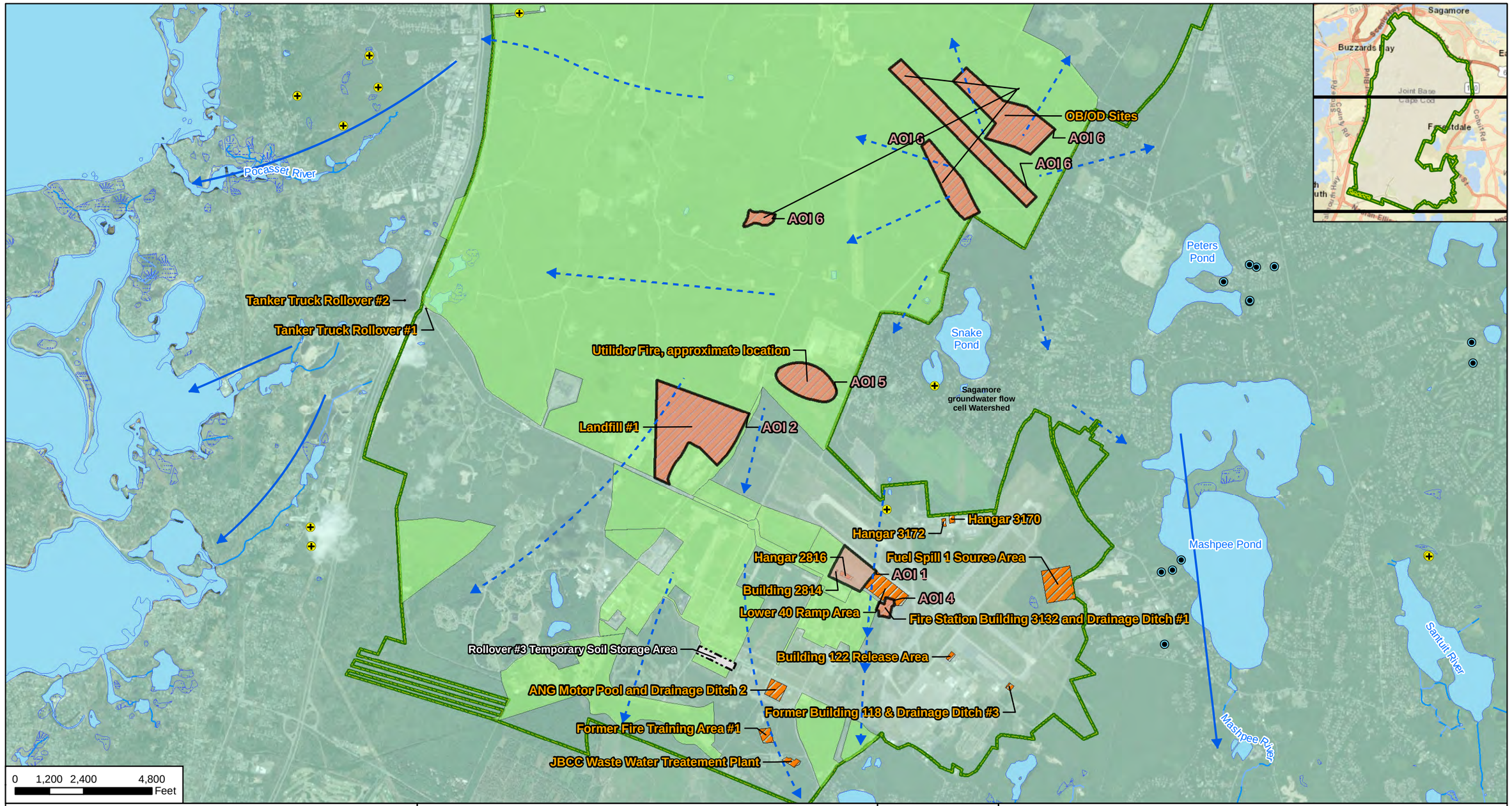

CLIENT	ARNG			
PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA			
REVISED	9/25/2020	GIS BY	MS	9/25/2020
SCALE	1:40,800	CHK BY	DC	9/25/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	9/25/2020

- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Camp Edwards
- JBCC Facility Boundary
- Water Body
- Wetland
- River/Stream
- Canal/Ditch
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Community Groundwater Source
- Non-Community Groundwater Source

N

Camp Edwards South Areas of Interest

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-2

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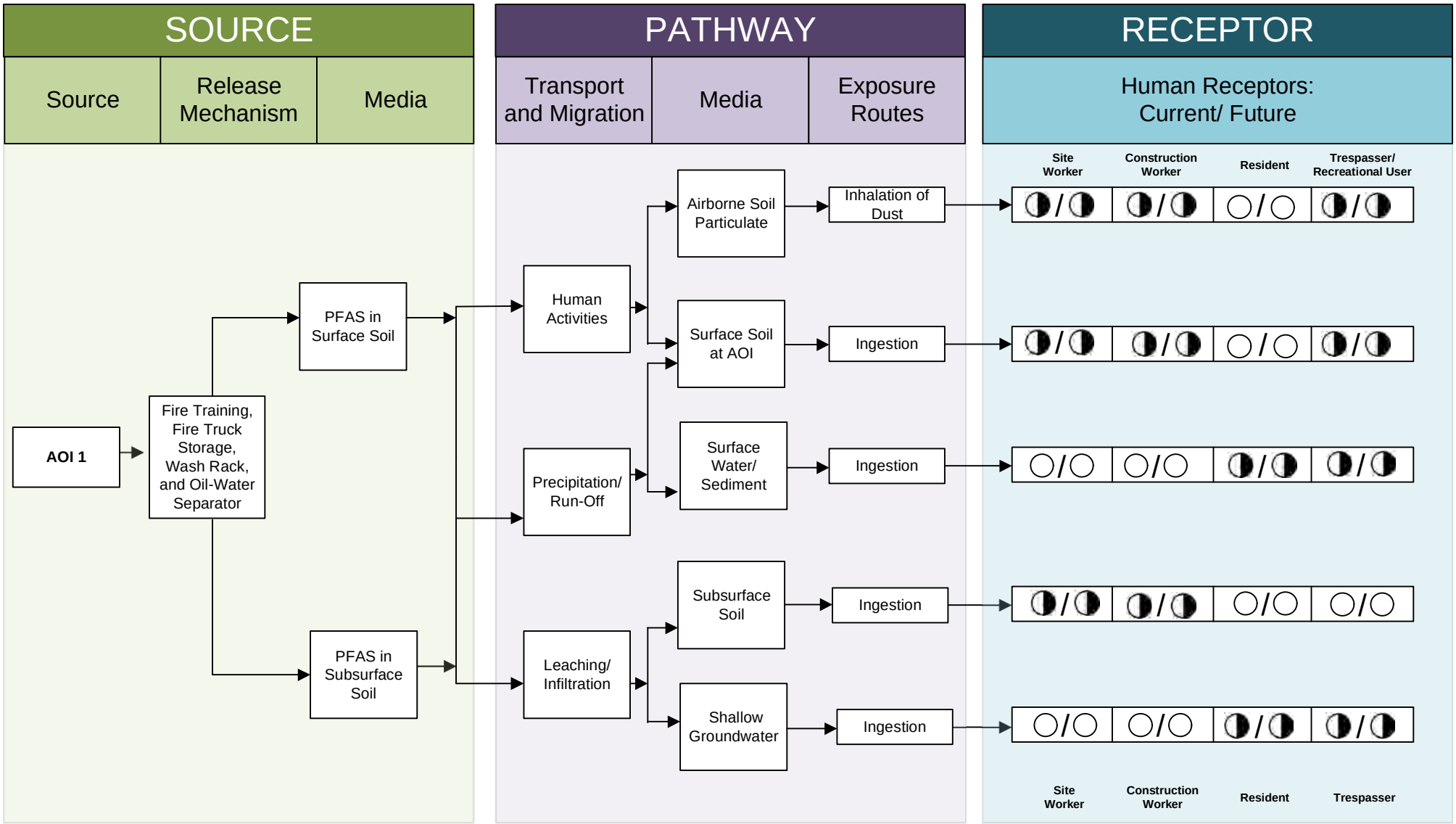
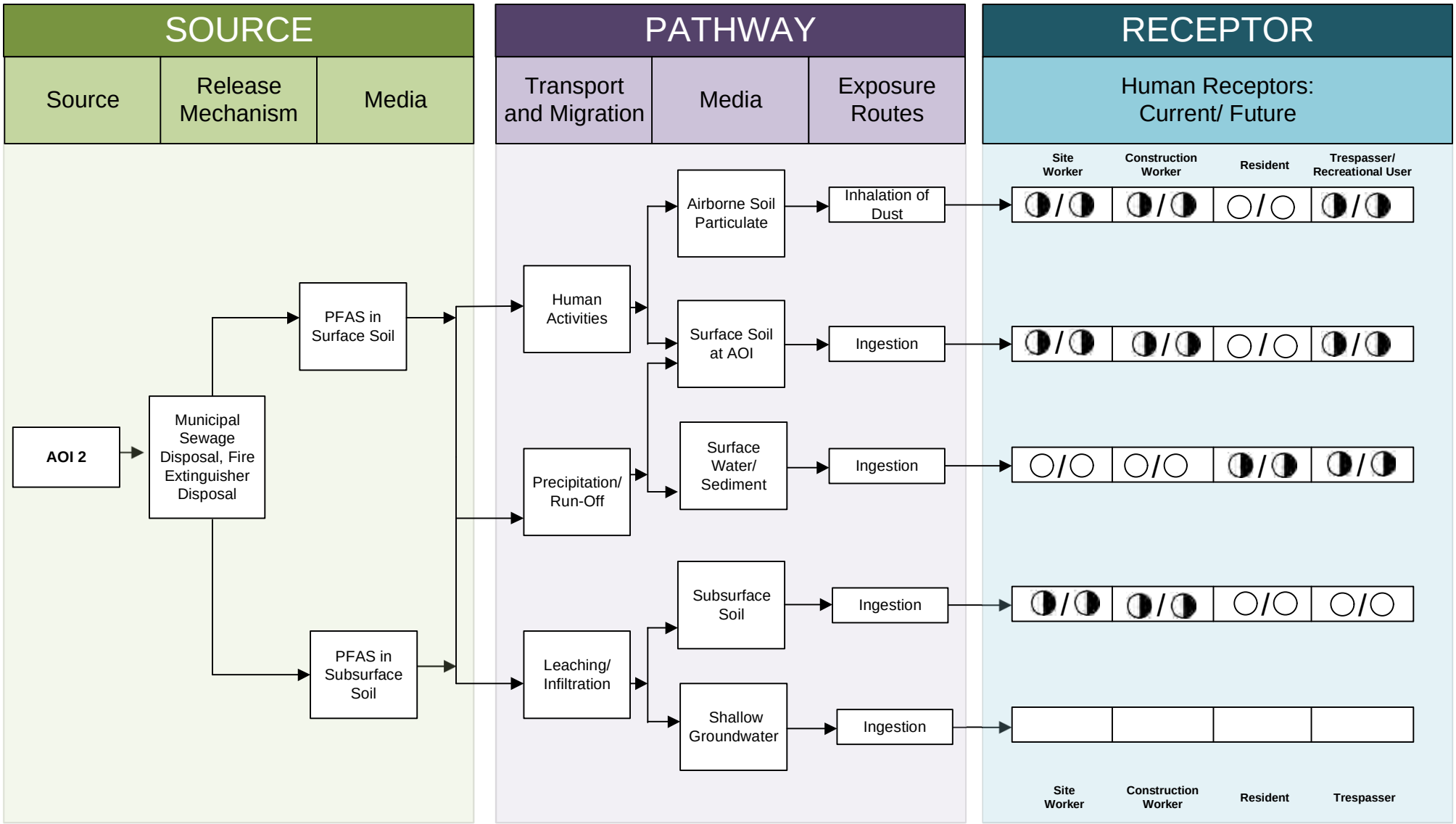


