FINAL
Preliminary Assessment Report
Ellington Field Army Aviation Support Facility
Houston, Texas

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

July 2020

Prepared for:

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

UNCLASSIFIED

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Acronyms and Abbreviations

AECOM	AECOM Technical Services, Inc.
AASF	Army Aviation Support Facility
AFFF	aqueous film forming foam
AGPU	aircraft ground power unit
ANGB	Air National Guard Base
AOI	area of interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
DoD	Department of Defense
EDR™	Environmental Data Resources, Inc.™
^{o}F	degrees Fahrenheit
FTA	fire training area
GCAS	Gulf Coast Aquifer System
ITRC	Interstate Technology Regulatory Council
HA	Health Advisory
NASA	National Aeronautics and Space Administration
OWS	Oil-water separator
ng/l	nanograms per liter
PA	Preliminary Assessment
PFAS	per- and poly-fluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
ppt	parts per trillion
SI	Site Inspection
TCEQ	Texas Commission on Environmental Quality
TXANG	Texas Air National Guard
TXARNG	Texas Army National Guard
UCMR3	Unregulated Contaminant Monitoring Rule 3
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VSI	visual site inspection

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 Ellington Field Army Aviation Support Facility (AASF) (also referred to as the "facility") in Houston, Texas, to assess potential PFAS release areas and exposure pathways to receptors. The performance of this PA included the following tasks:

- Reviewed available administrative record documents and Environmental Data Resources, Inc. (EDR)™ report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a 1-day site visit on 26 April 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed personnel during the site visit who were associated with Ellington Field AASF activities, including the Ellington Field AASF Maintenance Supervisor (on site since 1986), Texas Air National Guard (TXANG) Base Environmental Manager (on site since 2008), and the TXANG Fire Chief (on site since 1988);
- Identified areas of interest (AOIs) and developed a preliminary conceptual site model (CSM) to outline the potential release, pathway, and receptors of PFAS for Ellington Field AASF.

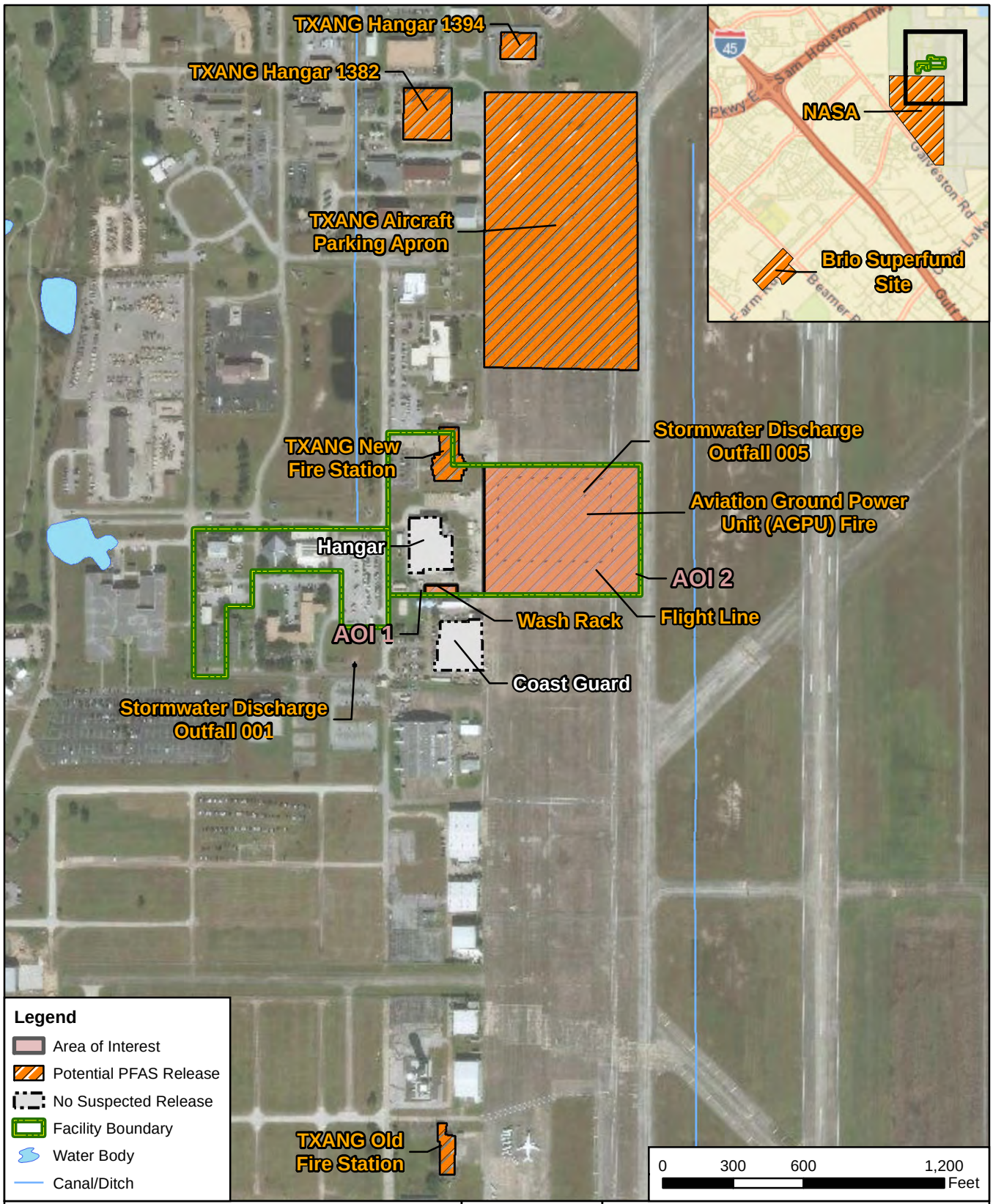
Two suspected PFAS releases were identified during the PA, as described below. These releases constitute two AOIs identified at Ellington Field AASF. The AOIs are shown in **Figure ES-1** and summarized in **Table ES-1** below.

Table ES-1: AOIs at Ellington Field AASF

Area of Interest	Description	Used by	Release Dates
AOI 1	Releases during AFFF fire extinguisher training with mobile carts at the wash rack; discharged to OWS, and then to the sanitary sewer system.	TXARNG and TXANG	1990s - 2009
AOI 2	Releases during AFFF fire extinguisher training with mobile carts at the flight line. Surface runoff flows to stormwater discharge outfall 005 and eventually flows to Horsepen Bayou.	TXARNG and TXANG	1990s - 2009

Based on the reported AFFF releases at these AOIs, there is potential for exposure to PFAS contamination in media at or near the facility. The preliminary CSMs for AOI 1 and AOI 2, which present the potential receptors and media impacted, are shown on **Figure ES-2** and **Figure ES-3**, respectively. Based on the US Environmental Protection Agency (USEPA) Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated that no PFAS were detected in a public water system above the USEPA Health Advisory (HA) within 20 miles of the facility. PFAS analyses performed in 2016 had method detection limits that were higher than currently

achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Ellington Field, TX			
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SCALE	1:7,200	CHK BY	MC	4/14/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	4/14/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
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Figure ES-1

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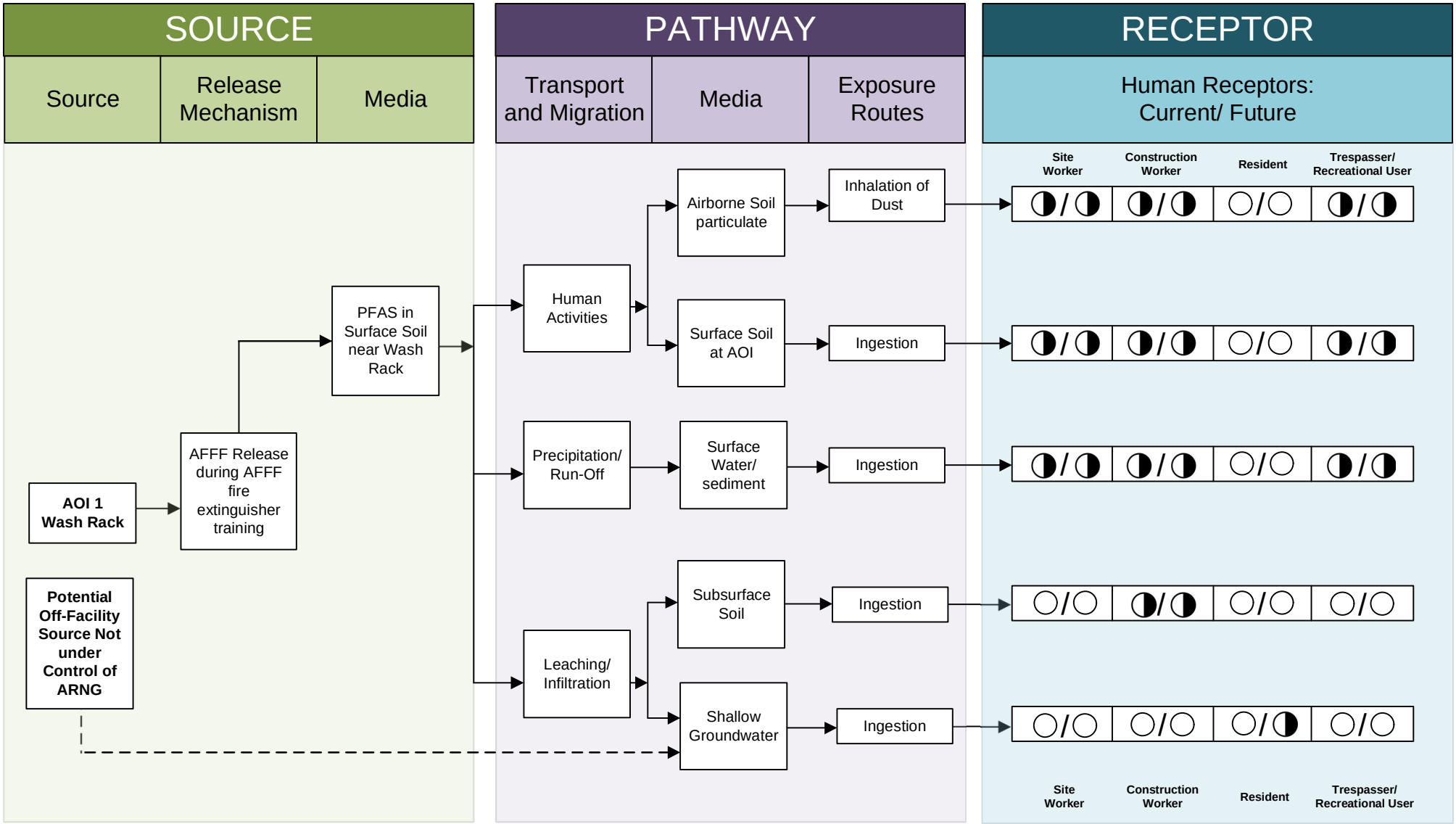
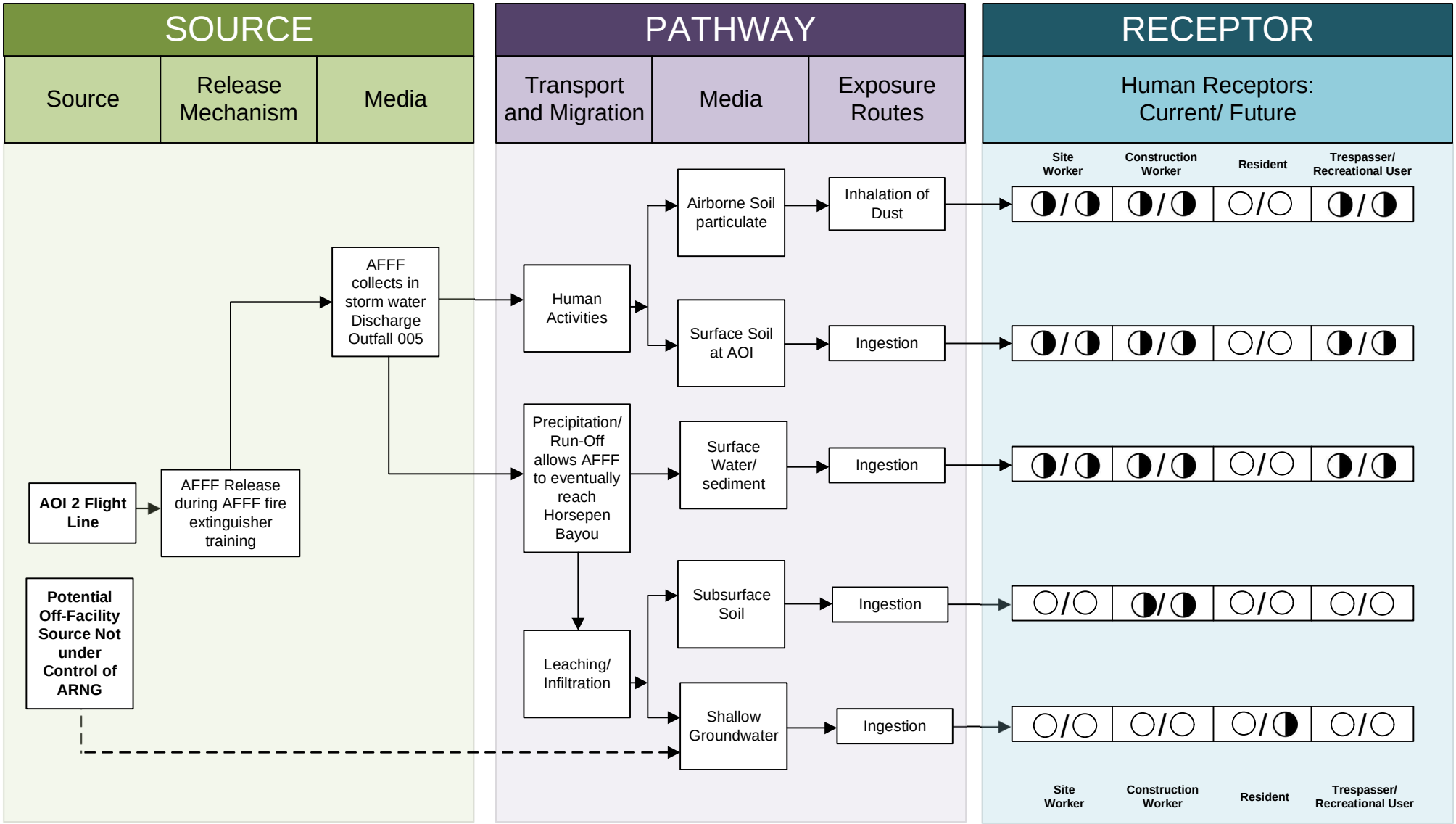


LEGEND

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

Note:
1. The residential receptor refers to an off-facility receptor.

Figure ES-2
Preliminary Conceptual Site Model
AOI 1 AFFF Release at Wash Rack at Ellington Field AASF



LEGEND

- Flow-Chart Stops
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Note:
1. The residential receptor refers to an off-facility receptor.

Figure ES-3
Preliminary Conceptual Site Model
AOI 2 AFFF Release at Flight Line at Ellington Field AASF

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 (US) Army Corps of Engineers (USACE) Baltimore District and their contractor AECOM Technical Services, Inc. (AECOM) under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017.

The ARNG is assessing potential effects on human health related to processes at their facilities that used per- and poly-fluoroalkyl substances (PFAS), primarily releases of aqueous film forming foam (AFFF) although other sources of PFAS 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. The regulatory framework at both federal and state levels continues to evolve. The US Environmental Protection Agency (USEPA) issued 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.

This report presents findings of a PA for PFAS-containing materials at Ellington Field Army Aviation Support Facility (AASF) (also referred to as the "facility") in Houston, Texas, 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 Part 300), and Army requirements and guidance.

This PA documents the locations where PFAS were historically stored and reportedly released into the environment at Ellington Field AASF. The term PFAS will be used throughout this report to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, 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 Environmental Data Resources, Inc. (EDR)™ report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a 1-day site visit on 26 April 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed personnel during the site visit who were associated with Ellington Field AASF activities, including the Ellington Field AASF Maintenance Supervisor (on site since 1986), the Texas Air National Guard (TXANG) Base Environmental Manager (on site since 2008), and the TXANG Fire Chief (on site since 1988);
- Identified areas of interest (AOIs) and developed a preliminary conceptual site model (CSM) to outline the potential release, pathway, and receptors of PFAS for Ellington Field AASF.

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 potential or suspected fire training areas (FTAs) at the facility identified during the site visit
- **Section 3** – **Non-Fire Training Areas:** describes other locations of potential or suspected PFAS releases at the facility identified during the site visit
- **Section 4** – **Emergency Response Areas:** describes areas of suspected or potential AFFF release at the facility, specifically in response to emergency situations
- **Section 5** – **Adjacent Sources:** describes sources of 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 at the AOIs
- **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

Ellington Field AASF was built in the 1970s. Texas ARNG (TXARNG) staff interviewed during the site visit have worked at the facility as early as 1986. Ellington Field AASF is home to the 149th Attack Reconnaissance Battalion of the TXARNG and occupies the northwest corner of Ellington Field. The southern portion of Ellington Field has been leased to the National Aeronautics and Space Administration (NASA) by the City of Houston. The Ellington Field airfield is jointly used by Department of Defense (DoD) and private parties (147 CES/CEV, June 2013). Ellington Field was officially inactivated by the Air Force in 1976, and all Air Force Reserve squadrons were transferred to other military facilities; however, the TXARNG, TXANG, US Army Reserve, US Navy Reserve, US Marine Corps Reserve, US Coast Guard, and the Civil Air Patrol still maintain a military presence at the base. The facility is located 16 miles southeast of downtown Houston and is 11 miles west of Trinity Bay (**Figure 1-1**). In 2009, the Air Force issued a permit with a term expiring in 2039 (**Appendix A**) for the TXARNG's use of approximately 17.6 acres of land and facilities at Ellington Field Air National Guard Base (ANGB), Harris County, Texas.

1.5 Facility Environmental Setting

Ellington Field AASF is located in south-eastern Texas, approximately 32 miles northwest of the Gulf of Mexico. The facility is situated near Horsepen Bayou, which feeds into Clear Lake, which then flows into Trinity Bay and Galveston Bay.

1.5.1 Geology

The Houston area is located in the Gulf Coast Plain physiographic province. The Gulf Coast Plain includes depositional environments ranging from fluvial, fluvial-deltaic, barrier-strand plain, and bay-estuary lagoon. Underlying Tertiary and Quaternary units were deposited in coastal environments similar to active processes today. Geologic outcrops in the area of Houston and Harris County consist primarily of the Pleistocene Beaumont Formation and more recent Quaternary alluvium along surface water channels (**Figure 1-2**). The Beaumont Formation, also called the Beaumont Clay, is typically described as poorly bedded, calcareous clay of various colors, containing discontinuous stringers and beds of silt and fine sand. Total thickness of the Beaumont Clay ranges from about 500 feet in Harris County to about 700 feet in the vicinity of Galveston (Leidos, 2018).

1.5.2 Hydrogeology

The primary hydrogeologic unit present in the Gulf Coast Plain physiographic province is the Gulf Coast Aquifer System (GCAS). The GCAS framework includes the shallower Chicot aquifer, which is composed of the Pleistocene, Lissie, and Willis formations, and a deeper Evangeline aquifer, which is composed of the upper and lower Pliocene-age Goliad formation (**Figure 1-2**). The GCAS consists of complex interbedded clays, silts, sands, and gravels of Cenozoic age, which are hydrologically connected to form a large, leaky, artesian aquifer system. This system comprises four major components consisting of the following generally recognized water-producing formations. The deepest formation is the Catahoula, which contains groundwater near the outcrop in relatively restricted sand layers. Above the Catahoula is the Jasper aquifer, which is primarily contained within the Oakville sandstone. The Burkeville confining layer separates the Jasper from the overlying Evangeline aquifer, which is contained within the Fleming and Goliad sands. The Chicot aquifer, or upper component of the GCAS, consists of the Lissie, Willis, and Beaumont formations, and overlying alluvial deposits. Not all formations are present throughout the system, and nomenclature often differs from one end of the system to the other. Maximum total sand thickness ranges from 700 feet in the south to 1,300 feet in the northern extent. The average depth of groundwater at the facility is typically around 10 feet below ground surface (bgs) and generally flows to the east (Leidos, 2018).

The facility's drinking water is supplied by the City of Houston. A query of the Texas Water Development Board Submitted Driller's Reports and Groundwater Database identified four industrial wells, thirty-two (32) monitoring wells, four public supply wells, and one domestic well within a 1-mile radius of the facility. The industrial water supply wells range in depth from 376 feet to 555 feet bgs. The monitoring wells range in depth from 15 to 90 feet bgs. The public supply wells range in depth from 391 to 583 feet bgs, and the domestic well is 548 feet bgs. The public supply wells are owned by Time Warner Cable, BW Grayson Business Park, and the City of Houston Ellington Field (two wells). Humble Oil & Refining Co. own one domestic well. These wells are shown on **Figure 1-2**. Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated that no PFAS were detected in a public water system above the USEPA HA within 20 miles of the facility. PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

1.5.3 Hydrology

No natural or significant surface water bodies, navigable waterways, or wetlands are present at the facility (Leidos, 2018). Armand Bayou is located approximately 4.5 miles east of the facility, and the Houston Ship Channel is located approximately 9 miles north of the facility. Surface water flow at the facility is dictated by the facility's man-made surface drainage system, which is shared

between TXARNG and TXANG, as well as other occupants that reside at Ellington Field Joint Reserve Base. The system contains multiple ditches/channels for surface flow. Stormwater moves by open channel flow and underground drainage pipes until the runoff reaches Horsepen Bayou, located approximately 2 miles southeast of the facility; Horsepen Bayou flows easterly, eventually combining with Armand Bayou (**Figure 1-3**) (Leidos, 2018). Stormwater from TXANG that may contain PFAS, as demonstrated in the TXANG SI Report (Leidos, 2018), is transported to Horsepen Bayou through the TXARNG facility in the shared drainage system.

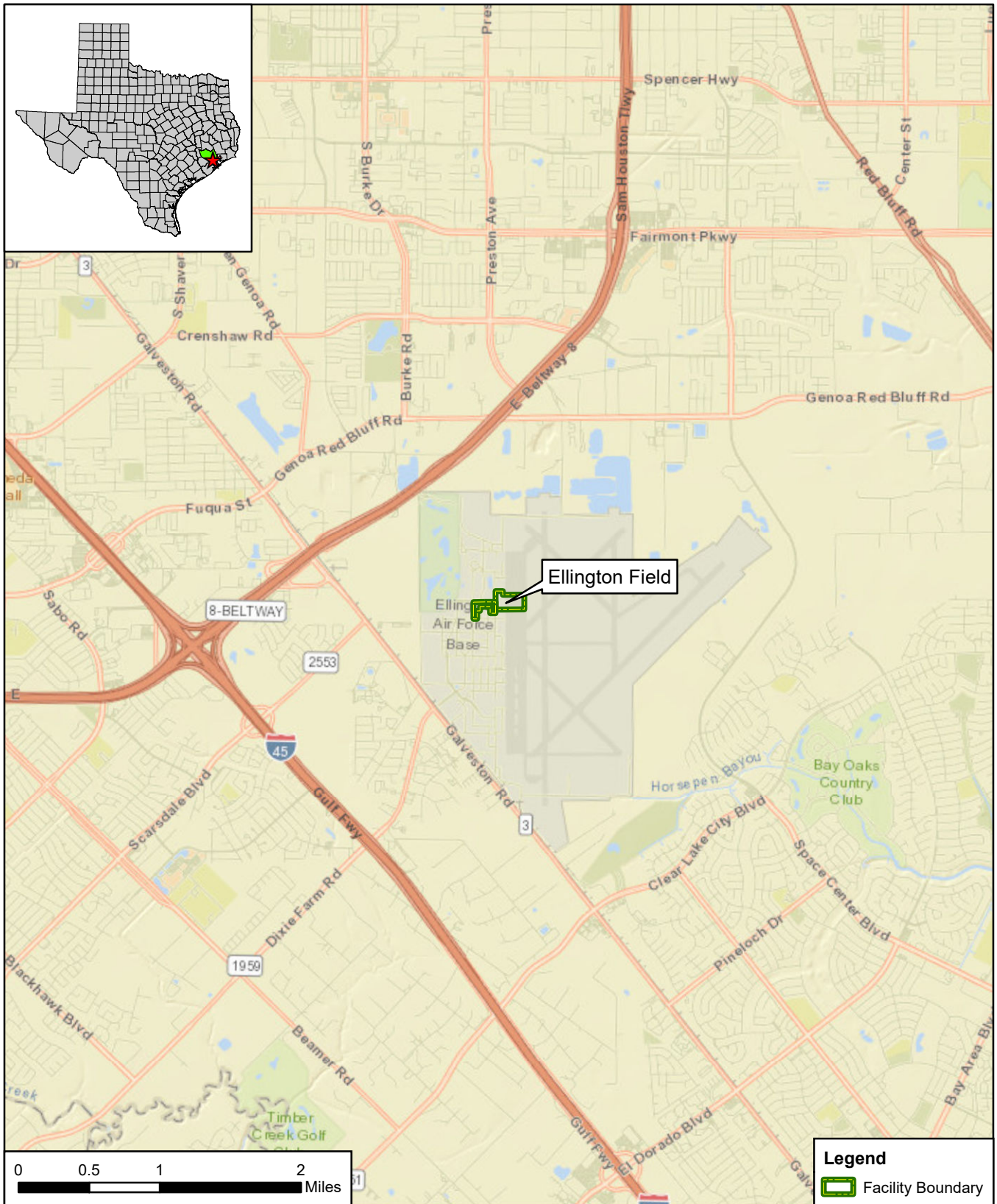
1.5.4 Climate

Houston has a humid subtropical climate, with long, hot and humid summers and short, mild winters. Houston's proximity to large water bodies brings in warm air for much of the year. Houston occasionally faces severe tornadoes as well as thunderstorms. The average high temperature in Houston reaches 95 degrees Fahrenheit (°F) at the peak of August. Winters are mild to cool with the average daily high temperature above 60°F. Average annual precipitation is 50 inches, with even distribution over the year (Weather Atlas, 2019).