LEGEND

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

Notes:
1. The resident and recreational user receptors refer to an off-site resident and recreational user.
2. Dermal contact exposure pathway is incomplete for PFAS

Figure 6-3
Preliminary Conceptual Site Model
AOI 1 Hangar 2816 & Building 2814

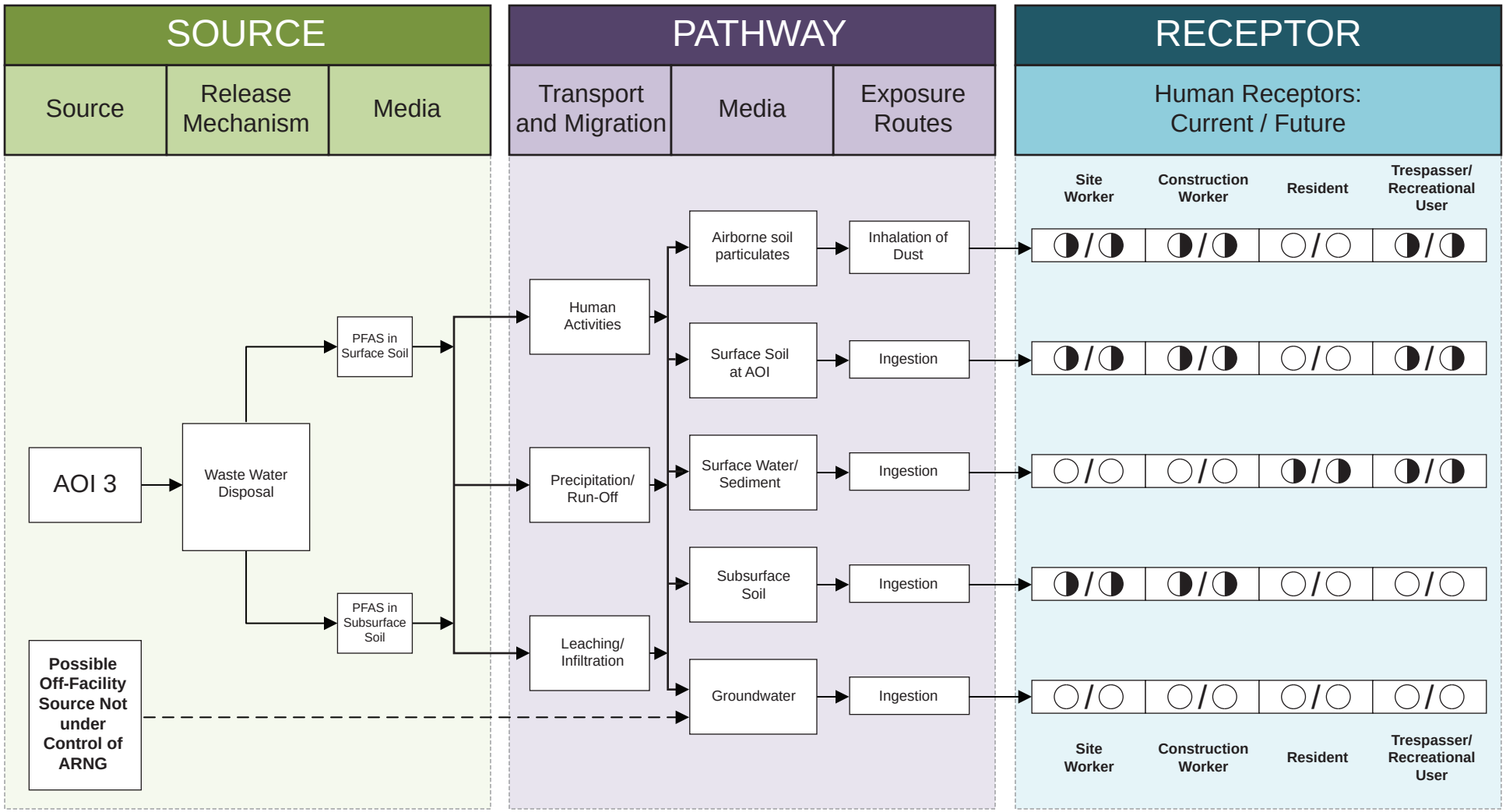


LEGEND

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

Notes:
1. The resident and recreational user receptors refer to an off-site resident and recreational user.
2. Dermal contact exposure pathway is incomplete for PFAS
3. AFCEC to perform evaluation of groundwater ingestion pathway