1.5.5 Current and Future Land Use

The facility currently includes a hangar (Building 1183), which is used to service army aviation vehicles such as helicopters. East of the hangar is the TXARNG aircraft parking area, where aircraft are parked and minor maintenance is performed, and further east of the aircraft parking area is the flight line. North of the hangar is the TXANG's new fire station (Building 1190), which is located along the TXARNG facility boundary. South of the hangar is a wash rack. Ellington Field AASF also includes paved vehicle parking areas, aircraft and equipment parking areas, and supporting facilities such as sidewalks and administrative buildings.

Current land use in the direct vicinity of Ellington Field AASF includes the Ellington Field Joint Reserve Base buildings surrounding the facility, a municipal golf course and oil & gas company to the west, flight lines to the east, and a concrete supplier and various industrial and commercial buildings as well as residential use to the north. During personnel interviews, it was noted that TXARNG is planning to expand the AASF Building 1183 and retrofit the hangar with a high expansion foam AFFF fire suppression system. No other future changes to the current use were noted during personnel interviews.



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Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/30/2019

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

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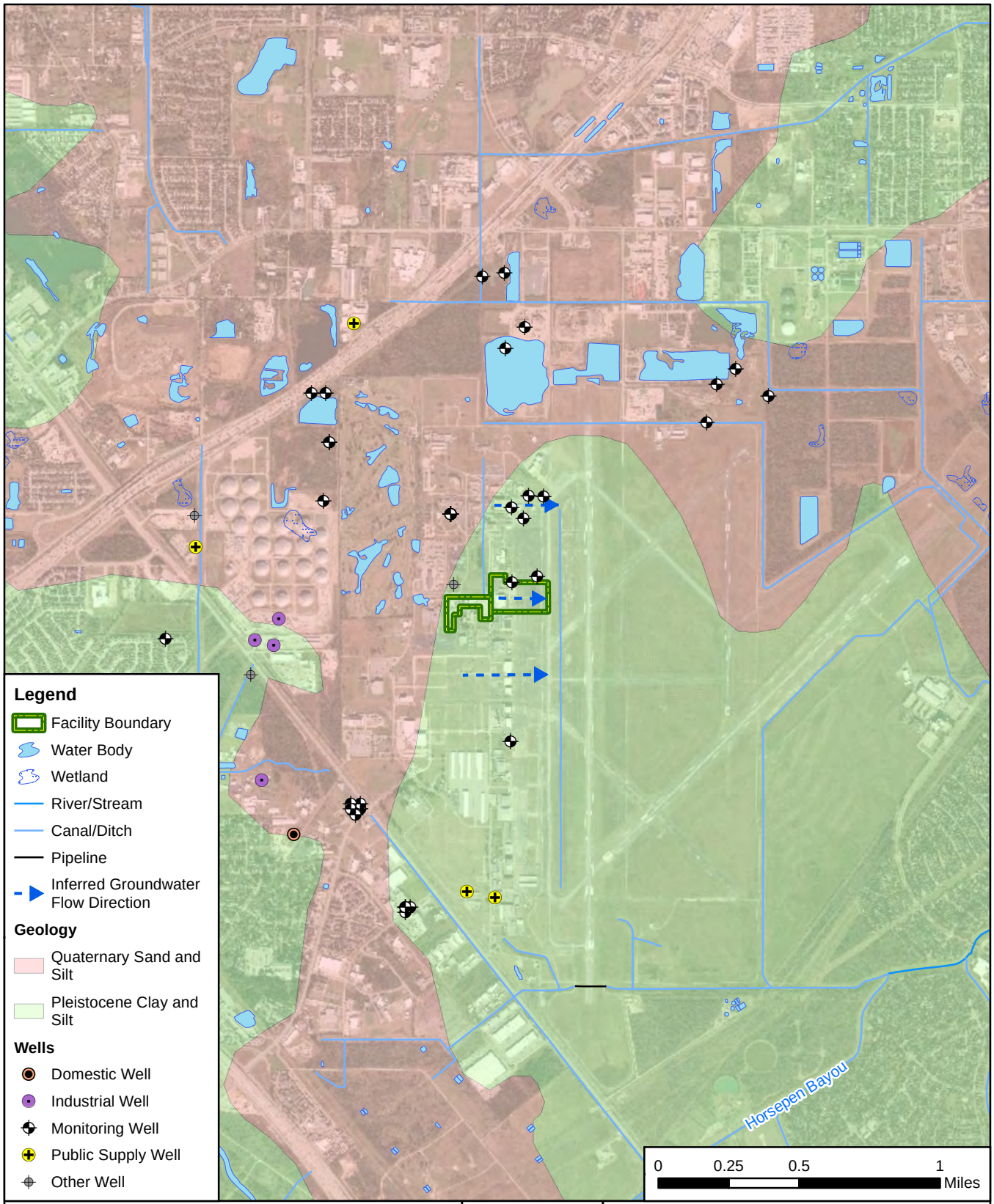

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	1/7/2020

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Groundwater Features

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Figure 1-2

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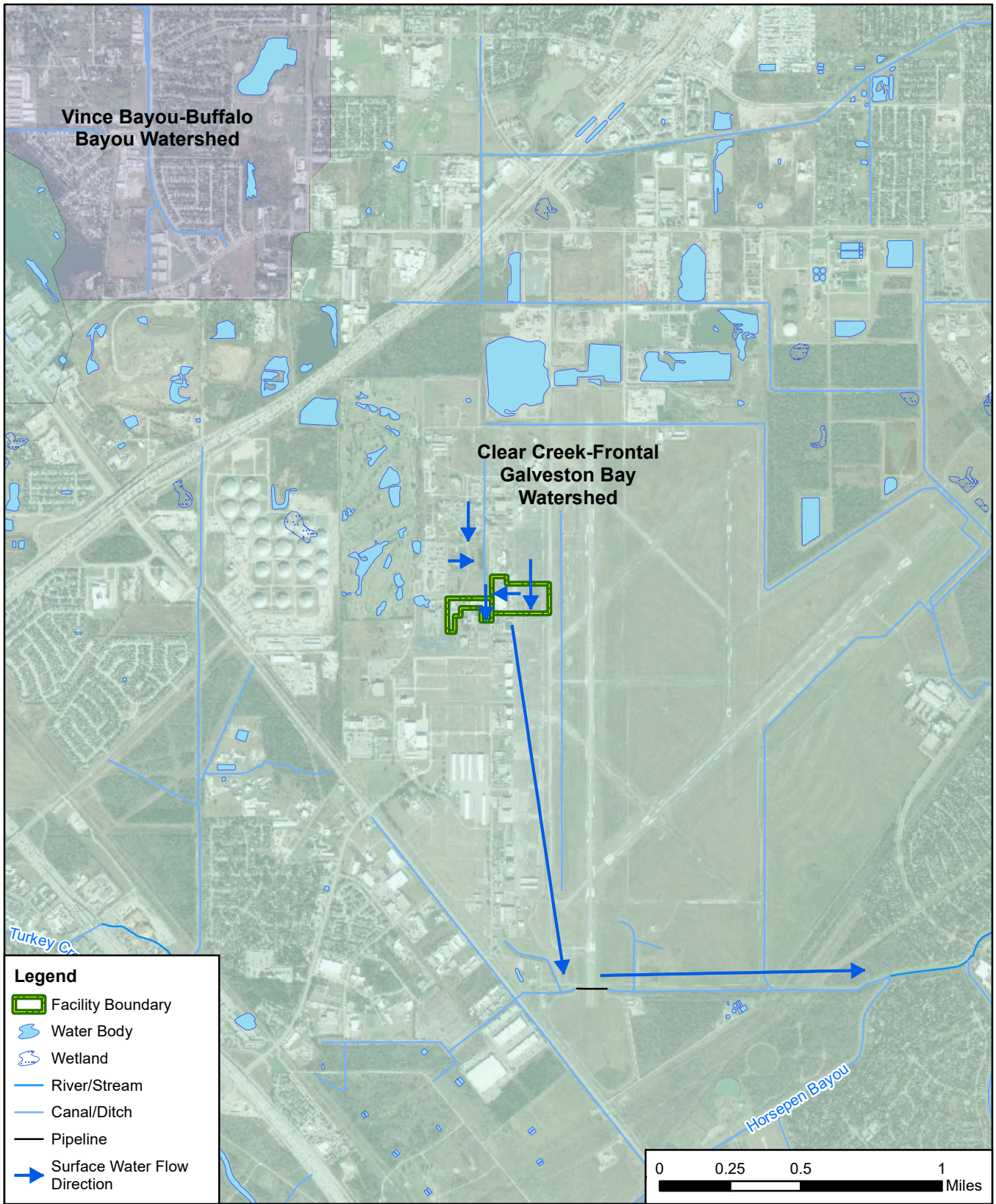

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	2/28/2020

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Surface Water Features

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Figure 1-3

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2. Fire Training Areas

With the exception of mobile cart extinguisher testing/training at the wash rack area and the flight line (described in **Sections 3.1** and **3.2**, respectively), Ellington Field AASF personnel (onsite since 1986) confirmed there are no current or historical designated FTAs at the facility.

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**. The Ellington Field AASF is comprised of the hangar, administrative buildings, parking lots, a wash rack area, and flight line. These non-FTAs were investigated during the PA. These and other areas are described below and shown on **Figure 3-1,** with photographs provided in **Appendix C**.

3.1 Wash Rack Area

TXARNG personnel began training with Tri-Max™ units in the early 1990s. TXARNG personnel practiced with Tri-Max™ units once a year with the TXANG fire department at the wash rack or the flight line. Training with one or two Tri-Max™ units occurred each year. To practice using the Tri-Max™ units, a metal burn box was set on fire, and the AASF personnel would practice putting it out. During Tri-Max™ training at the wash rack, the AFFF would have flowed to the oil-water separator (OWS), then to the sanitary sewer system. Wastewater discharges to the Metro Central Waste Treatment Facility at 12815 Galveston Rd, Webster, Texas, approximately 1.8 miles south of the facility. AFFF discharged at the wash rack may have migrated from the paved area to the nearby grassy area and infiltrated into soil.

The Tri-Max™ units were disposed of between 2007 and 2009 due to deteriorating hoses. In around 2010, AFFF at the facility was donated to the TXANG fire department, and Tri-Max™ units were replaced with Purple K units. TXARNG personnel onsite since 1986 are not aware of any bulk AFFF stored at the facility. No bulk AFFF was discovered on-site during an annual building inspection conducted by the TXANG fire chief in 2010. Geographic coordinates for the AASF wash rack are 29°36'39.31"N; 95°10'09.54"W.

3.2 Flight Line

TXARNG personnel practiced with Tri-Max™ units once a year with the TXANG fire department at the wash rack or the flight line. Training with one or two Tri-Max™ units occurred each year. A metal burn box was set on fire, and the AASF personnel would practice putting it out.

Tri-Max™ units were stationed on the flight line. AASF personnel interviewed recalled Tri-Max™ units being on-site in the early 1990s. Initially the AASF personnel were responsible for maintaining the Tri-Max™ units, but that responsibility was later given to the TXANG fire department, and then to a third-party contractor. One person interviewed recalled there being at least 10 Tri-Max™ units at the facility.

At peak operation (before 1995), there were between 30 to 40 helicopters on-site. Historically, there was one Tri-Max™ fire extinguisher staged between every two helicopters stored on the flight line.

Personnel recalled the Tri-Max™ units rusting frequently; repairs and hydrostatic testing were performed on the units by an outside contractor. These repairs and tests occurred off site. One person interviewed recalled training four or five times with the Tri-Max™ units. The geographic coordinates for the AASF flight line are 29°36'41.77"N; 95°10'04.34"W.

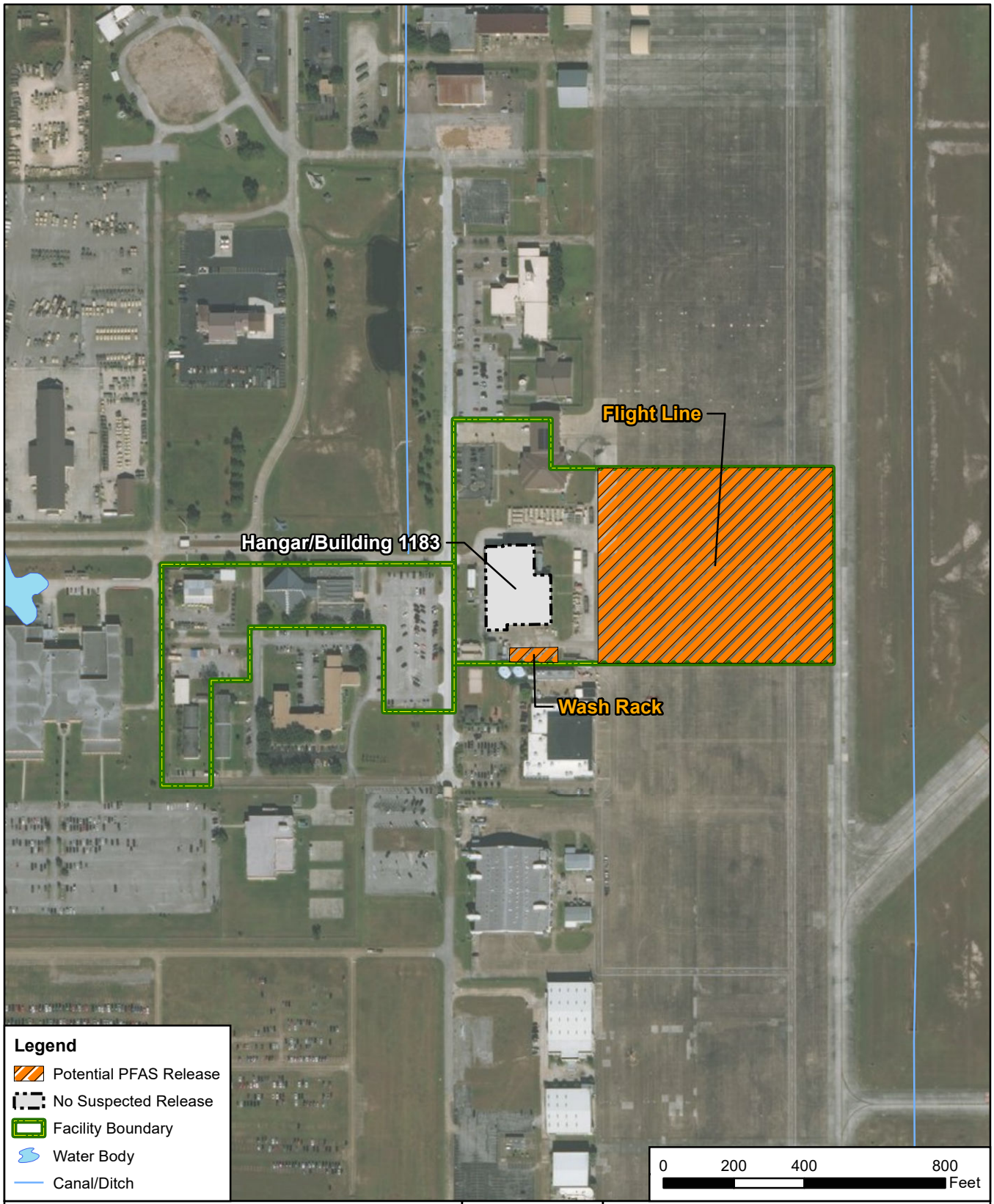
3.3 Hangar

The hangar (Building 1183; built in the 1970's) is located adjacent to the flight line and is used for helicopter maintenance, storage, and training. No fire suppression system is currently installed at the hangar. No known releases of AFFF have occurred at the hangar. The facility has future renovation plans to install a high expansion foam AFFF fire suppression system in the hangar. The geographic coordinates for the hangar are 29°36'41.04"N; 95°10'09.92"W.

3.4 Landfills

During PA interviews, TXARNG staff noted no current or former landfills located at or in the vicinity of Ellington Field AASF.

Landfills are not usually a primary release area of PFAS, but materials disposed in landfills may create a secondary source of contamination. Such materials may include sludge from a wastewater treatment plant that processes PFAS-laden water, used AFFF storage containers, or products associated with waterproofing uniforms or boots.



CLIENT	ARNG			
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SCALE	1:4,800	CHK BY	MC	2/28/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	2/28/2020

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Non-Fire Training Area

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Figure 3-1

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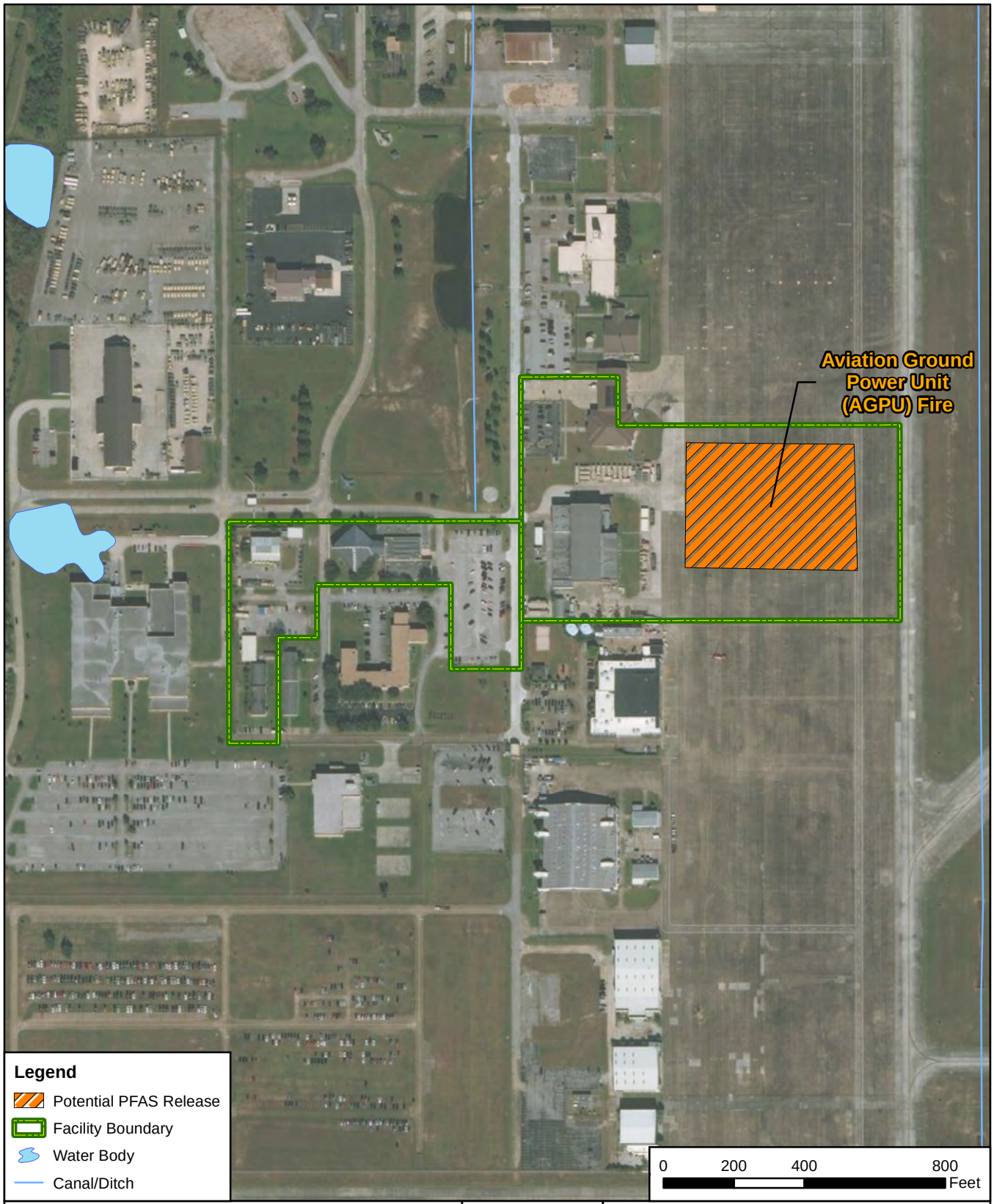
4. Emergency Response Areas

In 1997 an aircraft ground power unit (AGPU) caught fire on the Ellington Field AASF flight line, and Tri-Max™ units were used to put the fire out. **Figure 4-1** shows the approximate extents of this emergency response area.



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Emergency Response Area

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12420 Milestone Center Drive
Germantown, MD 20876

Figure 4-1

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5. Adjacent Sources

Figure 5-1 shows the various adjacent sources described in this section. More information about the analytical results from sampling at various TXANG locations is presented in the SI Report for PFOS and PFOA at Ellington Field Joint Reserve Base, Houston, Texas (Leidos, 2018), included in **Appendix A**.

5.1 Brio Superfund Site

The Brio Superfund Site is located at 2501 Dixie Farm Rd in Friendswood, Texas, approximately 3.5 miles southwest of Ellington Field AASF. The 58-acre Brio Refining, Inc. site was used as a chemical reprocessing and refining facility from the 1950's to 1982. Chemical disposal practices contaminated groundwater, surface soils, and subsurface soils with hazardous chemicals. Following cleanup, USEPA removed the site from the Superfund program's National Priorities List in 2006. Currently, elevated groundwater contaminant concentrations have been reported in the 50-foot sand water bearing zone at the Brio Site, and field work is being completed to investigate the need for further remedial action (USEPA, Brio Refining, Inc., 2019). There is no known use of PFAS at the site, and groundwater flow to the east is unlikely to bring contamination from the Brio Site to Ellington Field.

5.2 TXANG Old Fire Station

The old fire station (Building 694) operated by TXANG from pre-1988 to 2012 reported having minor leaks of AFFF from crash response trucks and firetrucks over the years (BB&E, Inc., 2016). The old fire station is located approximately 2,600 feet south of the TXARNG hangar.

A monitoring well was installed adjacent to the old fire station in 2018 to determine PFAS levels in shallow groundwater. Results indicated estimated PFOS and PFOA levels of 40,000 and 14,000 ppt, respectively. These results are orders of magnitude higher than the USEPA HA of 70 ppt of combined PFOS and PFOA (Leidos, 2018).

5.3 TXANG New Fire Station

The facility currently receives fire protection from the new TXANG Fire Department fire station, located just north of the TXARNG hangar, in Building 1190, constructed in 2012. The TXANG Fire Chief (onsite since 1988) reported their department switched from AFFF with longer-chain (C8) PFAS to AFFF with short-chain (C6) PFAS in December 2016.

AFFF manufactured with short-chain (C6) fluorotelomer-based PFAS do not contain or breakdown in the environment to PFOS and other long-chained PFAS and are currently considered lower in toxicity and have significantly reduced bioaccumulation potential compared to long-chain PFAS. However, foams made with only short-chain (C6) PFAS may still contain trace quantities (parts per billion) of PFOA and PFOA precursors as byproducts of the manufacturing process. Current best management practices suggest that industries that require AFFF use (for example, military applications) purchase foams that consist of short-chain (C6) PFAS (Interstate Technology Regulatory Council [ITRC], October 2018).

The TXANG Fire Chief reported that his department has never trained with the AFFF spray from a firetruck. However, TXANG has conducted joint fire training using AFFF-containing mobile carts with TXARNG staff at the TXARNG wash rack and flight line from the early 1990s to approximately 2009. The new fire station currently uses fire/crash response vehicles and firetrucks that are

equipped with AFFF containing short-chain (C6) PFAS but does not currently conduct fire training exercises involving AFFF with the TXARNG.

In 2018, groundwater sampling results from a monitoring well installed adjacent to the new fire station indicate estimated levels of PFOS and PFOA of 2,200 and 350 ppt, respectively. These levels exceed the USEPA HA of 70 ppt of combined PFOS and PFOA (Leidos, 2018).

5.4 Stormwater Discharge Outfalls

Stormwater discharge outfalls were also tested for PFAS in 2018. A surface water sample taken from stormwater discharge outfall 005 (located in the flight line of TXARNG facility) exceeded the USEPA HA of 70 ppt, with a combined PFOS and PFOA result of 103 ppt (Leidos, 2018).

5.5 TXANG Aircraft Parking Apron

Groundwater samples from four monitoring wells installed at the aircraft parking apron, north of TXARNG facility, all exceed the USEPA HA of 70 ppt of combined PFOS and PFOA; results ranged from 133 to 28,600 ppt of combined PFOS and PFOA (Leidos, 2018).