Figure 6-4
Preliminary Conceptual Site Model
AOI 2 Landfill #1

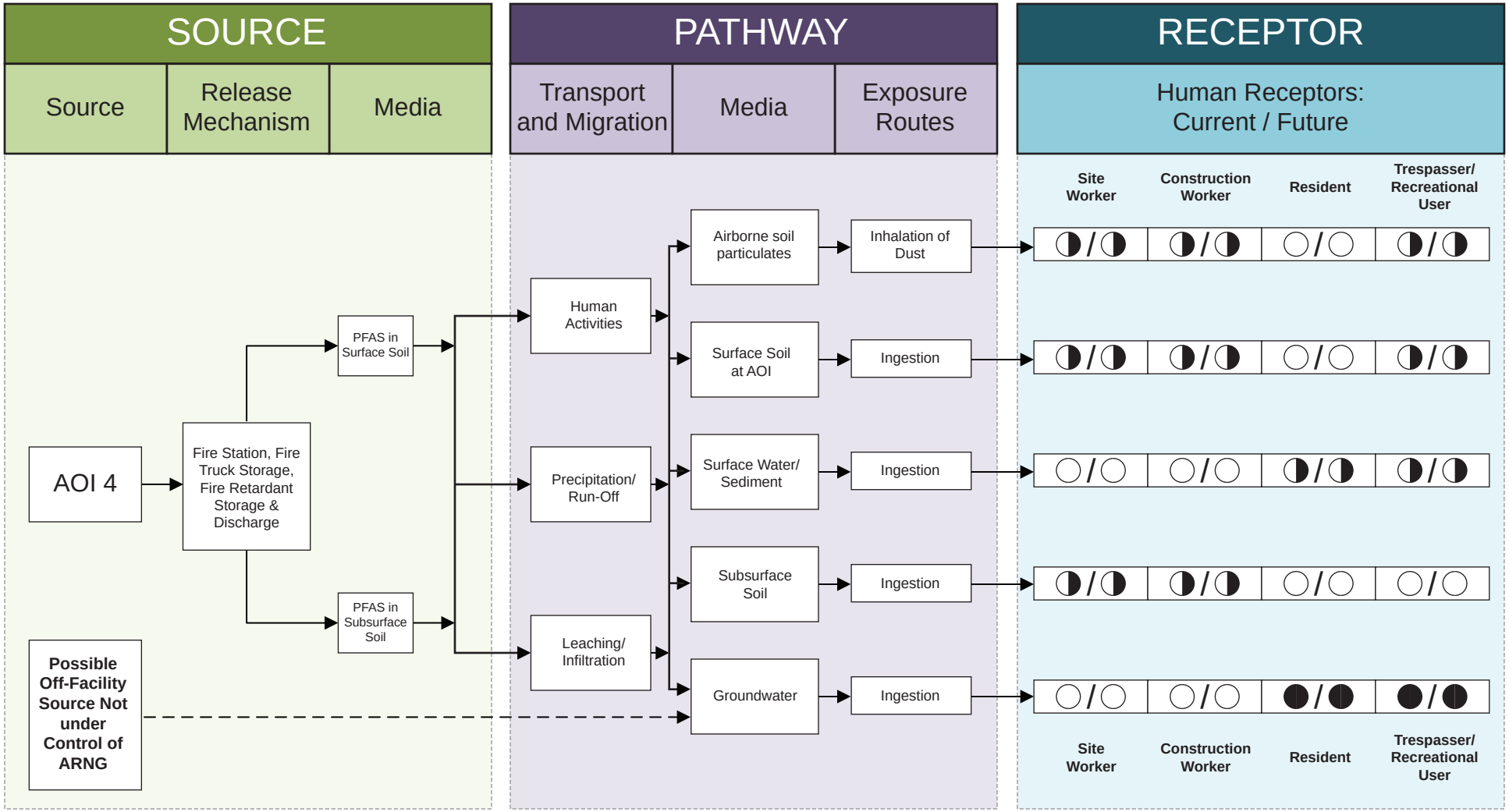


LEGEND

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

Figure 6-5

Preliminary Conceptual Site Model
AOI 3 WWTP Sand Infiltration Beds

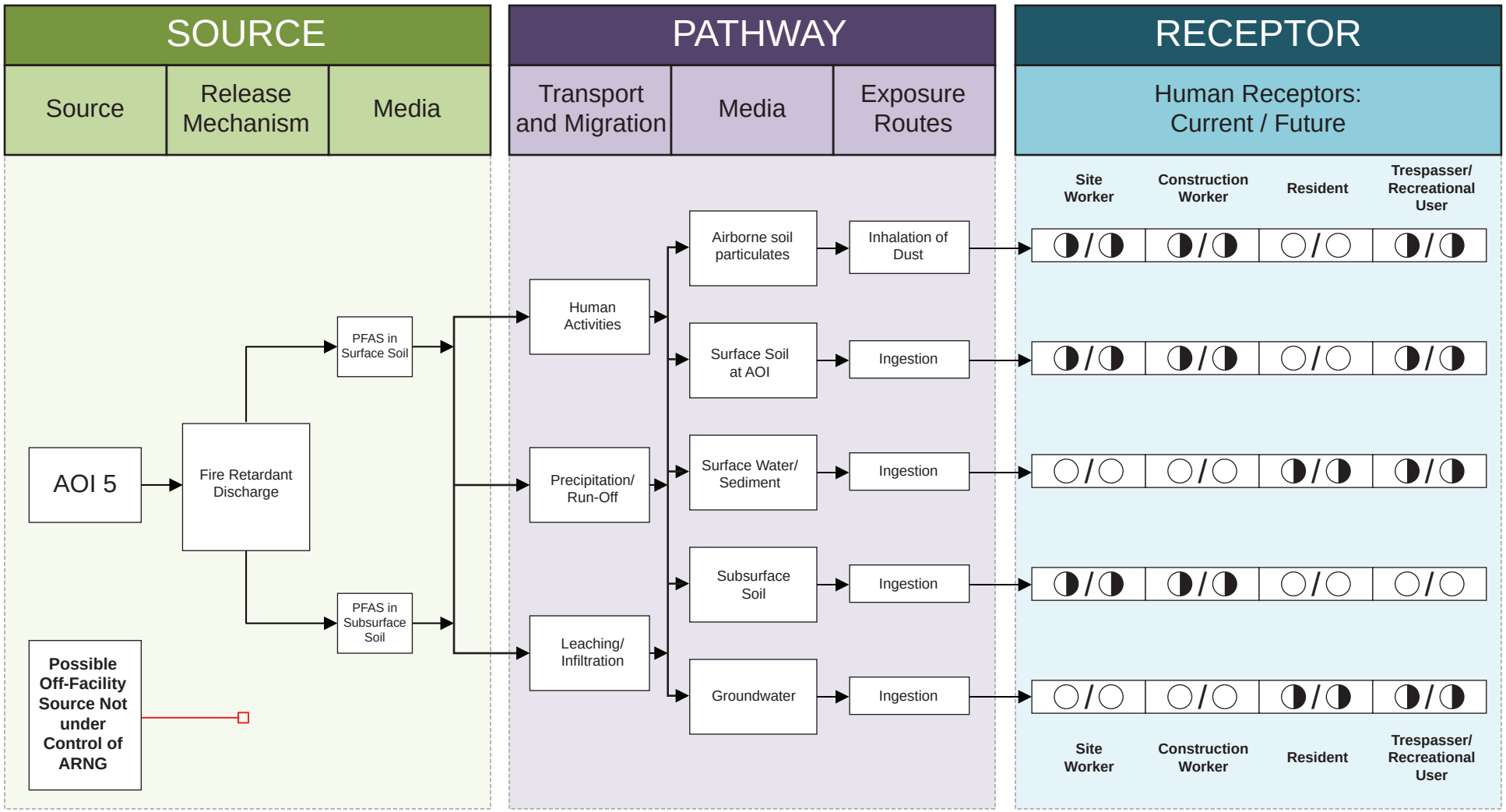


LEGEND

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

Figure 6-6

Conceptual Site Model
AOI 4 Fire Station Building 3132 & Drainage Ditch #1

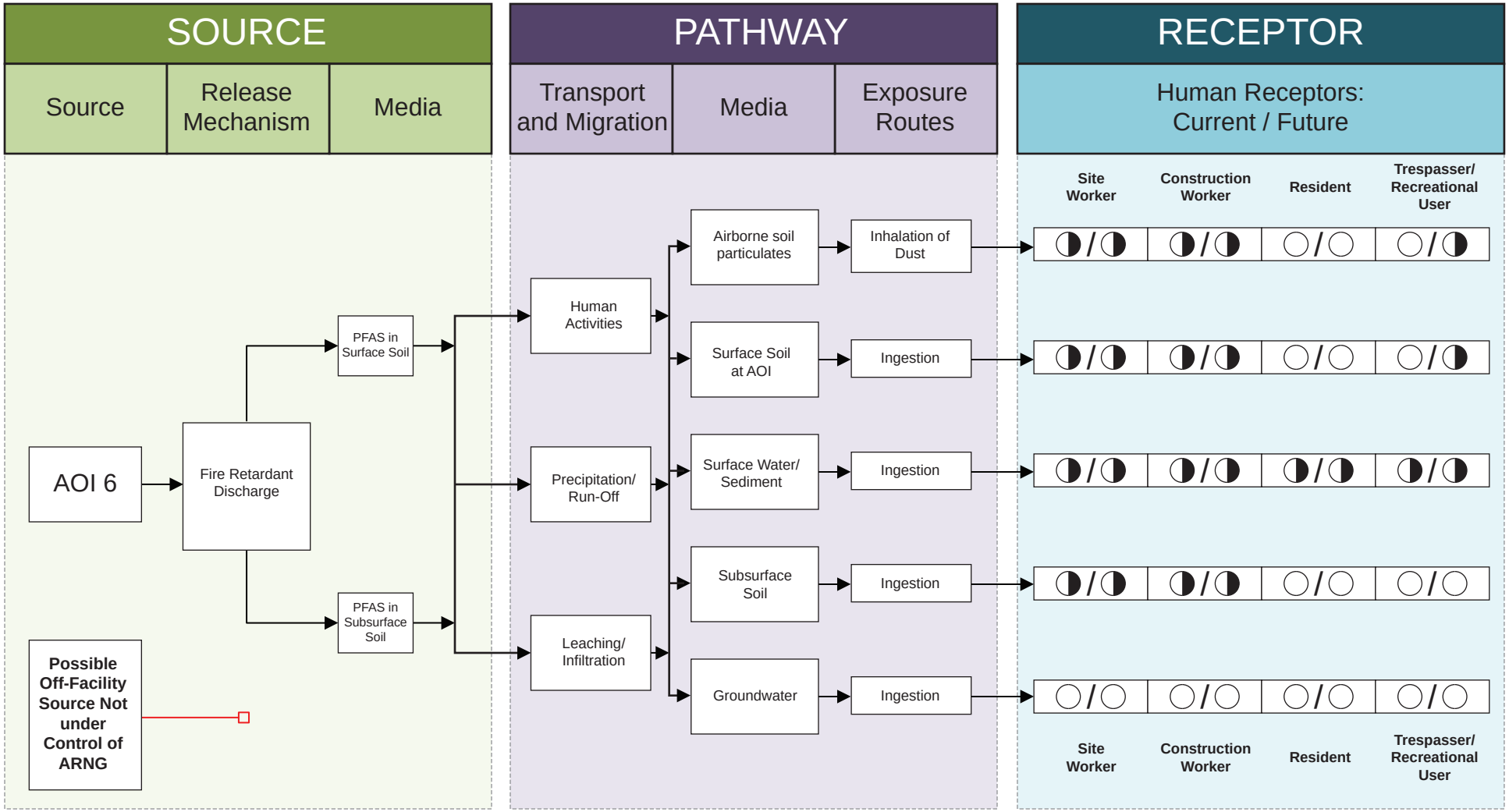


LEGEND

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

Figure 6-7

Preliminary Conceptual Site Model AOI 5 Utilidor Fire



LEGEND

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

Figure 6-8

Preliminary Conceptual Site Model AOI 6 OB/OD Sites

7. Conclusions

This report presents a summary of available information gathered during the PA on the use and storage of AFFF and other PFAS-related activities at Camp Edwards. The PA findings are based on the information presented in **Appendix A** and **Appendix B**.

7.1 Findings

The AFCEC IRP is performing ongoing PFAS-related activities at AOI 1 through AOI 5 and other sites; future actions at these AOIs will continue to be managed by the AFCEC IRP. For AOI 6, the IAGWSP in coordination with MassDEP and the USEPA have written the *Final Sampling Work Plan for Per- and Polyfluoroalkyl Substances (PFAS)* (USACE, 2019) to address each OB/OD Site for PFAS. **Figure 7-1** and **Figure 7-2** present a summary of PA findings (**Table 7-1**).

Table 7-1. Camp Edwards Areas of Interest

Area of Interest	Name	Used by	Release Dates
AOI 1	Hangar 2816 and Building 2814	MAARNG	1970s to 2013
AOI 2	LF-1	JBCC	1970s to 1984
AOI 3	WWTP Sand Infiltration Beds	JBCC	1995 to Present
AOI 4	Fire Station Building 3132 and Drainage Ditch #1	JBCC	Ongoing; 25 March 2015 and other unspecified release dates
AOI 5	Utilidor Fire	MAARNG	Late 1980s
AOI 6	OB/OD Sites (J1, J2, J3, and Demolition Area 1)	MAARNG and a Department of Defense Contractor	Mid-1970s to late 1980s

Thirteen potential off-facility sources of PFAS were considered in the local area surrounding Camp Edwards. Descriptions of these sources are presented in the *AFCEC JBCC PFAS Program Summary* (**Appendix A**; AFCEC, 2020).

Based on the potential AFFF releases documented at Camp Edwards and the contiguous surrounding JBCC area, there is potential for exposure to PFAS contamination in soil, groundwater, surface water, and sediment for the following potential receptors: site workers (e.g., Camp Edwards military and non-military staff and visitors), onsite construction workers, fulltime and part-time residents outside the facility boundary, trespassers, and recreational users. In addition, residents using groundwater for drinking water surrounding the facility may be exposed to migrating PFAS contamination via the nearby groundwater pathway. The groundwater ingestion pathway is potentially complete for off-facility residents to the south, southeast, southwest, and west of Camp Edwards. Receptors are less likely to be exposed to potential PFAS contamination through direct contact with soil and inhalation via air; however, some PFAS chemicals are water soluble and can migrate readily from soil to groundwater or surface water via leaching and run-off. Therefore, there is a potential for PFAS contamination in soil to migrate to groundwater and surface water systems.

7.2 Uncertainties

A number of information sources were investigated during this PA to determine the potential for PFAS-containing materials to have been present, used, or released at the facility. Historically,

documentation of PFAS use was not required because PFAS were considered benign. Therefore, records were not typically kept by the facility or available during the PA on the use of PFAS in training, firefighting, or other non-traditional activities, or on its disposition.

The conclusions of this PA are based on all available information, including previous environmental reports, observations made during the visual site inspection, and interviews. Interviews of personnel with direct knowledge of a facility generally provided the most useful insights regarding a facility's historical and current PFAS-containing materials. Sometimes the provided information was vague or conflicted with other sources. Gathered information has a degree of uncertainty due to the absence of written documentation, the limited number of personnel with direct knowledge due to staffing changes, the time passed since PFAS were first used (1969 to present), and a reliance on personal recollection. Inaccuracies may arise in potential PFAS release locations, dates of release, volume of releases, and the concentration of AFFF used. There is also a possibility the PA has missed a source of PFAS, as the science of how PFAS may enter the environment continually evolves.