5.6 TXANG Hangars 1382 and 1394

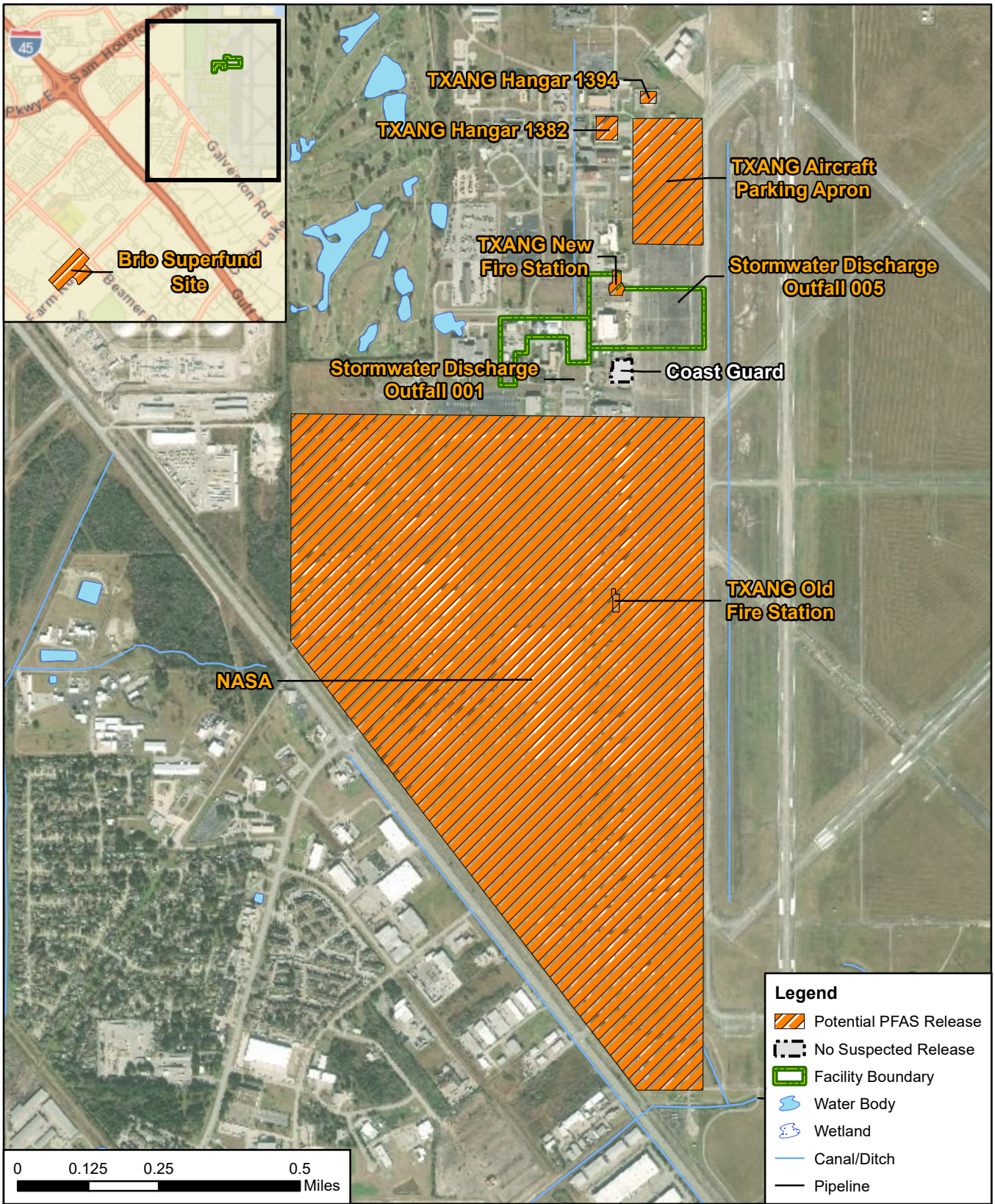
Hangars 1382 and 1394 both previously contained AFFF in fire suppression systems. The AFFF fire suppression systems were removed from both hangars. In 2014, the AFFF fire suppression system in Hangar 1382 was replaced with a high-expansion foam system. Interviews with site personnel indicate a few minor AFFF releases at both hangars in the past.

Soil samples collected just east of Hangar 1382 had PFOS/PFOA compounds detected, with one PFOS (2,000 J micrograms per kilogram) exceedance of the USEPA and Texas Commission on Environmental Quality (TCEQ) screening level in subsurface soil. Groundwater data compared to screening criteria indicated an exceedance of the USEPA HA for PFOS and PFOA (combined), with a result of 28,600 nanograms per liter (ng/L). PFOS, PFOA, PFHxS, and PFHpA exceeded their respective groundwater TCEQ screening levels as well.

Soil samples collected just south of Hangar 1394 had PFOS/PFOA compounds detected but had no exceedances of the screening criteria for soil. Groundwater data indicated an exceedance of the USEPA HA for PFOS and PFOA (combined), with a result of 1,783 ng/L. PFOS and PFHxS exceeded their respective groundwater TCEQ screening levels as well (Leidos, 2018).

5.7 NASA

NASA leases the southern portion of Ellington Field from the City of Houston and hosts various privately held companies on its property. NASA operations may have contributed PFAS due to the suspected use of AFFF for firefighting purposes. No personnel from NASA were interviewed, and AFFF use is unknown.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Ellington Field, TX			
REVISED	1/9/2020	GIS BY	MS	1/9/2020
SCALE	1:15,840	CHK BY	MC	1/9/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	1/9/2020

Adjacent Sources

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

Q:\Projects\ENV\GEARS\GEO\ARNG PFAS\900-CAD-GIS\920-GIS or Graphics\MXD\TX\Ellington_Field_PA_Figures\Fig_5-1_Ellington_Field_Adjacent_Source.mxd

6. Preliminary Conceptual Site Model

Based on the PA findings, the AFFF release areas associated with the Ellington Field AASF wash rack and flight line were identified as AOI 1 and AOI 2, respectively. This section describes the CSM components and the specific preliminary CSMs developed for the AOIs. 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. The AOIs are shown on **Figure 6-1**, and the preliminary CSMs for AOI 1 and AOI 2 are presented on **Figure 6-2** and **Figure 6-3**, respectively.

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. Receptors at Ellington Field AASF include site workers, construction workers, and trespassers. Secondary receptors include recreational users and residents outside of the facility boundary. As described below, the preliminary CSMs for the wash rack and flight line AOIs indicate the specific receptors that could potentially be exposed to PFAS.

6.1 AOI 1 Wash Rack

AFFF was used at the wash rack during yearly fire training from the early 1990s to approximately 2009. An unknown quantity of AFFF was released during these fire training events, where reportedly one or two Tri-Max™ units were used for practice.

Releases at the wash rack would have been conveyed to the OWS, then flowed to the sanitary sewer system, and ultimately discharged to the Metro Central Waste Treatment Facility, located approximately 1.8 miles south of the facility. Underground conveyances to the OWS as well as the OWS itself may have leaks that released PFAS to the subsurface. During training exercises, AFFF may have migrated from the paved wash rack area to the grassy areas south of the wash rack and infiltrated into soil. Runoff could also have caused AFFF to migrate to the ditch to the east of the wash rack, where it would eventually discharge through Stormwater Discharge Outfall 001 at the southern end of the facility. Once inside the box culverts, the stormwater flow continues south, until the runoff reaches Horsepen Bayou (BB&E, Inc., 2016). Under such scenarios, ground disturbing activities in these areas could result in site or construction worker exposure to PFAS via inhalation of dust or ingestion of exposed surface or subsurface soil. Site and construction workers could also be exposed to PFAS contaminated surface water and sediment. Additionally, recreational users of Horsepen Bayou and connected water bodies could be exposed to PFAS contaminated surface water.

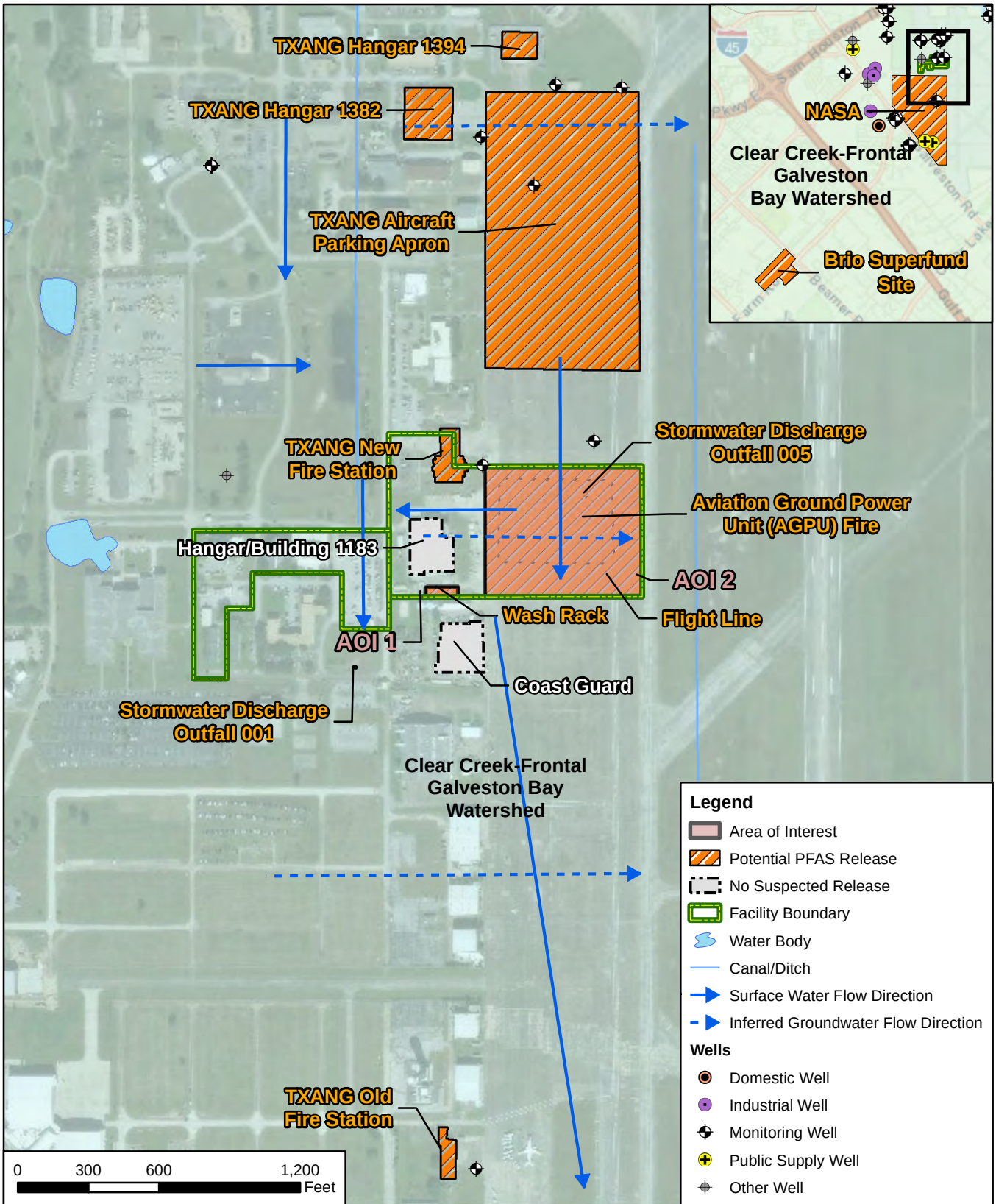
Potential PFAS contamination may have further infiltrated to shallow groundwater, which flows to the east. During the TXANG PFAS SI, four monitoring wells were installed at the downgradient facility boundary. The concentrations of PFOA/PFOS in all of the wells exceeded the HAs (Leidos, 2018). Therefore, it is likely that PFAS contamination in groundwater has already migrated off the facility. Four public supply wells and one domestic well were identified within a 1-mile radius of the facility, according to the Texas Water Development Board Groundwater Database Reports; however, none of these wells were identified to the east of the facility, which the SI noted is the direction that shallow groundwater flows.

6.2 AOI 2 Flight Line

AFFF was used at the flight line during fire training from the early 1990s to approximately 2009. An unknown quantity of AFFF was released during these fire training events.

Based on the nature of the release (during routine training), it appears unlikely that AFFF would have been discharged to the ground surface outside of the flight line. AFFF released on the flight line would likely flow to stormwater discharge outfall 005, which is located within the flight line. TXANG sampled surface water from Stormwater Discharge Outfall 005 during their PFAS SI. The sample contained 700 ppt PFOA/PFOS (Leidos, 2018). The outfall conveys flow south to Horsepen Bayou, and then to Armand Bayou (BB&E, 2016). Under such scenarios, ground disturbing activities in these areas could result in site or construction worker exposure to PFAS via inhalation of dust or ingestion of exposed surface or subsurface soil. Site and construction workers could also be exposed to PFAS in surface water and sediment. Additionally, recreational users of Horsepen Bayou and connected water bodies could be exposed to PFAS in surface water.

Potential PFAS contamination may have further infiltrated to shallow groundwater, which flows to the east. The TXANG installed four monitoring wells during the PFAS SI at the downgradient facility boundary. The concentrations of PFOA/PFOS in all of the wells exceeded the HAs (Leidos, 2018). Therefore, it is likely that PFAS contamination in groundwater has already migrated off the facility. Four public supply wells and one domestic well were identified within a 1-mile radius of the AASF, according to the Texas Water Development Board Groundwater Database Reports; however, none of these wells were located east of the facility.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Ellington Field, TX			
REVISED	4/14/2020	GIS BY	MS	4/14/2020
SCALE	1:7,200	CHK BY	MC	4/14/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	4/14/2020

N

Areas of Interest

AECOM
12420 Milestone Center Drive
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Figure 6-1

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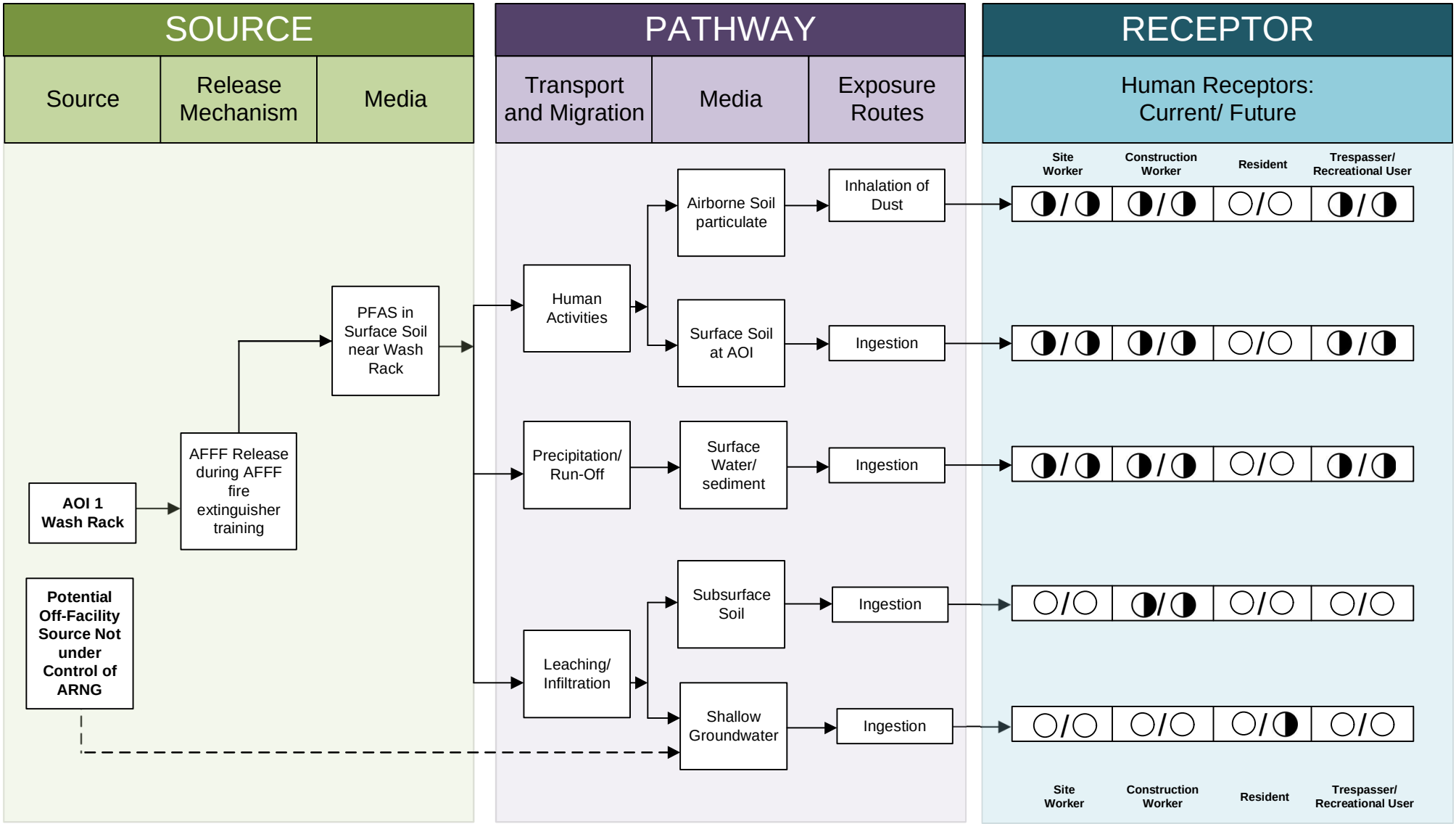
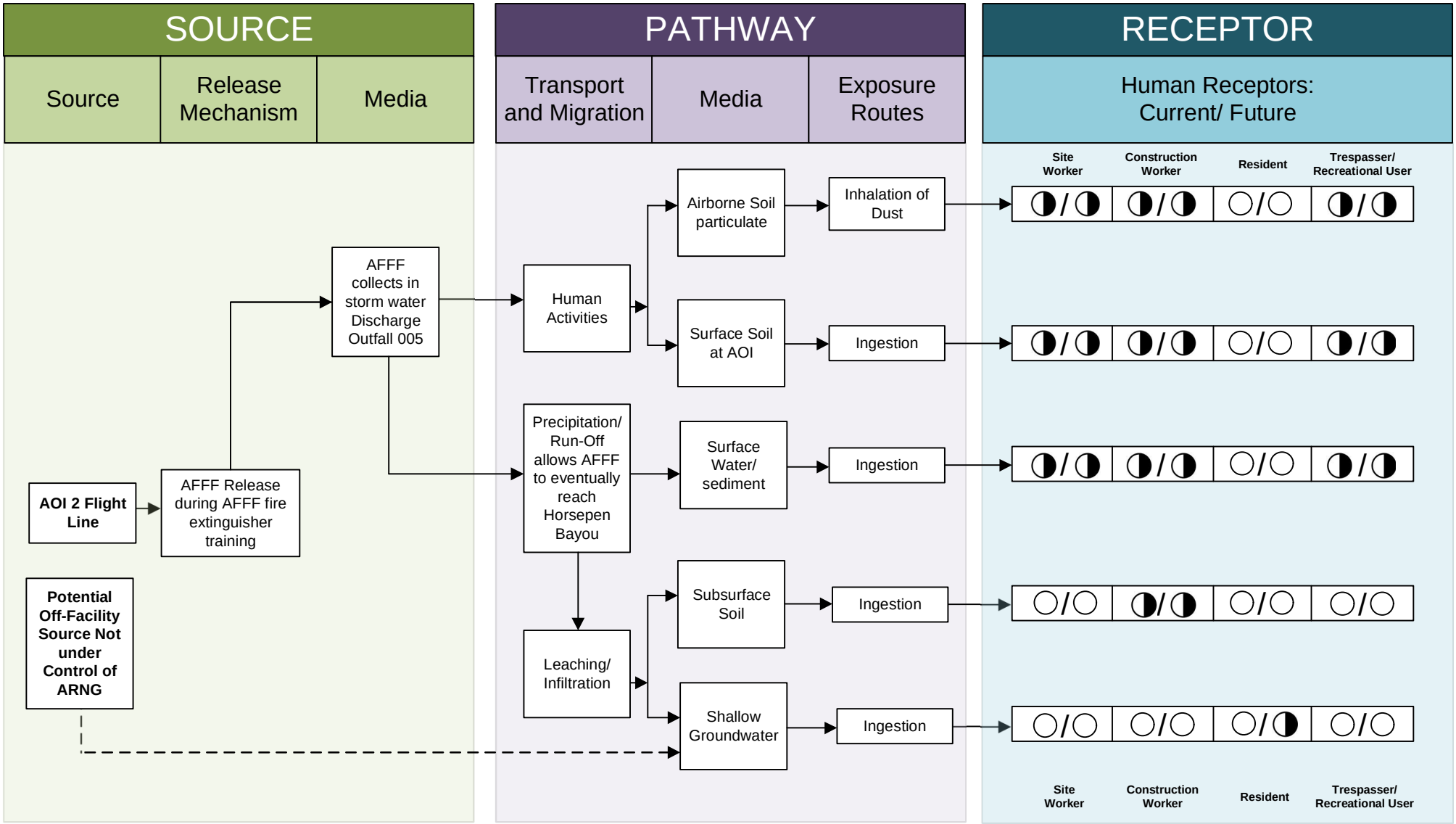


LEGEND

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

Note:
1. The residential receptor refers to an off-facility receptor.

Figure 6-2
Preliminary Conceptual Site Model
AOI 1 AFFF Release at Wash Rack at Ellington Field AASF



LEGEND

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

Note:
1. The residential receptor refers to an off-facility receptor.

Figure 6-3
Preliminary Conceptual Site Model
AOI 2 AFFF Release at Flight Line at Ellington Field AASF

7. Conclusions

Two AOIs were identified at Ellington Field AASF during the PA (**Figure 7-1**).

7.1 Findings

Based on interviews with current AASF personnel, reported historical AFFF releases are associated with the AFFF fire extinguisher training at the wash rack and flight line. These releases indicate the potential for PFAS contamination in surface and subsurface soil to intercept one or more receptors. No evidence of other accidental or incidental spills or leaks from AFFF storage containers/areas were identified during the site visit. The remaining buildings associated with the AASF are not equipped with or store AFFF. The findings of potential AFFF release are summarized in **Table 7-1** below.

Table 7-1: AOIs at Ellington Field AASF

Area of Interest	Description	Used by	Release Dates
AOI 1	Releases during AFFF fire extinguisher training with mobile carts at the wash rack; discharged to OWS, and then to the sanitary sewer system.	TXARNG and TXANG	1990s - 2009
AOI 2	Releases during AFFF fire extinguisher training with mobile carts at the flight line. Surface runoff would flow to stormwater discharge outfall 005 and eventually flow to Horsepen Bayou.	TXARNG and TXANG	1990s - 2009

7.2 Uncertainties

Available 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 disposal.

The conclusions of this PA are based on all available information, including: previous environmental reports, EDRs™, observations made during the VSI, 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 incomplete. 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 was 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, 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 the PA:

Table 7-2: Uncertainties

Area of Interest	Source of Uncertainty
AGPU Fire	The exact location of the AGPU fire is unknown; it is assumed to have happened somewhere in the general flight line area.

7.3 Potential Future Actions

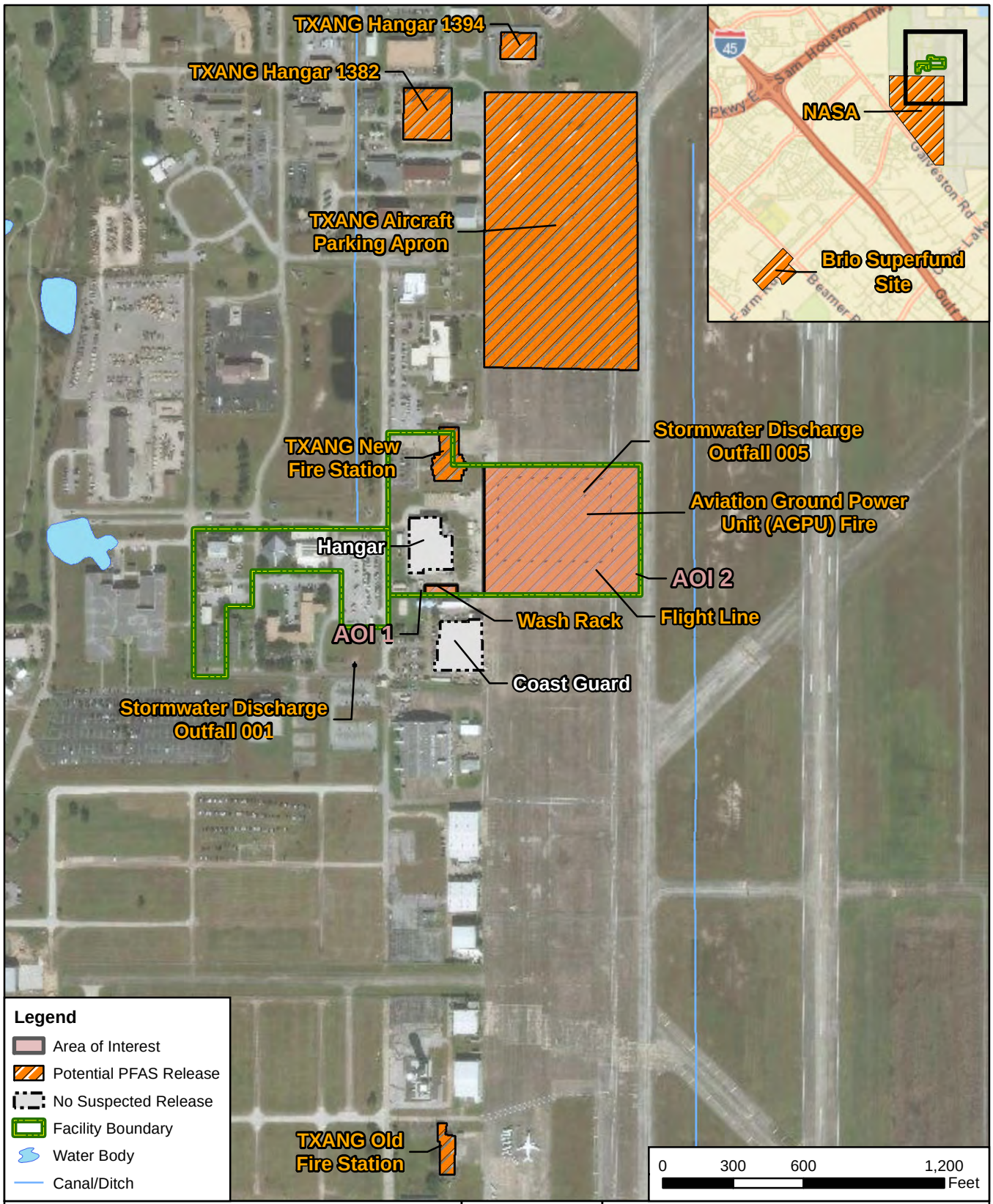
Based on the documented absence (1986-present) of the release of PFAS-containing materials at the Hangar, evidence does not indicate that current or former TXARNG activities in this area contributed PFAS contamination to soil, groundwater, surface water, or sediment at Ellington Field AASF. The Hangar will not move forward in the CERCLA process.