In order to minimize the level of uncertainty, readily available data regarding the use and storage of PFAS were reviewed, retired and current personnel were interviewed, multiple persons were interviewed for the same potential source area, and potential source areas were visually inspected.

Table 7-2 summarizes the uncertainties associated with this PA:

Table 7.2. Uncertainties within the PA

Area of Interest	Source of Uncertainty
All AOIs	Camp Edwards interviewees did not recall the type or brand of firefighting foam historically used; it is not known if the generic use of the term “foam” by interviewees may have, in some instances, been in reference to AFFF or other non-PFAS containing firefighting foams or wetting agents.
AOI 1: Hangar 2816 and Building 2814	Exact locations of potential PFAS releases were not recalled during interviews. Interviewees recalled conflicting locations for the CAFS training area and where the fire truck was parked.
AOI 2: LF-1	Interviewees could not identify the content or quantity of disposed material in unregulated disposal areas. It is unclear from interviews if disposed municipal sewage sludge and fire extinguisher fluid contain PFAS.
AOI 3: WWTP Infiltration Sand Beds	The quantity of PFAS in influent released from off-facility sources is unknown.
AOI 4: Fire Station Building 3132 & Drainage Ditch #1	Interviewees could not recall the exact amount or extent of off-facility source release into Drainage Ditch #1 or exact location and extent of potential release from line flushing into Drainage Ditch #1.
AOI 5: Utilidor Fire	Interviewees did not recall the type or quantity of foam discharged into the subsurface during the underground fire or the exact location and extent of the potential release.
AOI 6: OB/OD Sites (J1, J2, J3, and Demolition Area 1)	Exact locations and quantities of AFFF use unknown. Interviewees were unavailable to confirm anecdotal evidence regarding AFFF use.

7.3 Potential Future Actions

Interviews and records (covering from the 1940s to present) indicate that current or former ARNG activities may have resulted in potential PFAS releases at the six AOIs identified during the PA.

Based on the preliminary CSMs developed for the AOIs, there is potential for human receptors to be exposed by direct or indirect pathways to PFAS contamination by inhalation of soil dust or ingestion of soil, groundwater, surface water, and sediment at these AOIs. **Table 7-3** summarizes the rationale used to determine if the AOIs should be considered for further investigation under the CERCLA process and undergo an SI.

The AFCEC IRP is performing ongoing PFAS-related activities at AOI 1 through AOI 5; future actions at these AOIs will continue to be managed by the AFCEC IRP. The ARNG IAGWSP being executed under the SDWA is currently working with the MassDEP and USEPA on a comprehensive PFAS investigation work plan to collect groundwater samples at several sites on Camp Edwards, including at AOI 6. ARNG will evaluate the need for an SI at AOI 6 at Camp Edwards based on the potential receptors, the potential migration of PFAS contamination off the facility, and the availability of resources. Any future investigations related to PFAS at AOI 6 will be managed by the IAGWSP.

Table 7-3 PA Findings Summary

Area of Interest	AOI Location	Rationale	Potential Future Action
AOI 1: Hangar 2816 & Building 2814	41.659555°N; 70.535325°W and 41.660028°N; 70.536491°W	History of AFFF storage and potential discharge to ground surface; detections of PFAS in groundwater at the AOI exceeding the USEPA HA.	Managed by the AFCEC IRP
AOI 2: LF-1	41.673590°N; 70.554194°W	Potential disposal of materials containing PFAS; detections of PFAS in groundwater at the AOI exceeding the USEPA HA.	Managed by the AFCEC IRP
AOI 3: WWTP Sand Infiltration Beds	41.764626°N; 70.562624°W	Discharge of wastewater containing PFAS to the subsurface; detections of PFAS in groundwater at the AOI exceeding the USEPA HA.	Managed by the AFCEC IRP
AOI 4: Fire Station Building 3132 & Drainage Ditch #1	41.656330°N; 70.529865°W and 41.656981°N; 70.531698°W	Approximately 2 gallons of AFFF released to ground surface and additional releases through the building drains and connected OWS and WWTP lines; detections of PFAS in groundwater downgradient of the AOI exceeding the USEPA HA.	Managed by the AFCEC IRP
AOI 5: Utilidor Fire	41.677778°N; 70.540833°W	Unknown type and quantity of foam used once for emergency response in 1988 or 1989. The AFCEC Remediation Program Manager stated that groundwater results nearby the AOI indicated this foam did not contain PFAS.	Managed by the AFCEC IRP
AOI 6: OB/OD Sites (J1, J2, J3, and Demolition Area 1)	41.694006°N; 70.546667°W	Unknown quantity of AFFF potentially used to extinguish open burns and detonations from the mid-1970s to late 1980s.	Proceed with further investigation; focus on soil and groundwater.