Interviews (covering 1986 to present) indicate that releases during AFFF fire extinguisher training at the wash rack (AOI 1) and flight line (AOI 2) may have resulted in potential PFAS releases identified during the PA. Based on the preliminary CSM developed for the AOIs, there is potential for receptors to be exposed to PFAS contamination in soil at the 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.

ARNG will evaluate the need for an SI at AOIs 1 and 2 at Ellington Field AASF based on the presence of a PFAS release, possible receptors, the migration potential of PFAS contamination to receptors, and the availability of resources.

Table 7-3: Rationale

Area of Interest	AOI Location	Rationale	Potential Future Action
AOI 1: Wash Rack	29°36'39.31"N; 95°10'09.54"W	Releases during AFFF fire extinguisher training with mobile carts at the wash rack; discharged to OWS, and then to the sanitary sewer system. AFFF may have infiltrated into soil, surface water/sediment, and groundwater in surrounding area.	Proceed to an SI, focus on soil, surface water/ sediment, and groundwater
AOI 2: Flight Line	29°36'39.31"N; 95°10'09.54"W	Releases during AFFF fire extinguisher training with mobile carts at the flight line. Surface runoff would flow to stormwater discharge outfall 005 and eventually flow to Horsepen Bayou. AFFF may have infiltrated into nearby soil, surface water/sediment, and groundwater.	Proceed to an SI, focus on soil, surface water/ sediment, and groundwater



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Ellington Field, TX			
REVISED	4/14/2020	GIS BY	MS	4/14/2020
SCALE	1:7,200	CHK BY	MC	4/14/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	4/14/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 7-1

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8. References

147 CES/CEV, Mr. Mark A Garcia, Ellington Field Base Environmental Manager. June 2013. Re-Certification of Ellington Field Environmental Baseline Survey (EBS), Aug 06 for Building 1183 Hangar Expansion Project 1-149th Attack Reconnaissance Battalion, Texas Army National Guard.

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Interstate Technology Regulatory Council (ITRC). October 2018. Aqueous Film-Forming Foam (AFFF). https://pfas-1.itrcweb.org/wp-content/uploads/2019/03/pfas-fact-sheet-afff-10-3-18.pdf. Accessed 12 September 2019.

Leidos. December 2018. Site Inspection Report for Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Ellington Field Joint Reserve Base, Houston, Texas. 147th Attack Wing Ellington Field Joint Reserve Base, Texas Air National Guard, Houston, Texas.

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Weather Atlas. 2019. Houston, TX – Detailed climate information and monthly weather forecast. https://www.weather-us.com/en/texas-usa/houston-climate. Accessed 4 September 2019.

Appendix A
Data Resources

Data resources will be provided separately on CD. Data resources for Ellington Field AASF include:

Previous Investigations Completed

- Final Perfluorinated Compounds Preliminary Assessment Site Visit Report. 147th Reconnaissance Wing, Ellington Field Joint Reserve Base, Texas Air National Guard, Houston, Texas. May 2016. Prepared by BB&E, Inc.
- Final Site Inspection Report for Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Ellington Field Joint Reserve Base, Houston, Texas. 147th Attack Wing, Ellington Field Joint Reserve Base, Texas Air National Guard, Houston, Texas. December 2018. Prepared by Leidos.
- Re-Certification of Ellington Field Environmental Baseline Survey (EBS), August 2006 for Building 1183 Hangar Expansion Project, 1-149th Attack Reconnaissance Battalion, Texas Army National Guard. Prepared by 147 CES/CEV Mr. Mark A. Garcia. 4 June 2013.

Miscellaneous Data Resources

- Department of the Air Force Permit to United States Army for Real Property Located on Ellington Field, Air National Guard Base, Texas.
- Directive for a New 30-Year Permit, Ellington Field (ANG), TX. Department of the Army, License for National Guard Purposes, Ellington Air National Guard Base, Harris County, Texas.
- EDR™ Aerial Photo Decade Package, December 2019. Ellington Field AASF, 11300-11468 Blume Ave, Houston, TX 77034.
- EDR™ Radius Map Report with GeoCheck, December 2019. Ellington Field AASF, 11300-11468 Blume Ave, Houston, TX 77034.
- EDR™ Certified Sanborn Map Report, December 2019. Ellington Field AASF, 11300-11468 Blume Ave, Houston, TX 77034.

Appendix B
Preliminary Assessment Documentation

Appendix B.1
Interview Records

PA Interview Questionnaire - Environmental Manager

Facility: Ellington AASF
Interviewer [redacted]
Date/Time: 4/26/19 @ 0900

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

1. Roles or activities with the Facility/years working at the Facility.

11 years as environmental manager at facility.

2. Where can I find previous facility ownership information?

ARNG is tenant under Air ~~Force~~ National Guard. Those documents were given electronically.

3. What can you tell us about the history of PFAS including aqueous film forming foam (AFFF) at the Facility? Was it used for any of the following activities, circle all that apply and indicate years of active use, if known? Identify these locations on a facility map.

Maintenance No
Fire Training Areas Yes
Firefighting (Active Fire) ~~No~~ Yes - Approx ground fire
Crash No
Fire Suppression Systems (Hangers/Dining Facilities) No
Fire Protection at Fueling Stations Yes (never used)
Non-Technical/Recreational/ Pest Management No
Metals Plating Facility No
Waterproofing Uniforms (Laundry Facilities) No
Other

4. Fill out CSM Information worksheet with the Environmental Manager.

5. Are any current buildings constructed with AFFF dispensing systems or fire suppression systems? What are the AFFF/suppression system test requirements? What is the frequency of testing the AFFF/suppression system? Do you have "As Built" drawings for the buildings?

No fire suppression system at AASF Hangar. Future renovation plans to add high suppression foam system to Hangar.

PA Interview Questionnaire - Environmental Manager

Facility:_____
Interviewer:_____
Date/Time:_____

6. Are fire suppression systems currently charged with AFFF or have they been retrofitted for use of high expansion foam? If retrofitted, when was that done?

No current suppression system.

7. How is AFFF procured? Do you have an inventory/procurement system that tracks use?

AFFF is no longer procured.

8. What type of AFFF has been/is being used (3%, 6%, Mil Spec Mil-F-24385, High Expansion)? Manufacturer (3M, Dupont, Ansul, National Foam, Angus, Chemguard, Buckeye, Fire Service Plus)?

Unknown

9. Where is the AFFF stored? How is it stored (tanks, 55-gallon drums, 5-gallon buckets)? What size are the storage tanks? Is the AFFF stored as a mixed solution (3% or 6%) or concentrated material?

No AFFF currently stored on-site. No recollection of bulk AFFF stored on-site historically.

10. How many FTAs are/were on this facility and where are they? Locate on a map. How many FTAs are active and inactive? For inactive FTAs, when was the last time that fire training using AFFF was conducted at them?

Fire training conducted at wash rack or flightline. Trained with Tri-Max every year 1997-1999. Trained with 1 or 2 units.

PA Interview Questionnaire - Environmental Manager

Facility:_____
Interviewer:_____
Date/Time:_____

11. When a release of AFFF occurs during a fire training exercise, now and in the past, how is the AFFF cleaned and disposed of? Were retention ponds built to store discharged AFFF? Was the AFFF trickled to the sanitary sewer or left in the pond to infiltrate?

AFFF was pushed to wash rack, which goes to OWS, then to sanitary sewer.

12. Can you recall specific times when city, county, and/or state personnel came on-post for training? If so, please state which state/county agency or military entity? Do you have any records, including photographs to share with us?

ARNG trained with ~~AF~~ ANG fire department with Tri-Max (once per year). 1997-1999.

No fire training with local fire department.

13. Did military routinely or occasionally fire train off-post? List the units that you can recall used/trained at various areas.

No

14. Did individual units come with their own safety personnel, did they also bring their own AFFF? Was training with AFFF part of these exercises? How were emergencies handled under these circumstances?

NA

15. Are there specific emergency response incident reports (i.e., aircraft or vehicle crash sites and fires)? If so, may we please copy these reports? Who (entity) was the responder?

ANG

"Agpoo" ground power unit caught fire, in 1997. ~~AF~~ fire department used Tri-Max units to put it out. ARNG also responded.

PA Interview Questionnaire - Environmental Manager

Facility:_____
Interviewer:_____
Date/Time:_____

16. Do you have records of fuel spill logs? Was it common practice to wash away fuel spills with AFFF? Is/was AFFF used as a precaution in response to fuel releases or emergency runway landings to prevent fires?

Unknown

17. Was AFFF used for forest fires or fire management on-post/off-post? If so, please describe what happened and who was involved?

Unknown

18. Are there mutual aid/use agreements between county, city, and local fire department? Please list, even if informal. If formalized, may we have a copy of the agreement?

ARNG is covered by ~~AF~~ ANG fire department.

19. Can you provide any other locations where AFFF has been stored, released, or used (i.e. hangars, buildings, fire stations, firefighting equipment testing and maintenance areas, emergency response sites, storm water/surface water, waste treatment plants, and AFFF ponds)?

Only known releases are at wash rack and Agpoo fire.

20. Are you aware of any other creative uses of AFFF? If so, how was AFFF used? What entities were involved?

No

PA Interview Questionnaire - Environmental Manager

Facility:_____
Interviewer:_____
Date/Time:_____

21. Are there past studies you are aware of with environmental information on plants/animals/ groundwater/soil types, etc., such as Integrated Cultural Resources Management Plans or Integrated Natural Resources Management Plans?

PFAS PA report for Air National Guard, and site inspection report.

22. What other records might be helpful to us (environmental compliance, investigation records, admin record) and where can we find them?

NA

23. Do you have or did you have a chrome plating shop on base? What were/are the years of operation of that chrome plating shop?

No

24. Do you know whether the shop has/had a foam blanket mist suppression system or used a fume hood for emissions control? If foam blanket mist suppression was used, where was the foam stored, mixed, applied, etc.?

No

25. How is off-spec AFFF disposed (used for training, turned in, or given to a local Fire Station)? If applicable, do you know the name of the vendor that removes off-spec AFFF? Do you have copies of the manifest or B/L?

In the early 90s, Tri-Max units were maintained by ARNG, then became the responsibility of the AFANG fire department, then were serviced by an outside contractor. Unknown about disposal.

PA Interview Questionnaire - Environmental Manager

Facility:_____
Interviewer:_____
Date/Time:_____

26. Do you recommend anyone else we can interview? If so, do you have contact information for them?

Fire Chief [redacted]

[redacted]

PA Interview Questionnaire – Fire Station

Facility: Ellington AASF
Interviewer: [redacted]
Date/Time: 4/26/19 @ 11 am

Interviewee: [redacted] National Guard **Title:** Fire Chief (Air ~~Force~~ Fire Department) **Phone Number:** [redacted] **Email:** [redacted]	Can your name/role be used in the PA Report? (Y) or N Can you recommend anyone we can interview? Y or (N)

1. Roles or activities with the Facility/years working at the Facility.

31 years at the facility. Fire Chief since 1998.

2. What can you tell us about the history of AFFF at the Facility? Was it used for any of the following activities, circle all that apply and indicate years of active use, if known? Identify these locations on a facility map.