CLIENT	ARNG			
PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA			
REVISED	7/21/2020	GIS BY	MS	7/21/2020
SCALE	1:14,400	CHK BY	DC	7/21/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	7/21/2020

- Area of Interest
- Potential PFAS Release
- JBCC Facility Boundary
- Water Body
- Wetland

N

Camp Edwards North Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 7-1

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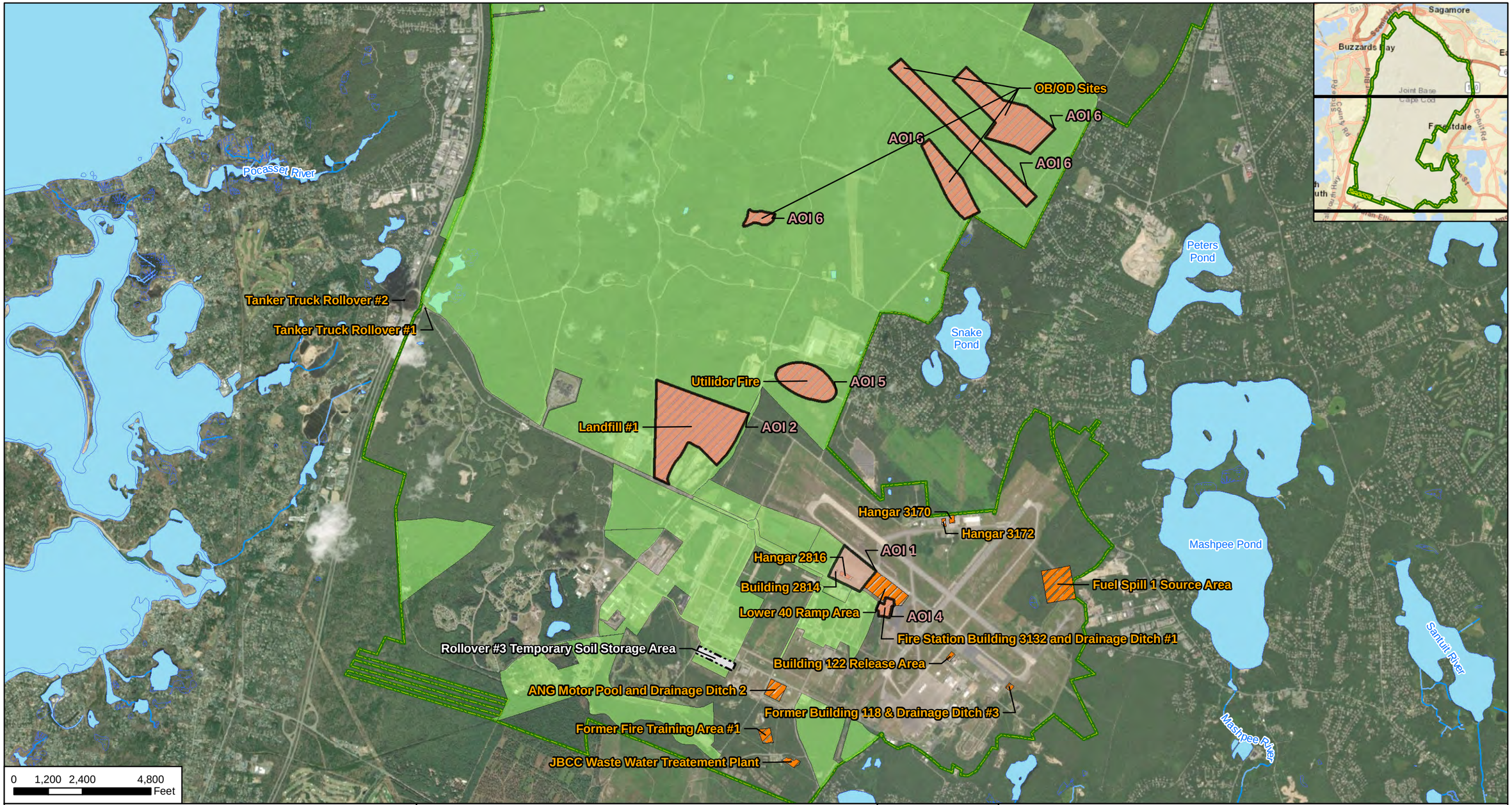

CLIENT	ARNG
PROJECT	Preliminary Assessment for PFAS at Camp Edwards, MA

REVISED	9/25/2020	GIS BY	MS	9/25/2020
SCALE	1:40,800	CHK BY	DC	9/25/2020
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	9/25/2020

- Area of Interest
- Potential PFAS Release
- No Suspected Release
- Camp Edwards
- JBCC Facility Boundary
- Water Body
- Wetland
- River/Stream
- Canal/Ditch

N

Camp Edwards South Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 7-2

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Appendix A
Data Resources

Data Resources will be provided separately on CD. Data Resources for Camp Edwards include:

Camp Edwards Previous Investigations

- 1992 Comprehensive Plan, Massachusetts Military Reservation, Cape Cod, MA
- 2009 Camp Edwards Training Site Integrated Natural Resources Management Plan
- 2009 Decision Document Addendum No. 1 Demolition Area 1 Source Area, Camp Edwards, Massachusetts Military Reservation, Cape Cod, Massachusetts
- 2009 Final Integrated Cultural Resources Management Plan Revision for Sites and Training Installations of the Massachusetts Army National Guard, Fiscal Years 2009-2013
- 2015 Final Preliminary Assessment Report for Perfluorinated Compounds at Joint Base Cape Cod, MA
- 2016 Final Supplemental Remedial Investigation/Feasibility Study Work Plan for 1,4-Dioxane and Perfluorinated Compounds at Ashumet Valley, Joint Base Cape Cod, MA
- 2017 Final Focused Site Inspection Report for Perfluorinated Compounds at the Flight Line Area, Joint Base Cape Cod, MA
- 2018 Final Supplemental Remedial Investigation Report for 1,4-Dioxane and Perfluorinated Compounds at Landfill-1, Joint Base Cape Cod, MA
- 2018 Final 5th Five Year Review, 2012-2017, Joint Base Cape Cod Superfund Site, Otis Air National Guard Base, MA
- 2018 Action Memorandum for a Time-Critical Removal Action Treatment of PFOS- and PFOA-Contaminated Water in Water Supply Wells Near Joint Base Cape Cod, MA
- 2019 USACE Final Sampling Work Plan for Per- and Polyfluoroalkyl Substances (PFAS). Apr. 2019.
- 2020, AFCEC JBCC PFAS Program Summary

Camp Edwards Facility Maps

- 2004 Ground-Water Recharge Areas and Traveltimes to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, MA
- 2018 Joint Base Cape Cod 2018 Occupancy

Appendix B
Preliminary Assessment Documentation

Appendix B.1
Interview Records

~~PA Interview Questionnaire - Other~~

Facility: _____
Interviewer: _____
Date/Time: _____

PFAS Camp Edwards Sign In

Name	Organization	Signature
[redacted]	AECOM	[redacted]
	MAARNG ENV	
	ARNG - NGB	
	ARNG - IAGWSP	
	ARNG - ENV	
	ARNG - I3E	
	ARNG - IATAP	
	MAARNG, ENV	
	AFCEC	
	ARNG - I3E	
	CH2M / Jacobs	

PA Interview Questionnaire - Other

Facility: MA ARNG Office
Interviewer: [redacted]
Date/Time: 9/13/18

- Will sampling procedures for PFAS
  - PFAS sampling at end of calendar year
  - Demo 1, J2 North, J2 East, J3
- Public drinking water wells have GAC systems (on post)
  - 4 wells → 3 to NE, 1 to NW
- Doing our own PA regardless of other services work
- Fire station under ARNG control
- ARNG owns 27% of LF1
- ARNG owns 36% of Fire station building, wheeled equipment, 9 firefighters (own the AFFF)
  - 2 military trucks, 4 civilian trucks
- [redacted] "Hangar 2816 only potential SI site".
- ~~8~~ 5 sites
- 2814 (Fire Truck)
- OB/OD
- JBCC Fire Department (Fire Station Building 3132)
- B2818 Tri-Max on Helicopter Pad
- LF1
- Demo 1
- J2 North
- J2 East
- J3
- J1 South
- Rollover #3
- J1, J2, J3 all DOD contractors under Army (offsite release areas)

PA Interview Questionnaire - Other

Facility: AFCEC
Interviewer: [redacted]
Date/Time: 9/13/18 1025

Interviewee: [redacted] **Title:** **Phone Number:** **Email:**	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N

Roles or activities with the Facility/Years working at the Facility:

Air National Guard Groundwater Program

AFCEC is federal facilities manager

PFAS Use: Identify accidental/intentional release locations, time frame of release, frequency of releases, storage container size (maintenance, fire training, firefighting, buildings with suppression systems (as builts), fueling stations, crash sites, pest management, recreational, dining facilities, metals plating, or waterproofing). How are materials ordered/purchased/disposed/shared with others?