Maintenance (e.g., ramp washing) No
Fire Training Areas Yes
Firefighting (Active Fire) Yes
Crash No
Fire Suppression Systems (Hangers/Dining Facilities) ~~Yes~~ No
Fire Protection at Fueling Stations Yes
Non-Technical/Recreational/ Pest Management No

3. Are any current buildings constructed with AFFF dispensing systems or fire suppression systems? What are the AFFF/suppression system test requirements? What is the frequency of testing at the AFFF/suppression systems?

High expansion foam (C6) is used in Building 1190 (New Fire station) for ~~a suppression system.~~ fire trucks use.

4. Are fire suppression systems currently charged with AFFF or have they been retrofitted for use of high expansion foam?

AFFF was converted to high expansion foam (C6).

5. How is AFFF procured? Do you have an inventory/procurement system that tracks use?

Unknown.

PA Interview Questionnaire – Fire Station

Facility:_____
Interviewer:_____
Date/Time:_____

6. What type of AFFF has been/is being used (3%, 6%, Mil Spec Mil-F-24385, High Expansion)? Manufacturer (3M, Dupont, Ansul, National Foam, Angus, Chemguard, Buckeye, Fire Service Plus)?

High Expansion

7. Is AFFF formulated on base? If so, where is the solution mixed, contained, transferred, etc.?

Not formulated on base. Does not help refill Tri-Max for ARNG.

8. Where is the AFFF stored? How is it stored (tanks, 55-gallon drums, 5-gallon buckets)? What size are the storage tanks? Is the AFFF stored as a mixed solution (3% or 6%) or concentrated material?

No bulk AFFF on-site during 2010 inspection.

Leak of AFFF at old fire station.

9. How is the AFFF transferred to emergency response vehicles, suppression systems, flightline extinguishers? Is/was there a specified area on the facility where vehicles are filled with AFFF and does this area have secondary containment in case of spills? How and where are vehicles storing AFFF cleaned/decontaminated?

Unknown

10. Provide a list of vehicles that carried AFFF, now and in the past, and where are/were they located?

Fire trucks

11. Any vehicles have a history of leaking AFFF? Do you/did you test the vehicles spray patterns to make sure equipment is working properly? How often are/were these spray tests performed and can you provide the locations of these tests, now and in the past?

Unknown

PA Interview Questionnaire – Fire Station

Facility:_____
Interviewer:_____
Date/Time:_____

12. How many FTAs are/were on this facility and where are they? Locate on a map. How many FTAs are active and inactive? For inactive FTAs, when was the last time that fire training using AFFF was conducted at them?

Training with AFFF at washrack

13. What types of fuels/flammables were used at the FTAs?

Metal burn box set on fire, practiced putting it out

14. What was the frequency of AFFF use at each location? When a release of AFFF occurs during a fire training exercise, now and in the past, how is/was the AFFF cleaned and disposed of? Were retention ponds built to store discharged AFFF? Was the AFFF trickled to the sanitary sewer or left in the pond to infiltrate?

Washrack → OWS → ~~sto~~ ganitary sewer

15. Are there mutual aid/use agreements between county, city, local fire department? Please list, even if informal. If formalized, may we have a copy of the agreement? Can you recall specific times when city, county, state personnel came on-post for training? If so, please state which state/county agency, military entity? Do you have any records, including photographs to share with us?

ANG provides fire protection for ARNG.

16. Did individual units come on-post with their own safety personnel, did they also bring their own AFFF? Was training with AFFF part of these exercises? How were emergencies handled under these circumstances?

No

PA Interview Questionnaire – Fire Station

Facility:_____
Interviewer:_____
Date/Time:_____

17. Did military routinely or occasionally fire train off-post? List units that you can recall used/trained at various areas.

No

18. Are there specific emergency response incident reports (i.e., aircraft or vehicle crash sites and fires)? If so, may we please copy these reports? Who (entity) was the responder?

Agpoo (ground power unit) caught fire. ARNG & ANG responded.

19. Do you have records of fuel spill logs? Was it common practice to wash away fuel spills with AFFF? Is/was AFFF used as a precaution in response to fuel releases or emergency runway landings to prevent fires?

No

20. Was AFFF used for forest fires or fire management on-post/off-post? If so, please describe what happened and who was involved?

No

21. Can you provide any other locations where AFFF has been stored, released, or used (i.e. hangars, buildings, fire stations, firefighting equipment testing and maintenance areas, emergency response sites, storm water/surface water, waste water treatment plants, and AFFF ponds)?

None

PA Interview Questionnaire – Fire Station

Facility:_____
Interviewer:_____
Date/Time:_____

22. Are you aware of any other creative uses of AFFF? If so, how was AFFF used? What entities were involved?

None

23. How is off-spec AFFF disposed (used for training, turned in, or given to a local Fire Station)? If applicable, do you know the name of the vendor that removes off-spec AFFF? Do you have copies of the manifest or B/L?

Outside contractor

24. Do you recommend anyone else we can interview? If so, do you have contact information for them?

PA Interview Questionnaire - Other

Facility: Ellington AASF
Interviewer:
Date/Time:

Interviewee: See Sign-in sheet **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:

Base Environmental Manager (11 yrs)
HAASF Army officer (29 yrs)

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
ARNG is tenant under Air Force.	Use
In 1986 the Air Base closed.	Procurement
No drinking water wells onsite. Nearest surface water and groundwater sources are 80 miles away.	Disposition
	Storage (Mixed)
Groundwater flows to the east.	Storage (Solution)
	Inventory, Off-Spec
Shallow groundwater is ~3 ft bgs. Clay layer underneath.	Containment
	SOP on Filling
	Leaking Vehicles
Across I-45 from site is a capped Superfund site.	Nozzle and Suppression System Testing
	Dining Facilities
At peak, ~30-40 helicopters on-site (before 1995)	Vehicle Washing
	Ramp Washing
Currently, ~15 helicopters	Fuel Spill Washing and Fueling Stations
	Chrome Plating or Waterproofing

PA Interview Questionnaire - Other

Facility:_____
Interviewer:_____
Date/Time:_____

No suppression system at Hangar. Future renovation will add high expansion suppression foam system.

Air National Guard fire department uses C6 high expansion foam. ~~Swift~~ Switched out C8 AFFF.

AASF built in 1970s. No major fire responses.

1 Tri-Max fire extinguisher per 2 helicopters.

No Tri-Max use in 10 years.
In 2010 or 2011 donated AFFF Tri-Max units to fire department and replaced with Purple K units.

Did not have AFFF (bulk) on-site.

In 2005, helicopter crashed and burned in Camp Swift. Used AFFF to put out fire.

No fire training with local fire department.

Used AFFF on hard surfaces for limited training.

1997-1999 trained with Tri-Max units.
Hoses on Tri-Max units deteriorated. Disposed in 2007.

Not aware of any bulk AFFF stored at AASF.

Tri-Max stationed out on ramp.

Early 90's ARNG started maintaining Tri-Max units. Then fire department took over maintenance, then contractor.

PA Interview Questionnaire - Other

Facility:_____
Interviewer:_____
Date/Time:_____

At least 10 Tri-Max units onsite.

Practice with Tri-Max (once per year) with fire department, out on wash rack or flightline. Trained with 1 or 2 units each year. Metal burn box set on fire, then practiced putting it out.

Tri-Max units had lots of rust. They were contracted out for repair and hydrostatic testing.

2008-2010 shipped out Tri-Max units.

4 or 5 times used Tri-Max units for training.
Wash rack → OWS → sanitary sewer

1997 Agpoo caught fire. Used Tri-Max unit to put out fire. Agpoo is a ground power unit.

Fire department never trained with spray from truck.

Trained with AFFF at washrack. ~~Dfbn~~ Didn't help refill Tri-Max for ARNG. - Fire Chief [redacted]

No bulk AFFF on site during inspection in 2010.

Leak of AFFF at old fire station (Building 694).

4/26/19

Ellington

Preliminary Assessment Sign-In Sheet

Name	Position	Years at the Facility	Phone Number/Email	May AECOM use your name in the PA Report?
[redacted]	BASE ENVIRONMENTAL MGR	11	[redacted]	Yes
	STATE Environmental Mgr	1		Yes
	Supervisor FMS & SGM	8		Yes
	HHASF CDR	12		
	HHASF Asst Offcr	29		
	HHASF LMO	27		
	" " maintance Supervisor	33		
	HHASF Aircraft Systems Supervisor	11		
	147TH Fire Chief	31		

Appendix B.2
Visual Site Inspection Checklists

Facility ST
Visual Survey Inspection Log

Recorded by [redacted]
ARNG Contact [redacted]
Date: 4/26/19

Site Name / Area Name / Unique ID: Ellington Field AASF
Site / Area Acreage: 21 acres
Historic Site Use (Brief Description): AASF

Current Site Use (Brief Description): AASF

1. Was AFFF used at the site/area? (Y) / N
   3a. If yes, document how AFFF was used and usage time (e.g., *fire fighting training 2001 to 2014*) fire fighting training 1997-1999, ground power unit fire 1997.
2. Has usage been documented? Y / (N)
   2a. If yes, keep a record (place electronic files on a disk)

Significant Topographical Features:

1. Has the infrastructure changed at the site/area? (Y) / N
   1a. If so, please describe change: (*ex. Structures structures longer exist.*) New fire station (Building 1190) built in 2011.
2. Is the site/area vegetated? Y / (N)
   2a. If not vegetated, briefly describe the site/area composition: Mostly imperious cover
3. Does the site or area exhibit evidence of erosion? Y / (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? Y / (N)
   4a. If yes, describe the location and extent of the ponding :

Migration Potential:

1. Does site/area drainage flow off installation? (Y) / N
   1a. If so, please note observation and location: Through various stormwater discharge outfalls
2. Is there standing water or drainage issues within the site/area? Y / (N)
   2a. If so, please note observation and location:
3. Is there channelized flow within the site/area? Y / (N)
   3a. If so, please note observation and location:
4. Have man-made drainage channels been constructed within the site/area? (Y) / N
   4a. If so, please note the location of the channel: There is a storm water drainage system.

Additional Notes

Appendix B.3
Conceptual Site Model Information

Preliminary Assessment – Conceptual Site Model Information

Site Name: Ellington Field AASF

Why has this location been identified as a site? Historic use of Tri-Max fire extinguishers.

Are there any other activities nearby that could also impact this location?
Superfund site across I-45. ARNG colocated with ANG (has historic PFAS use, documented in reports)

Training Events

Have any training events with AFFF occurred at this site? Yes, 1997-1999

If so, how often? 4/5 times used Tri-Max for training

How much material was used? Is it documented? Not documented

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? Dictated by Base's surface drainage system

Average rainfall? 45.3 in/year

Any flooding during rainy season? Yes

Direct or indirect pathway to ditches? Multiple ditches/channels for surface flow

Direct or indirect pathway to larger bodies of water? Stormwater moves by open channel flow ↑ underground drainage p until it reaches Horsepen Bayou mi sout of site

Does surface water pond any place on site? Large detention pond (NW of site)

Any impoundment areas or retention ponds? Large detention pond (NW of site)

Any NPDES location points near the site? 6 stormwater discharge outfalls

How does surface water drain on and around the flight line? Flight line drains to south at SDO-005.

Preliminary Assessment – Conceptual Site Model Information

Groundwater:

Groundwater flow direction? Generally to the east

Depth to groundwater? 10 ft bgs

Uses (agricultural, drinking water, irrigation)? 70 wells within 1 mi. radius of base. Industrial (Exxon) to N Domestic to SE. Irrigati well to N.

Any groundwater treatment systems? No

Any groundwater monitoring well locations near the site? Yes, to N & S of site.

Is groundwater used for drinking water? No

Are there drinking water supply wells on installation? No

Do they serve off-post populations? No

Are there off-post drinking water wells downgradient No

Waste Water Treatment Plant:

Has the installation ever had a WWTP, past or present? No

If so, do we understand the process and which water is/was treated at the plant? NA

Do we understand the fate of sludge waste? NA

Is surface water from potential contaminated sites treated? NA

Equipment Rinse Water

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

Unknown. Mostly (likely) flow travels down wash rack, to OWS, to sanitary sewer.

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?

Unknown

3. Other?

Preliminary Assessment – Conceptual Site Model Information

Identify Potential Receptors:

Site Worker Yes

Construction Worker Yes

Recreational User No

Residential No

Child No

Ecological Yes

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

Residential to SE, (Elementary school), NASA to south, industrial, oil & gas to west.

Documentation

Ask for Engineering drawings (if applicable).

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

Appendix C
Photographic Log

APPENDIX C – Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Ellington Field AASF	Houston, Texas

Photograph No. 1

Description:

Photo facing east of US Coast Guard Property and above ground holding tank.

Photograph No. 2

Description:

Historical aerial photo of flight line and AASF. Historically, 1 Tri-Max fire extinguisher unit was placed for every 2 helicopters.