- LF1, Ashumet Valley, FS1 Plumes have PFAS - LF1 has treatment system GAC	**Known Uses** Use
- AFCEC PA didn't include impact area ranges - Published PA and focused SI	Procurement Disposition
- 2816 just above HA at 65-70 ft bgs - 998 ppt in gw in DP boring W of building	Storage (Mixed) Storage (Solution)
- WWTP influent has PFAS, but not in lift stations - haven't identified source	Inventory, Off-Spec Containment SOP on Filling
- LF1 plume in 2 wells - narrow	Leaking Vehicles
- Mass DEP took over Rollover #3	Nozzle and Suppression System Testing
- Existing foam in buckets from town of Bourne after Rollover #3 happened ~ 2013-2014	Dining Facilities Vehicle Washing
- Temporarily placed soil from Rollover #3 excavation near on Gunther Rd. near Golf Course	Ramp Washing Fuel Spill Washing and Fueling Stations
- DEP picked up soil a few weeks later & transported off site.	Chrome Plating or Waterproofing

- Soil was stored on poly and covered while on site.
- Will provide photos.

PA Interview Questionnaire - Other

Facility: B 2816
Interviewer [redacted]
Date/Time: 9/13/18

Interviewee: [redacted] **Title:** Retired **Phone Number:** **Email:**	Can your name/role be used in the PA Report? Y or (N) Can you recommend anyone we can interview? Y or (N)

Roles or activities with the Facility/Years working at the Facility:

Aircraft Mechanic 1976 - 2012
Building 2816

PFAS Use: Identify accidental/intentional release locations, time frame of release, frequency of releases, storage container size (maintenance, fire training, firefighting, buildings with suppression systems (as builts), fueling stations, crash sites, pest management, recreational, dining facilities, metals plating, or waterproofing). How are materials ordered/purchased/disposed/shared with others?

- had a lime green fire truck	**Known Uses**
- had a company of firefighters	Use
- several (20) 5-gal plastic drums of AFFF	Procurement
- stored in dirt / in 2814	Disposition
- pump unit from truck stored behind 2814	Storage (Mixed)
- truck body rusted	Storage (Solution)
- no evidence of leak	Inventory, Off-Spec
	Containment
- ARNG owned area NW of B2814	SOP on Filling
- Shot AFFF from truck once when they first got it.	Leaking Vehicles
- Brought Tri-Max into building in winter & during storms	Nozzle and Suppression System Testing
- Older ~~Tri-Max~~ (or) training area in parking lot	Dining Facilities
- Late 70's (~5-yr period) ~ 50 personnel	Vehicle Washing
- annual training	Ramp Washing
- Bethany Fire Dept.	Fuel Spill Washing and Fueling Stations
- Old fire dept. building SE of 2814 late 70's - 90's	Chrome Plating or Waterproofing

- Family Day - possibility of use - doesn't remember it.

PA Interview Questionnaire - Other

Facility: B 2816
Interviewer: [redacted]
Date/Time: 9/13/18

Interviewee [redacted] **Title:** **Phone Number:** **Email:**	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N

Roles or activities with the Facility/Years working at the Facility:

PFAS Use: Identify accidental/intentional release locations, time frame of release, frequency of releases, storage container size (maintenance, fire training, firefighting, buildings with suppression systems (as builts), fueling stations, crash sites, pest management, recreational, dining facilities, metals plating, or waterproofing). How are materials ordered/purchased/disposed/shared with others?

	Known Uses
-Used Trimax with practice solution for training once per year in parking lot & on flight line	Use
- Practice solution looked like soapy foam - white	Procurement
- 15 years ago to about 5 years ago	Disposition
[redacted]	Storage (Mixed)
[redacted] — may know the solution	Storage (Solution)
[redacted]	Inventory, Off-Spec
[redacted] - Went to Trimax training - ran the training	Containment
	SOP on Filling
	Leaking Vehicles
	Nozzle and Suppression System Testing
	Dining Facilities
	Vehicle Washing
	Ramp Washing
	Fuel Spill Washing and Fueling Stations
	Chrome Plating or Waterproofing

PA Interview Questionnaire - Other

Facility: New Fire Station
Interviewer [redacted]
Date/Time: 9/13/18

Interviewee: [redacted] **Title:** Station Chief / Sgt. **Phone Number:** **Email:**	Can your name/role be used in the PA Report? Y or (N) Can you recommend anyone we can interview? (Y) or N [redacted] ← may know about UTE fire

Roles or activities with the Facility/Years working at the Facility:

On post since 1989
With AASF 89-93
93-Present w/ fire dept. - transitioned between 2 buildings

PFAS Use: Identify accidental/intentional release locations, time frame of release, frequency of releases, storage container size (maintenance, fire training, firefighting, buildings with suppression systems (as builts), fueling stations, crash sites, pest management, recreational, dining facilities, metals plating, or waterproofing). How are materials ordered/purchased/disposed/shared with others?

- Facility built in 2007	**Known Uses**
- 2 trucks w/ 600-gal tanks. Have not used. - Pressure test with water, not foam	Use
	Procurement
	Disposition
UTE Site Fire ~1988/1989	Storage (Mixed)
- underground fire - ~~Bomarc~~ missile site	Storage (Solution)
- Used foam - verified by [redacted]	Inventory, Off-Spec
	Containment
	SOP on Filling
- Storing AFFF at new fire station ~1,620 gallons total stored on site	Leaking Vehicles
	Nozzle and Suppression System Testing
	Dining Facilities
- Class A foam (Nova Cool) used at wildfire - Sprayed along Jefferson between goat pasture Rd and Pocasset Rd.	Vehicle Washing
	Ramp Washing
	Fuel Spill Washing and Fueling Stations
- verified ~200 gal foam used	Chrome Plating or Waterproofing

- Barnstable Co. & Plymouth Co. Fire Depts. also participated (over 10)

PA Interview Questionnaire - Other

Facility: New Fire Station
Interviewer: [redacted]
Date/Time: 9/13/18

- [redacted] as deputy fire chief

- No live fire training on post w/ AFFF
  - All training at the academy
- B2816 had twin-agent truck w/ AFFF
- Former vehicle maintenance shop South of B2816
  - Mandated to do refractometer test on foam annually
  - had to spray foam to do test
  - doesn't know where test was performed

Army had 530C fire truck at the FMS Shop
↳ would have had foam
↳ green
↳ parked at back fence of FMS shop
- was formerly outside of air guard old fire station

- OWS at 2814 went in 1989
  - Area excavated to build pad
- ~~No rec~~ Doesn't recall foam use on either side of 2814
- Maintenance did foam testing

PA Interview Questionnaire - Other

Facility: New Fire Station
Interviewer: [redacted]
Date/Time: 9/13/18

[redacted]

- used class A foam for wild fire
  ~220 gal class A foam used
- used it on perimeter of fire
- June 2016

Appendix B.2
Visual Site Inspection Checklists

Visual Site Inspection Checklist

Names(s) of people performing VSI: [redacted]

Recorded by: [redacted]

ARNG Contact: [redacted]

Date and Time: 9/13/2018 11:30

Method of visit (walking, driving, adjacent): Walking

Source/Release Information

Site Name / Area Name / Unique ID: Building 2814

Site / Area Acreage: 6.5

Historic Site Use (Brief Description): Former MA ARNG fire station and motor pool

Current Site Use (Brief Description): MA ARNG Echo Company training facility and motor pool

Physical barriers or access restrictions: Yes, access restricted to facility staff

1. Was PFAS used (or spilled) at the site/area? **Y**

1a. If yes, document how PFAS was used and usage time (e.g., fire fighting training 2001 to 2014):

Class 530C fire truck equipped with AFFF on site late 1970s-1990s. 20 5-gal plastic drums of AFFF stored in dirt near building.

2. Has usage been documented? **N**

2a. If yes, keep a record (place electronic files on a disk):

3. What types of businesses are located near the site? **Industrial / Commercial / Plating / Waterproofing / Residential**

3a. Indicate what businesses are located near the site

On base.

4. Is this site located at an airport/flightline? **Y**

4a. If yes, provide a description of the airport/flightline tenants:

Adjacent to Otis ANG flightline

Visual Survey Inspection Log

Other Significant Site Features:

1. Does the facility have a fire suppression system? **N**

1a. If yes, indicate which type of AFFF has been used:

1b. If yes, describe maintenance schedule/leaks:

1c. If yes, how often is the AFFF replaced:

1d. If yes, does the facility have floor drains and where do they lead? Can we obtain an as built drawing?

Transport / Pathway Information

Migration Potential:

1. Does site/area drainage flow off installation? **N**

1a. If so, note observation and location:

2. Is there channelized flow within the site/area? **N**

2a. If so, please note observation and location:

3. Are monitoring or drinking water wells located near the site? **Y**

3a. If so, please note the location:

4. Are surface water intakes located near the site? **N**

4a. If so, please note the location:

5. Can wind dispersion information be obtained? **N**

5a. If so, please note and observe the location.

6. Does an adjacent non-ARNG PFAS source exist? **N**

6a. If so, please note the source and location.

6b. Will off-site reconnaissance be conducted?

Visual Survey Inspection Log

Significant Topographical Features:

1. Has the infrastructure changed at the site/area? **Y**

1a. If so, please describe change (ex. Structures no longer exist):

Wash rack installed in 1989. Cold storage building constructed behind B2814.

2. Is the site/area vegetated? **Y**

2a. If not vegetated, briefly describe the site/area composition:

Partial vegetation - grasses behind the motor pool.

3. Does the site or area exhibit evidence of erosion? **N**

3a. If yes, describe the location and extent of the erosion:

4. Does the site/area exhibit any areas of ponding or standing water? **N**

4a. If yes, describe the location and extent of the ponding:

Receptor Information

1. Is access to the site restricted? **Y**

1a. If so, please note to what extent:

Only site workers permitted on site. Fences.

2. Who can access the site? **Site Workers / Construction Workers / Trespassers / Residential / Recreational Users / Ecological**

2a. Circle all that apply, note any not covered above:

Site Workers, Construction Workers, Trespassers

3. Are residential areas located near the site? **N**

3a. If so, please note the location/distance:

4. Are any schools/day care centers located near the site? **N**

4a. If so, please note the location/distance/type:

5. Are any wetlands located near the site? **N**

5a. If so, please note the location/distance/type:

Visual Survey Inspection Log

Additional Notes

Fire truck may have performed testing on AFFF system at this location. AFFF may have been discharged at the north end of the motor pool in the grassy area/location of current WR/OWS.

Photographic Log

Photo ID/Name	Date & Location	Photograph Description
1	9/13/2018 Building 2814	Motor Pool area behind Building 2814 with cold storage building.
2	9/13/2018 Building 2814	Secondary containment area for OWS on left. Area of potential AFFF testing to east (foreground) and northeast (background) of secondary containment area.
3	9/13/2018 Building 2814	Motor Pool behind Building 2814. Potential parking area for fire truck.

Visual Survey Inspection Log

Names(s) of people performing VSI: [redacted]

Recorded by: [redacted]

ARNG Contact: [redacted]

Date and Time: 9/13/2018 11:30

Method of visit (walking, driving, adjacent): Walking

Source/Release Information

Site Name / Area Name / Unique ID: Hangar 2816

Site / Area Acreage: 13.75

Historic Site Use (Brief Description): Helicopter hangar for MA ARNG

Current Site Use (Brief Description): Helicopter hangar for MA ARNG

Physical barriers or access restrictions: Yes, access restricted to facility staff

1. Was PFAS used (or spilled) at the site/area? **Y**

1a. If yes, document how PFAS was used and usage time (e.g., fire fighting training 2001 to 2014):

Tri-Max units containing AFFF stored on site from late 1970s to around 2013. Annual training with the units occurred on site intermittently.

2. Has usage been documented? **N**

2a. If yes, keep a record (place electronic files on a disk):

3. What types of businesses are located near the site? **Industrial / Commercial / Plating / Waterproofing / Residential**

3a. Indicate what businesses are located near the site

On Base

4. Is this site located at an airport/flightline? **Y**

4a. If yes, provide a description of the airport/flightline tenants:

Adjacent to Otis ANG flightline

Visual Survey Inspection Log

Other Significant Site Features:

1. Does the facility have a fire suppression system? **Y**

1a. If yes, indicate which type of AFFF has been used:

Purple K - potassium bicarbonate

1b. If yes, describe maintenance schedule/leaks:

N/A

1c. If yes, how often is the AFFF replaced:

N/A

1d. If yes, does the facility have floor drains and where do they lead? Can we obtain an as built drawing?

Floor drains lead to storm sewer system. As-built drawing requested.

Transport / Pathway Information

Migration Potential:

1. Does site/area drainage flow off installation? **N**

1a. If so, note observation and location:

2. Is there channelized flow within the site/area? **N**

2a. If so, please note observation and location:

3. Are monitoring or drinking water wells located near the site? **Y**

3a. If so, please note the location:

4. Are surface water intakes located near the site? **N**

4a. If so, please note the location:

5. Can wind dispersion information be obtained? **N**

5a. If so, please note and observe the location.

6. Does an adjacent non-ARNG PFAS source exist? **Y**

6a. If so, please note the source and location.

Lower 40 Ramp Area adjacent to site to the east.

6b. Will off-site reconnaissance be conducted? **N**

Visual Survey Inspection Log

Significant Topographical Features:

1. Has the infrastructure changed at the site/area? **Y**

1a. If so, please describe change (ex. Structures no longer exist):

Floor drains used to discharge to dry wells on either side of the building.

2. Is the site/area vegetated? **N**

2a. If not vegetated, briefly describe the site/area composition:

3. Does the site or area exhibit evidence of erosion? **N**

3a. If yes, describe the location and extent of the erosion:

4. Does the site/area exhibit any areas of ponding or standing water? **N**

4a. If yes, describe the location and extent of the ponding:

Receptor Information

1. Is access to the site restricted? **Y**

1a. If so, please note to what extent:

Only site workers permitted on site. Fences

2. Who can access the site? **Site Workers / Construction Workers / Trespassers / Residential / Recreational Users / Ecological**

2a. Circle all that apply, note any not covered above:

Site Workers, Construction Workers, Trespassers

3. Are residential areas located near the site? **N**

3a. If so, please note the location/distance:

4. Are any schools/day care centers located near the site? **N**

4a. If so, please note the location/distance/type:

5. Are any wetlands located near the site? **N**

5a. If so, please note the location/distance/type:

Visual Survey Inspection Log

Additional Notes

Photographic Log

Photo ID/Name	Date & Location	Photograph Description
4	9/13/18 Hangar 2816	Front of Hangar 2816 - Helicopter Hangar Area
5	9/13/18 Hangar 2816	Floor drains in Hangar 2816. The floor drains run along the length of the building on the northwest side.
6	9/13/18 Hangar 2816	Storm drain on flight line at Hangar 2816. The storm drain runs parallel to Building 2818 from northwest to southeast, where it connects to Drainage Ditch #1.

Visual Survey Inspection Log

Names(s) of people performing VSI: [redacted]

Recorded by: [redacted]

ARNG Contact: [redacted]

Date and Time: 9/13/2018 13:00

Method of visit (walking, driving, adjacent): Walking

Source/Release Information

Site Name / Area Name / Unique ID: Fire Station Building 3132

Site / Area Acreage: 6.4

Historic Site Use (Brief Description): JBCC Fire Station

Current Site Use (Brief Description): JBCC Fire Station

Physical barriers or access restrictions: On base. No physical barriers.

1. Was PFAS used (or spilled) at the site/area? **Y**

1a. If yes, document how PFAS was used and usage time (e.g., fire fighting training 2001 to 2014):

Approximately 1,620 gals AFFF stored on facility 2007-Present. Approximately 2 gallons AFFF flushed out of fire hoses to gravel area in NW corner of facility.

2. Has usage been documented? **N**

2a. If yes, keep a record (place electronic files on a disk):

3. What types of businesses are located near the site? **Industrial / Commercial / Plating / Waterproofing / Residential**

3a. Indicate what businesses are located near the site

On Base

4. Is this site located at an airport/flightline? **Y**

4a. If yes, provide a description of the airport/flightline tenants:

Adjacent to Otis ANG flightline

Visual Survey Inspection Log

Other Significant Site Features:

1. Does the facility have a fire suppression system? **N**

1a. If yes, indicate which type of AFFF has been used:

1b. If yes, describe maintenance schedule/leaks:

1c. If yes, how often is the AFFF replaced:

1d. If yes, does the facility have floor drains and where do they lead? Can we obtain an as built drawing?

Transport / Pathway Information

Migration Potential:

1. Does site/area drainage flow off installation? **N**

1a. If so, note observation and location:

2. Is there channelized flow within the site/area? **Y**

2a. If so, please note observation and location:

Drainage Ditch #1 located to the west of the building.

3. Are monitoring or drinking water wells located near the site? **Y**

3a. If so, please note the location:

4. Are surface water intakes located near the site? **N**

4a. If so, please note the location:

5. Can wind dispersion information be obtained? **N**

5a. If so, please note and observe the location.

6. Does an adjacent non-ARNG PFAS source exist? **Y**

6a. If so, please note the source and location.

Lower 40 Ramp Area adjacent to site to the west.

6b. Will off-site reconnaissance be conducted? **N**

Visual Survey Inspection Log

Significant Topographical Features:

1. Has the infrastructure changed at the site/area? **N**

1a. If so, please describe change (ex. Structures no longer exist):

2. Is the site/area vegetated? **Y**

2a. If not vegetated, briefly describe the site/area composition:

Partially vegetated to the west and Drainage Ditch #1. Grasses, trees, and shrubs.

3. Does the site or area exhibit evidence of erosion? **N**

3a. If yes, describe the location and extent of the erosion:

4. Does the site/area exhibit any areas of ponding or standing water? **N**

4a. If yes, describe the location and extent of the ponding:

Receptor Information

1. Is access to the site restricted? **Y**

1a. If so, please note to what extent:

On base - authorized personnel only

2. Who can access the site? **Site Workers / Construction Workers / Trespassers / Residential / Recreational Users / Ecological**

2a. Circle all that apply, note any not covered above:

Site Workers, Construction Workers, Trespassers

3. Are residential areas located near the site? **N**

3a. If so, please note the location/distance:

4. Are any schools/day care centers located near the site? **N**

4a. If so, please note the location/distance/type:

5. Are any wetlands located near the site? **N**

5a. If so, please note the location/distance/type:

Visual Survey Inspection Log

Additional Notes

Photographic Log

Photo ID/Name	Date & Location	Photograph Description
7	9/13/2018 Drainage Ditch #1	Drainage Ditch #1
8	9/13/2018 Fire Station Building 3132	Front of Fire Station Building 3132 (current fire station for Joint Base Cape Cod)
9	9/13/2018 Fire Station Building 3132	Approximate location of Fire Station Building 3132 AFFF release.
10	9/13/2018 Fire Station Building 3132	Two ARNG fire engines with AFFF tanks.

Appendix B.3
Conceptual Site Model Information

Preliminary Assessment – Conceptual Site Model Information

Site Name: Camp Edwards

Why has this location been identified as a site? Facility is a training site with multiple vehicle maintenance and fueling areas. AFFF was stored in vehicles or plastic containers, and released in training Exercises and emergency responses.

Are there any other activities nearby that could also impact this location? Yes. AFFF releases from adjacent locations on JBCC related to AFF storage, emergency response actions, ANG facility, and waste/sewage water treatment.

Training Events

Have any training events with AFFF occurred at this site? **Yes**

If so, how often? **Annually from late 1970s through 2013.**

How much material was used? Is it documented? **Unknown quantity. Contents of foam discharge during training events could not be identified. Unknown quantity.**

Identify Potential Pathways: Do we have enough information to fully understand over land surface water flow, groundwater flow, and geological formations on and around the facility? Any direct pathways to larger water bodies?

Surface Water:

Surface water flow direction? **South towards wetlands and Ashumet Pond; west towards Buzzards Bay; north towards Cape Cod Canal and Cape Cod Bay.**

Average rainfall? **45.16 inches annual precipitation per year**

Any flooding during rainy season? **No**

Direct or indirect pathway to ditches? **Yes**

Direct or indirect pathway to larger bodies of water? **Yes. Wetlands areas, Ashumet Pond, Johns Pond, Cape Cod Canal.**

Does surface water pond any place on site? **Yes, in various wetlands areas**

Any impoundment areas or retention ponds? **No**

Any NPDES location points near the site? **Yes**

How does surface water drain on and around the flight line? **N/A**

Preliminary Assessment – Conceptual Site Model Information

Groundwater:

Groundwater flow direction? **To south in southern portion; to west in western portion, and to north in northern portion of Camp Edwards and JBCC.**

Depth to groundwater? **Unknown. Maximum hydraulic-head altitude observed at approximately 70 ft msl. Surface water bodies generally connected to groundwater.**

Uses (agricultural, drinking water, irrigation)? **Public water supply, registered community and non-community water supply, private water supply, drinking water**

Any groundwater treatment systems? **Landfill #1, Hunter Avenue, CS-10, CS-10 Mobile Treatment Unit, FS-12, Sandwich Road, FS-1, Ashumet Valley, FS-28**

Any groundwater monitoring well locations near the site? **Yes, many monitoring wells within JBCC and adjacent areas for ongoing investigations**

Is groundwater used for drinking water? **Yes. Groundwater is the sole source of drinking water in the area.**

Are there drinking water supply wells on installation? **Yes**

Do they serve off-post populations? **Yes**

Are there off-post drinking water wells downgradient? **Yes. PFAS have been detected in some downgradient public and private water supply and drinking water wells.**

Waste Water Treatment Plant:

Has the installation ever had a WWTP, past or present? **No. Camp Edwards wastewater is treated at the JBCC WWTP at intersection of Kittridge Road and Boron Drive, on ANG property. WWTP sand infiltration beds for treated wastewater located on north installation boundary.**

If so, do we understand the process and which water is/was treated at the plant? **Yes. Wastewater from JBCC is treated and discharged to sand infiltration beds.**

Do we understand the fate of sludge waste? **Sludge waste from the JBCC WWTP was disposed at the former sewage treatment plant and current WWTP on ANG property. Sludge waste was also disposed in Landfill #1.**

Is surface water from potential contaminated sites treated? **No.**

Equipment Rinse Water

1. Is firefighting equipment washed? Where does the rinse water go?

Firefighting equipment has been washed at Building 2814, Building 3132, and in the flight line area of Otis ANG Base. Rinse water collected in storm sewers and drainage ditches. Possible historical releases to ground surface and asphalt.

2. Are nozzles tested? How often are nozzles tested? Where are nozzles tested? Are nozzles cleaned after use? Where does the rinse water flow after cleaning nozzles?

Some nozzle testing/cleaning has occurred at Building 2814, Building 3132, and in the flight line area of Otis ANG Base. Rinse water flows to storm sewers and drainage ditches, as well as to ground surface and asphalt.

3. Other? **N/A**

Preliminary Assessment – Conceptual Site Model Information

Identify Potential Receptors:

Site Worker **Yes**

Construction Worker **Yes**

Recreational User **Yes**

Residential **Yes**

Child **Yes**

Ecological **Yes**

Note what is located near by the site (e.g. daycare, schools, hospitals, churches, agricultural, livestock)?

Recreational lakes, wetlands, woodlands; residents; Cape Cod Canal

Documentation

Ask for Engineering drawings (if applicable). **No engineering drawings were provided.**

Has there been a reconstruction or changes to the drainage system? When did that occur?

Hangar 2816 drains previously flowed to dry wells on site. The drainage system was reconstructed to discharge to storm sewer (date unknown).

Appendix C
Photographic Log

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 01

Description:
Motor Pool area behind Building 2814 with cold storage building.

Orientation:
W/NW

Photograph No. 02

Description:
Secondary containment area for OWS on left. Area of potential AFFF testing to east (foreground) and northeast (background) of secondary containment area.

Orientation:
NW

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 03

Description:
Motor Pool behind Building 2814. Potential parking area for fire truck.

Orientation:
S/SW

Photograph No. 04

Description:
Front of Building 2816 - Helicopter Hanger Area

Orientation:
NE

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 05

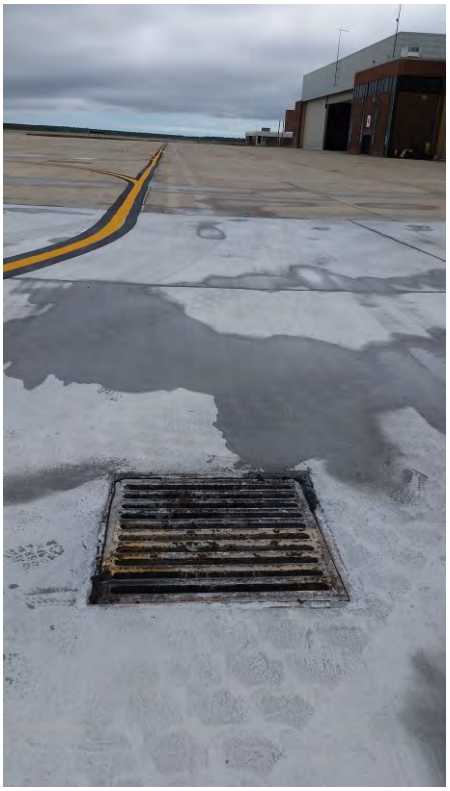
Description:
Floor drains in Hangar 2816. The floor drains run along the length of the building on the northwest side.

Orientation:
NW

Photograph No. 06

Description:
Storm drain on flight line at Hangar 2816. The storm drain runs parallel to Building 2818 from northwest to southeast, where it connects to Drainage Ditch #1.

Orientation:
E/SE



Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 07

Description:
Drainage Ditch #1

Orientation:
S

Photograph No. 08

Description:
Front of Fire Station Building 3132 (current fire station for Joint Base Cape Cod)

Orientation:
E

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 09

Description:
Approximate location of Fire Station Building 3132 AFFF release.

Orientation:
N/NE

Photograph No. 10

Description:
Two ARNG fire engines with AFFF tanks.

Orientation:
SE

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 11

Description:
Entrance to Landfill #1

Orientation:
W

[redacted]

Appendix C - Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Edwards	Joint Base Cape Cod, Massachusetts

Photograph No. 12

Description:
Rollover #3 Temporary Soil Storage Area soil excavated from off-post incident Rollover #3 was stored on concrete with liner between photo location and white truck.

Orientation:
NW

Photograph No. 13

Description:
Approximate location of UTES underground fire between pointer and finger. Other finger shows location of Fire Station Building 3132.

Orientation: